Supplementary data for:

Arc magmatic evolution and the construction of continental crust at the Central American Volcanic Arc system

Scott A. Whattam^{a,*}, Robert J. Stern^b

^a *Department of Earth and Environmental Sciences, Korea University, Seoul 136-701, Republic of Korea*

^b *Geosciences Department, University of Texas at Dallas, Richardson, TX 75083-0688, USA*

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* Corresponding author. Tel.: +82-2-3290-3172

E-mail address: whattam@korea.ac.kr

1. Detailed methods

1.1. Geochronological datasets and age bracketing

There are several hiatuses in magmatism exhibited by the CAVAS, some of which are linked to changing tectonic regimes (e.g., Abratis and Wörner 2001; Macmillan *et al.* 2004; Montes *et al.* 2012a; Whattam *et al.*, 2012) (Supplementary Fig. S1). Similarly, some dramatic changes in magma chemistry also appear to be tied to changing tectonic regimes. The most prominent example (at least as explored in the literature) is the generation of enriched alkaline (Carr *et al.* 1990; Herrstrom *et al.* 1995; Abratis and Wörner 2001; Lissinna 2005) and adakitic magmas (Defant *et al.* 1991a, 1991b, 1992; MacMillan *et al.* 2004 and references therein) beginning ~ 6 Ma subsequent to collision of the Cocos Ridge with the CAVAS trench after 8 Ma (see MacMillan *et al.* 2004) (Supplementary Fig. S1).

We filtered the radiometric data such that unpublished ages (e.g., as cited in Drummond *et al.* 1995) and those with no reported uncertainties are omitted. When using radiometric ages, bracketing is accomplished by taking the maximum of a given magmatic phase as the oldest plus its uncertainty and the minimum as the youngest age minus its uncertainty and rounding to the nearest Ma; an exception is the designation of 2.6 Ma for the upper limit of the PIV suite which conforms with that of the CentAm database (version 1.02 at: <http://www.earthchem.org/grl>). In distinguishing between the lower and upper limits of PII and PIII respectively, both of which are 16 Ma (i.e., PII 35-16 Ma and PIII 16-6 Ma), radiometric ages that are $15.x \pm Y.y$ or $16.x \pm Y.y$ Ma are rounded up if 'x' is 5 or greater and rounded down if 'x' is less than 5. For example, two radiometric dates from Nicaragua (Elming *et al.* 2001; 15.9 ± 0.9 Ma) and Costa Rica (Gazel *et al.* 2005, 15.40 ± 0.6 Ma) could be interpreted as being either greater or lesser than 16 Ma taking into consideration the range of errors and depending upon the way that ages are rounded,

i.e., either up or down. According to the way we round the ages, as 'x' > 5 in the 15.9 ± 0.9 Ma age, and 'x' < 5 in the 15.40 ± 0.6 Ma age, the former is placed in the PII (35-16 Ma) magmatic suite whilst the latter is placed in the PIII (16-6 Ma) magmatic suite. We subdivided the lower limit of PIII and the upper limit of PIV magmatism (6 Ma) in a similar fashion.

We bracket the aforementioned magmatic phases on the basis of apparent lulls in magmatic activity. Some magmatic gaps can be tied with tectonic events (e.g., the one between PI terminal magmatism at 39 Ma and incipient PII magmatism circa four m.y. later at 35 Ma, see Supplementary Fig. S1 and citations therein). In other cases, this is not as straightforward. For example our distinction between terminal PII magmatism at 16 Ma and the start of PIII magmatism at 16 Ma suggests no hiatus but we are unsure as to whether or not this is the case, at least for Panama. For example, the oldest radiometric Miocene ages of the Panama Cordillera are ~ 15 Ma (Lissina 2005; Wegner *et al.* 2011, see also below). In Costa Rica, pre-4 Ma volcanic rocks range from ~ 28-18 Ma and ~ 16-4 Ma (MacMillan *et al.* 2004; Gazel *et al.* 2005; Gazel *et al.* 2009), whereas in Nicaragua, Late Oligocene to Late Miocene volcanic rocks range from ~28-6 Ma (Ehrenborg 1996; Elming 2001; Plank *et al.* 2002; Saginor *et al.* 2011). Whether or not a magmatic 'gap' existed circa 16-15 Ma in Panama is real or the result of incomplete sampling/buried exposures etc., is uncertain; nevertheless, we subdivide in the middle Miocene and lower Miocene in order to allow a clearer chemotemporal resolution to be seen; e.g., if PII and PIII were combined (35-6 Ma) the distinction in chemotemporal progression between the Late Eocene to middle Miocene and the middle Miocene to latest Miocene would be blurred.

As well, 'normal' arc-related magmatic products (i.e., non-adakitic and non-arc alkaline) of the latest Miocene to the middle Pliocene (~6-3 Ma) are sparse which might suggest minor magmatic activity or incomplete sampling due to inaccessibility/burial etc. For example,

MacMillan et al. (2004) and Gazel et al. (2009) each report one circa 5 Ma and 4 Ma sample, respectively, from the Grifo Alto Formation (Unit) of the Aguacate arc, central Costa Rica (see Fig. 2 for locations); and Saginor et al. (2011) provide four circa 4-3 Ma aged samples from Nicaragua while Elsing et al. (2001) provides one circa 2.8 ± 1.0 Ma age from Nicaragua. Thus, there are no ages between 6-5 Ma (the youngest post 5 Ma age is 6.47 ± 0.21 Ma, central Costa Rica, Gazel *et al.* 2009) which could be related to collision of the Cocos Ridge with the Central America trench (see main text and below). Hence, we define PIII magmatism as having occurred between 16-6 Ma and PIV magmatism at 6-3 Ma. As well, the vast bulk of our compiled PVI (2.6-0 Ma) database is from the MARGINS CentAm database (version 1.02 at: <http://www.earthchem.org/grl>; see also below). However, as the CentAm database filtered data such that chemical analyses with ages of >2.6 Ma were omitted, it is uncertain as to how many circa 3.0-2.6 Ma age determinations have been made on CAVAS rocks but we note that the vast majority of chemical analyses of the CentAm database are of volcanics typically much younger than 1 Ma (Jordan, personal communication). Thus, we make a distinction between 6-3 Ma (PIV) and Quaternary magmatism (PVI, 2.6-0 Ma).

Age brackets for PI magmatism (75-39 Ma) are established on the basis of biostratigraphic data from Buchs et al. (2010) and radiometric data from Lissinna (2005), Wegner et al. (2011) and Montes et al. (2012a). The maximum age is constrained on the basis of proto-arc dykes reported as cutting ~ 75 -73 Ma limestone at Coiba Island, western Panama (Buchs et al., 2010) and the minimum age is constrained on the basis of latest recorded Eocene magmatism (39.4 ± 0.8 Ma) in Central Panama (Montes et al., 2012a). Age brackets for PII (35-16 Ma) magmatism are based on ages from Lissina (2005) (34.4 ± 0.5 Ma, western Panama) and Plank et al. (2002) (15.95 ± 0.46 Ma, Nicaragua). Age brackets for PIII (16-6 Ma) magmatism

are based on ages from Gazel et al. (2005) (15.40 ± 0.6 Ma, Sarapiquí arc, northern Costa Rica) and Gazel et al. (2009), 6.47 ± 0.21 , central Costa Rica). Age brackets for PV (5.9-0.02 Ma, PVa, arc alkaline, PVb, alkalic) magmatism are based on ages from Defant et al. (1991b) (4.47 ± 0.23 Ma, adakites from the La Yeguada volcano, central Panama); Defant et al. (1991a) (0.22 ± 0.07 Ma, adakites from the El Valle volcano, central Panama); Abratis and Wörner (2001) (5.82 ± 0.09 Ma, arc-alkaline from Sona-Azuero peninsula, southern Panama); and references therein which document arc alkaline magmas as young as the Holocene (0.01 Ma) (arc alkaline from central Panama to the north of the Azuero peninsula). Thus, when plotting PVa and PVb versus age we bracketed PVa arc alkaline at 5.9-0.01 Ma and PVb adakitic magmatism at 4.2-0.15 Ma. Age brackets for PIV (6-3 Ma) magmatism are from Gazel et al. (2009) (5.10 ± 0.10 Ma, central Costa Rica) and Saginor et al. (2011) (3.181 ± 0.011 , Nicaragua). Age brackets for PVI (2.6-0 Ma) magmatism (Costa Rica, Nicaragua) of the Quaternary to modern day volcanic are established on the basis of ages from references in the CentAm Geochem Database version 1.02 at: <http://www.earthchem.org/grl>. As explained above, the CentAm Geochem Database employs an age filter whereby only samples with ages < 2.6 Ma are listed, however the vast majority of samples of PV magmatism are $\ll 1$ Ma (Jordan, personal communication).

Radiometric age data from Panama, Costa Rica and Nicaragua which fall within the aforementioned brackets are from the following studies: PI (75-39 Ma) suite (Panama): Maury *et al.* (1995); Lissinna (2005); Wegner *et al.* (2011); Montes et al. (2012a); PII (35-16 Ma) suite (Panama, Costa Rica, Nicaragua): Kessler *et al.* (1977); Kesler (1978); Bellon and Tournon (1978); Defant *et al.* (1991b); Drummond *et al.* (1995); Abratis and Wörner (2001); Plank *et al.* (2002); MacMillan *et al.* (2004); Gazel *et al.* (2005); Lissinna (2005); Rooney *et al.* (2010); Saginor *et al.* (2011); Wegner *et al.* (2011); Whattam *et al.* (2012); PIII (16-6 Ma) suite (Panama,

Costa Rica, Nicaragua): Bellon and Tournon (1978); Defant *et al.* (1991a, 1991b); Drummond *et al.* (1995); Coates *et al.* (2003); MacMillan *et al.* (2004); Gazel *et al.* (2009); Saginor *et al.* (2011); Wegner *et al.* (2011); PIV suite (Costa Rica, Nicaragua): MacMillan *et al.* (2004); Gazel *et al.* (2009); Saginor *et al.* (2011); (PVa, b suite (Costa Rica, Panama): Defant *et al.* (1991a, 1991b, 1992); deBoer *et al.* (1995); Drummond *et al.* (1995); MacMillan *et al.*, (2004, and references therein); Lissinna (2005); Wegner *et al.* (2011); PVI suite: references as listed in the Central America geochemical database that comprises the CentAm Database version 1.02 at: <http://www.earthchem.org/grl>.

1.2 Geochemical dataset compilations and sources

An extended Table 2 is provided in Supplementary Table 1 which provides linearly regressed concentrations at the level of region in addition to linearly regressed concentrations at the collective (e.g., Panama plus Costa Rica or Panama plus Costa Rica plus Nicaragua or Costa Rica plus Nicaragua) level as provided in Table 2. Geochemical databases of PI (75-39 Ma) magmatism are from the 75-66 Ma Golfito Arc, southernmost Costa Rica; the 73-39 Ma Sona-Azuero Arc of central Panama; the 70-39 Ma Chagres-Bayano Arc of eastern Panama; and the central Cordillera of Panama (Hauff *et al.* 2000a; Lissina 2005; Buchs *et al.* 2010; Wegner *et al.* 2011). Data for PII (35-16 Ma) magmatism are from the Sona-Azuero region (Lissinna 2005); Cordillera de la Talamanca and El Baru volcano (Drummond *et al.* 1995) in eastern Costa Rica and westernmost Panama, respectively; the Petaquilla batholith (Kesler *et al.* 1977; Whattam *et al.* 2012) in central Panama; the Panama Canal region (Wörner *et al.* 2009; Rooney *et al.* 2010; Wegner *et al.* 2011); the Majé igneous complex (Whattam *et al.* 2012), Bahia Piña and the Pearl Islands (Lissinna 2005) to the east and south of the Panama Canal region; and (predominantly)

the Coyol Arc of SW Nicaragua (Plank *et al.* 2002; Saginor *et al.* 2011). Data for PIII (16-6 Ma) magmatism are from the Cordillera de la Talamanca in Costa Rica (Drummond *et al.* 1995; MacMillan *et al.* 2004); northern, central and southern Costa Rica (MacMillan *et al.* 2004; Gazel *et al.* 2009); the Tamarindo Formation in SW Nicaragua (Plank *et al.* 2002; Saginor *et al.* 2011); and the Cordillera de Panama (Wegner *et al.* 2011). Data for PIV magmatism (6-3 Ma) are predominantly from the Aguata Arc in north-central Costa Rica (Gazel *et al.* 2009) and near the Nicaragua-Honduras border in SW Nicaragua (Saginor *et al.* 2011). Data for PV magmatism are as follows: PVa consists of arc alkaline magmatic products from the Sona-Azuero region (Lissina 2005; see also Abratis and Wörner 2001; Hoernle *et al.* 2008; and Gazel *et al.* 2011) and PVb consists of adakitic products from the Cordillera de Panama at the El Baru, La Yeguada and El Valle volcanoes (Defant *et al.* 1991a, 1991b, 1992; Drummond *et al.* 1995; MacMillan *et al.* 2004; Lissina 2005; Wegner *et al.* 2011) and to the south of El Baru (Lissina 2005). The term ‘adakite’ is controversial and we note here that we use only upon the basis of its usage in the aforementioned studies. Only adakites from the datasets of Defant *et al.* (1991a, b, 1992) and Drummond *et al.* (1995), for which complementary radiometric age data are provided are used (see summary of MacMillan *et al.* 2004). The databases for PVI magmatism are from Costa Rica and Nicaragua (as compiled by Jordan *et al.* 2012) as provided in the CentAm Database version 1.02 at: <http://www.earthchem.org/grl> and from the GEOROC database at: <http://georoc.mpchainz.gwdg.de/georoc/>. All of the aforementioned localities are shown in Fig. 2 and raw (unprocessed) geochemical data of all phases are provided in Supplementary Table S2.

1.3. Isotope dataset compilations and sources

Isotope data used in this study (initial values only) and the sources of these data are provided in Supplementary Table S3.

1.4. Comparison with MORB, OPB, OIB, BCC and Arc

To better illuminate the tectonic evolution of the CAVAS over its 75 Ma lifespan, we also compiled geochemical data for lavas from representative examples of two distinct tectono-magmatic associations: (1) oceanic plateau basalts (OPB) and (2) volcanic arc basalts (VAB) of the Izu-Bonin Mariana Arc system (IBM). The OPB dataset ($n = 380$, as assembled by Whattam and Stern, 2015) compiles tholeiitic basalts from four oceanic plateaus (OP) in the Pacific Ocean: Ontong Java (Mahoney *et al.* 1993; Tejada *et al.* 2002), Manihiki (Hoernle *et al.* 2010) and Hikurangi (Hoernle *et al.* 2010) plateaus and the Shatsky Rise (Sano *et al.* 2012); and the Kerguelen Plateau (Mahoney *et al.* 1995; Frey *et al.* 2002; Neal *et al.* 2002), Indian Ocean. The volcanic arc basalt (VAB) dataset comprises Quaternary lavas from the IBM Arc (IBMVAB, as compiled by Jordan *et al.*, 2012). Additionally, we also use the compositions of mid-oceanic ridge basalts (MORB) and oceanic island basalts (OIB) (Sun and McDonough 1989) and bulk continental crust (BCC) (Rudnick and Gao 2003) for further comparison.

1.5. Methods of linear regression and propagation of uncertainties

1.5.1. Linear regression methods

To allow for compositional comparison of each temporal phase (P) minus the effects of fractionation, we have linearly regressed data to 55 wt. % SiO₂ in many of our geochemical plots (as listed in Table 2 and Supplementary Table S1). The particular oxide (in wt. %) or trace element (in ppm) that has been regressed is denoted by “X₅₅” as in K₂O₅₅ which represents K₂O

linearly regressed to 55 wt. % SiO₂. Linear regression was accomplished by first plotting SiO₂ versus each element 'X' on Harker bivariate plots in Excel and determining the value of the y-intercept of x via the least-squares line of best fit method, i.e. solving for y in $y = mx + b$ where $x = 55$ wt. % SiO₂ (as in Dickinson and Hatherton 1967 and others thereafter). The limitations of this method as discussed by Ragland and Defant (1983) is twofold: 1, regression in this manner provides a single SiO₂-standardized K₂O₅₅ (or other X₅₅) only, for a given suite of magmatic rocks and thus yields nil information as to chemical variability within the given magmatic suite; and (2) regression provides nil standardized values for individual samples in which to generate a standard error (SE) of the mean. For the purpose of this study, the limitations of point 1 are irrelevant as we do not plot standardized values for individual samples but rather mean standardized values for a suite (phase) of samples as it was not essential for us to demonstrate chemical variability within a particular suite (i.e., phase) but rather to compare average regressed values of key elements between the different magmatic suites; with respect to point 2, however, it was important for us to be able to calculate the SE of the mean of a suite of plotted standardized values.

In order to generate a SE of the mean for a suite of X₅₅ values, we generated a single X₅₅ for each X analysis by adding 'x' (from the equation $y = mx + b$) to X (the non-standardized element under consideration) and multiplying this by 55 (wt. % SiO₂) - X (wt. SiO₂). This allowed us to generate a series of individual, standardized X₅₅ values. We then averaged the discrete standardized values to arrive at a mean X₅₅ (which is equal to a single SiO₂-standardized value of X₅₅ for a suite of analyses) by solving for y in $y = mx + b$ where $x = 55$ wt. % SiO₂. To calculate a SE for each (mean) X₅₅, the standard deviation of the suite of individual standardized X₅₅ values was divided by the square root of the number of standardized X₅₅ values. To ensure

that our calculations of SE were correct, we then ran ‘descriptive statistics’ in Excel on the suite of standardized (X_{55}) analyzes to generate mean and SE of the mean for comparison.

2. Manifestation of CAVAS magmatism in phases I (75-39 Ma), II (35-16 Ma), III (16-6 Ma), IV (6-3 Ma), V (5.9-0.02 Ma) and VI: A synopsis

Here we provide a synopsis of the style (volcanic vs. plutonic), major compositional changes and extent of arc related magmatism in each of the six proposed magmatic episodes (Supplementary Fig. 1) that temporally and geographically span 75-0 Ma in Panama, Costa Rica and Nicaragua as provided in the literature.

2.1 *PI magmatism: 75-39 Ma*

Arc-related magmatic activity at 75-39 Ma affected the entirety of the southern margin of present-day Panama (e.g., Maury *et al.* 1995; Lissinna 2005; Wörner *et al.* 2009; Buchs *et al.* 2010; Wegner *et al.* 2011) and appears to have swept as far west as easternmost Costa Rica in the vicinity of the Golfito complex (Buchs *et al.* 2010) and probably even much further to the NW in the vicinity of the Nicoya peninsula (Whattam and Stern 2015). Wegner *et al.* (2011) distinguish a circa 73-39 Ma Sona-Azuero Arc (we base this age range on ages from Lissinna, 2005 and Wegner *et al.* 2011) in western Panama from a circa 68-39 Ma Chagres-Bayano Arc (ages from Wegner *et al.* 2011; Montes *et al.* 2012a) in eastern Panama. However, Lissinna (2005) dated various samples from Sona-Azuero which yielded ages of about 61-49 Ma; this along with fact that Sona-Azuero and Chagres-Bayano lavas and intrusives exhibit overlapping and gradational chemistry suggests instead a continuous Late Cretaceous to middle Eocene arc

system which may have extended as far east as western Colombia and Ecuador (Whattam and Stern 2015).

2.2. PII magmatism: 35-16 Ma

The circa 4 m.y. magmatic gap between terminal PI activity and the onset of PII magmatism is interpreted to be the result of the arrival of an ‘indenter’ (possibly a tract of thickened oceanic crust) at the CAVAS trench which shutdown the Late Cretaceous to Late Eocene arc (Kerr and Tarney 2005; Whattam *et al.* 2012; Montes *et al.* 2012b) and overlapped exhumation of the older (PI) arc system beginning ~ 47 Ma (Montes *et al.* 2012b) and left-lateral offset of the arc system (Lissinna 2005; Montes *et al.* 2012b). Magmatic activity circa 35-33 Ma appears to be very minor as there is only one sample that dates within this range (34.5 ± 0.5 Ma, western Panama, Lissina 2005). Similarly, we also note that Montes *et al.* (2012a) report that there was a temporary cessation of magmatism in Panama between 38-27 Ma and major magmatic activity does appear to have ended about 39 Ma (termination of PI magmatism). However, we extend the younger age limit of PII magmatism to accommodate the 34.5 ± 5 Ma age described above and explain below that magmatism continued in isolated regions in Panama between ~ 33-19 Ma.

The early stages of PII magmatism mark a change in magmatic style in Panama to predominantly plutonic activity, for example at El Baru (~31 Ma, Drummond *et al.* 1995) in westernmost Panama and Petaquilla (~32-26 Ma, Kesler *et al.* 1977; Kesler 1978; Whattam *et al.* 2012) in central Panama. Also unique is that during this phase, ‘adakitic-like’ magmatism occurred in isolated regions (Petaquilla, Panama Canal Basin, Majé range) between ~32-19 Ma (Rooney *et al.* 2012; Whattam *et al.* 2012). Commencement of PII magmatism also marks the

first appearance of CAVAS related arc activity in Nicaragua at ~ 33 Ma (Elming *et al.* 2001) and Costa Rica soon thereafter at 30-28 Ma (Gazel *et al.* 2009). Apparent predominantly plutonic activity gave way to primarily volcanic activity in the Panama Canal region between 25-19 Ma (Rooney *et al.* 2010; Farris *et al.* 2011; Wegner *et al.* 2011) and minor plutonism in eastern Panama generated the Majé range to the east and south of the Canal Basin region circa 19 Ma (Whattam *et al.* 2012). Although magmatism is recorded broadly across Panama circa 35-16 Ma including the Pearl Islands (~ 22 -19 Ma) to the south of the Majé range and at Bahia Pinã (~ 22 Ma) along southwestern most Panama (Lissinna 2005) there was a pause in magmatic activity circa 19-17 Ma as the only age that falls within this interval is 16.5 ± 0.3 Ma from a basalt in western Panama (Lissinna 2005). Arc magmatism continued until about 16 Ma in northern Costa Rica (Gazel *et al.* 2005) and Nicaragua (Ehrenborg 1996; Elming *et al.* 2001; Plank *et al.* 2002, terminal magmatism of their Age Group II).

2.3 PIII magmatism: 16-6 Ma

There appears to have been a lull in magmatism in Panama between 16-15 Ma as the only ages which fall near this time are 14.4 ± 0.3 Ma from Baru, northern Panama (Lissinna 2005) and 14.70 ± 0.34 Ma and 14.17 ± 0.42 Ma from the Cordilleran Arc (Wegner *et al.* 2011). We are uncertain as to whether this is real or the result of incomplete sampling. In any event, there was no magmatic lull at this time in Costa Rica and Nicaragua as radiometric dates from Nicaragua (15.4 ± 0.5 Ma; Elming *et al.* 2001) and Costa Rica (15.40 ± 0.6 Ma; Gazel *et al.* 2005) are reported. PIII magmatism continued from 14 Ma until about 7 Ma in Panama (Lissinna 2005; Wegner *et al.* 2011) including shoshonitic magmatism (possibly behind the volcanic front) in the vicinity of Bocas del Toro but appears to be absent between 7-5 Ma until the start of

adakitic magmatism in central Panama circa 4.7 Ma (Defant *et al.* 1991b). A similar but slightly more restricted magmatic pause appears to have occurred in Costa Rica between 6-5 Ma with the youngest circa 6 Ma age of 6.47 ± 0.21 Ma in central Costa Rica being followed by circa 5-4 Ma magmatic activity in central Costa Rica (MacMillan *et al.* 2004; Gazel *et al.* 2009). The cause of this magmatic hiatus after ~ 8 Ma has been ascribed to the collision of the Cocos Ridge with the CAVAS trench (e.g., Abratis and Wörner 2001) although the timing of this collision is a matter of debate (see MacMillan *et al.* 2004). A magmatic gap also appears in the Nicaraguan record as no circa 6-4 Ma ages have been recorded from arc-related lavas or intrusives (Elming *et al.* 2001; Plank *et al.* 2002) although Ehrenborg (1996) reports one circa 4 Ma age but with a large uncertainty (4.3 ± 1.3 Ma). This suggests that if this magmatic lull was indeed the result of collision of the Cocos Ridge with the CAVAS trench, its effects were realized as far west as Nicaragua. We note also that some studies (Benjamin *et al.* 2007; Hoernle *et al.* 2008; Gazel *et al.* 2009), interpret a circa 6 Ma and younger source enrichment event manifest as a switch from ‘normal’ calc-alkaline to anomalous OIB-like magmatism (Reagan and Gill 1989; Herrstrom *et al.* 1995; Feigenson *et al.* 2004) at the central Costa Rica volcanic front to represent subducted, Galapagos hotspot tracks contaminating the calc-alkaline magmatic arc source (Gazel *et al.* 2009, 2011).

2.4 PIV magmatism: 6-3 Ma

‘Normal’ (i.e., non-adakitic, non-alkaline) arc-related magmatic activity in Panama appears to have ceased by about 7 Ma (Lissinna 2005; Wegner *et al.* 2011). As well, ‘normal’ arc-related magmatism between 6-3 Ma in Costa Rica (Drummond *et al.* 1995; MacMillan *et al.* 2004; Gazel *et al.* 2009; dated samples, $n = 6$) and Nicaragua (Ehrenborg *et al.* 1996; Elming *et*

al. 2001; Saginor *et al.* 2011; dated samples, $n = 6$) is uncommon. Whether or not this scarcity is related to collision of the Cocos Ridge with the Central America trench is uncertain, but we note that voluminous ‘normal’ arc volcanism did not reappear until Quaternary time.

2.5. PV (PVa, arc alkalic, PVb, adakitic) magmatism: 5.9-0.02 Ma

The oldest recorded age of CAVAS adakitic magmatism is 4.47 ± 0.23 Ma from the La Yeguada volcano in central Panama (Defant *et al.* 1991b) with the bulk of adakitic magmatism occurring in isolated locales in central Panama and Costa Rica after ~ 1.5 Ma (Defant *et al.* 1991a, 1991b; Drummond *et al.* 1995; MacMillan *et al.* 2004; Lissina 2005; Wegner *et al.* 2011). Adakite petrogenesis in general is controversial (see Castillo 2006); in Panama, these young adakites have been interpreted as partial melts of: subducted lithosphere (e.g., Defant *et al.* 1991a) or the leading edge of the Cocos Ridge (Abratis and Wörner 2001). CAVAS adakitic magmatism has also been interpreted as the result of slab window formation and melting of Cocos Plate MORB (Johnston and Thorkelson 1997) or melting of a mantle wedge source contaminated by slab-derived melts (Gazel *et al.* 2011). Oligo-Miocene ‘adakitic-like’ intrusives (ALI) in the Panama Canal and eastern Panama (Majé range) have been ascribed to either fractionation (Rooney *et al.* 2010) or partial melting of lowermost mafic arc crust (Whattam *et al.* 2012).

Alkaline magmatism occurred in isolated regions primarily behind the volcanic front but over a broad region from the Talamanca range in Costa Rica to the central Cordillera of Panama and in a region to the immediate north of the Sona peninsula over the past ~ 6 Ma (Defant *et al.* 1992; deBoer *et al.* 1995; Abratis and Wörner 2001; Lissina 2005) and hence overlapped the timing of adakitic magmatism in Panama and Costa Rica. According to models of Johnston and Thorkelson (1997) and Abratis and Wörner (2001), following subduction of the Galapagos

spreading center and formation of a slab window ~ 8 Ma, Pacific mantle upwelled through the slab window and contaminated the Caribbean mantle wedge. Subsequent melting of a mixture of Galapagos-like enriched mantle and depleted MORB mantle (DMM) resulted in alkalic magmatism. Alternatively, Carr *et al.* (1990) argued that the enrichment seen in Costa Rica lavas which is not seen in Nicaragua lavas was a function of tectonics. The relatively flat subduction beneath Costa Rica allowed for enriched magmas to be generated and extracted on the upwelling limb of mantle counter-flow, whereas steeper subduction beneath Nicaragua did not allow for such upwelling (see Fig. 8 of Carr *et al.* 1990; see also main text). Hoernle *et al.* (2008) and Gazel *et al.* (2009, 2011) suggested that enrichment of Costa Rica magmas was the result of (localized) subduction of Galapagos hotspot tracks, which did not occur beneath Nicaragua whereas Goss and Kay (2006) ascribe enrichment to subduction erosion of forearc complexes.

PV adakite and arc alkaline magmatism overlapped that of ‘normal’ calc-alkaline magmatism in Costa Rica circa 6-3 Ma and the onset of CAVAS magmatism associated with construction of the modern volcanic front after ~ 2.6 Ma (see below).

2.6. PVI magmatism: 2.6-0 Ma

As mentioned above, the CentAm database (version 1.02 at: <http://www.earthchem.org/grl>) comprises the PVI magmatic suite and includes only volcanic samples which bear ages < 2.6 Ma. Thus, we are uncertain as to the number of samples and from where that record ages of circa 3-2.6 Ma. It is fairly well established that ‘normal’ arc magmatism ceased in Panama at ~ 7 Ma (Lissinna, 2005; Wegner *et al.*, 2011). In Costa Rica however, the youngest pre-Quaternary ages are circa 4-3 Ma (MacMillan *et al.*, Gazel *et al.*, 2009)

whereas in Nicaragua the youngest pre-2.6 Ma lavas are ~ 3.2 Ma (Saginer et al., 2011). Thus, it appears that arc magmatism circa 3.0-2.6 Ma is scarce.

3. Further details of major element chemotemporal evolution

The main text provides a synopsis of major element chemotemporal trends. Here, we provide further details of the major element chemical evolution of the CAVAS with time as recognized in this study.

3.1 *SiO₂ histograms*

SiO₂ histograms for lavas and intrusives of each temporal phase further discriminated on the basis of geographical region (Panama, Costa Rica and Nicaragua) are shown in Supplementary Fig.S2. The SiO₂ histogram and subsequent geochemical plots of PI (75-39 Ma) magmatism are biased by data from Panama due to the longer span (73-39 Ma for the Sona-Azuero and Chagres Bayano arcs vs. ~ 75-66 Ma for the Golfito Arc, Costa Rica, see above) and larger dataset ($n = 131$ vs. $n = 8$ for Costa Rica). PI Panamanian lavas and intrusives encompass the widest range in SiO₂ of all phases and regions (45-78 wt. %) with a mean and median of 56.0 and 53.6 wt. % SiO₂ (Fig. S2a). In contrast, PI Costa Rican lavas span a restricted range of 50-55 wt. % SiO₂ with a mean SiO₂ of 52.3 wt. %. PII (35-16 Ma) Panamanian lavas and intrusives exhibit a similar mean SiO₂ (58.0 wt. %) to, but higher median (57.7 wt. %) and consequently more restricted range in SiO₂ (48-69 wt. %) than PI Panamanian magmas (Fig. S2b). Similarly, the mean and median of PII Costa Rican magmas (51.4 and 50.8 wt. % SiO₂) are similar to PI Costa Rican lavas, both suites of which are markedly more silica-poor than PI and PII Panamanian magmas. PII Nicaraguan magmas span a more restricted spread in SiO₂ (51-66

wt. %) than PII Panamanian and Costa Rican products (48-69 wt. %, 45-62 wt. %) and exhibit a mean and median SiO₂ (55.5 wt. %, 54.5 wt. %) intermediate to PII Panamanian and Costa Rican lavas and intrusives. PIII Panamanian magmas span a similar range in SiO₂ (49-78 wt. %) to PI Panamanian magmas and a similar mean and median SiO₂ (58.4 and 57.0 wt. %) to PII Panamanian magmas (Fig. S2c). In contrast, PIII Costa Rican lavas and intrusives exhibit a significantly higher mean and median SiO₂ (59.1 and 58.4 wt. %) than PI and PII Costa Rican products which are slightly more silica-rich than PII Panamanian magmas. Similar to the situation in Panama, PIII Nicaraguan magmas exhibit a similar range in SiO₂ (49-68 wt. %) and mean and median (55.1 and 53.0 wt. %) to PII Nicaraguan magmas. The dataset for PIV (6-3 Ma) magmatic products is small ($n = 19$; 15 for Costa Rica and 4 for Nicaragua respectively) but its histogram (Fig. S2d) demonstrates a marked shift to significantly lower SiO₂ after 6 Ma for both regions but particularly Costa Rica. For example, the mean SiO₂ of Costa Rican and Nicaraguan PIV igneous rocks is 51.00 and 52.97 wt. % which represent mean decreases of ~ 8 and 2 wt. % for Costa Rica and Nicaragua respectively. Collectively, PIV products also exhibit a restricted range in SiO₂ (46-62 wt. %) with all but three samples containing 53 or less wt. % SiO₂. The 5.9-0.02 Ma PV magmas temporally overlap PIV (6-3 Ma) and PVI (2.6-0 Ma) magmatism and comprise arc alkalic basalts (PVa, $n = 15$) and adakites (PVb, $n = 86$). The latter encompass low to high SiO₂ adakites ranging from 53-71 wt. % SiO₂ with a mean and median of 60.1 and 59.4 wt.% SiO₂ whereas the alkalic basalts exhibit a mean and median of 47.7 and 47.1 wt. % with a restricted range of 45-50 wt. % SiO₂ (Fig. S2e). Collectively, PVI (2.6-0 Ma) lavas of the Quaternary Central American Volcanic Arc system (CAVAS) span 45-78 wt. % SiO₂ with a mean and median of 55.0 and 54.8 wt. % (Fig. S2f). These statistics are largely a reflection of the Costa Rican segment of the CAVAS as these lavas comprise 70% of the PVI database ($n = 405$

Costa Rican lavas vs. $n = 173$ Nicaraguan lavas). When discriminated into Costa Rican and Nicaraguan segments it is evident that PVI Costa Rican lavas are decidedly higher in SiO₂ (mean and median of 56.1 and 55.3 wt. %) than PVI Nicaraguan lavas (mean and median of 52.5 and 50.8 wt. %, Fig. S2f). As the mean SiO₂ of PIV Nicaraguan and Costa Rican lavas are 51.0 and 53.0 wt. %, the data suggests that PVI Costa Rican lavas evolved to higher SiO₂ after 3 Ma whereas Nicaraguan lavas did not.

Mean SiO₂ during PI (75-39 Ma) and PII (35-16 Ma) appears to reflect both location and time. For example, although mean SiO₂ is similar in PI and PII, the means in Panama and Costa Rica are different, ~ 56-57 wt. % and 51-52 wt. %, respectively. Similarly, the large jumps in mean SiO₂ of 7.70 and 5.13 wt. % recorded by Costa Rican magmas between PII (35-16 Ma) and PIII (16-6 Ma) and PIV (6-3 Ma) and PIV (2.6-0 Ma) respectively, are unique to Costa Rica; a significant drop in SiO₂ between PIII and PII ($\Delta\text{SiO}_2 \sim -8$ wt. %) is evident in Costa Rica but less so for Nicaragua ($\Delta\text{SiO}_2 \sim -2$ wt. %). As well, the histograms suggest that there is no discernible increase in SiO₂ between PI (mean SiO₂ of Panama plus Costa Rica of 56.0 wt. %) and PII (mean SiO₂ of Panama, Costa Rica plus Nicaragua of 55.9 wt. %). However, further parsing of Panamanian PI magmatism demonstrates a west to east and old to younger increase in SiO₂ from the Golfito Arc in southernmost Costa Rica (mean SiO₂ = 52.3 wt.%) to the Sona-Azuero Arc in western Panama (mean SiO₂ = 55.3 wt. %) to the slightly younger Chagres-Bayano Arc in eastern Panama (mean SiO₂ = 57.2 wt. %) (Supplementary Fig. S2).

3.2. SiO₂ vs. total alkalis (TAS)

In total alkalis (K₂O + Na₂O) versus SiO₂ (TAS) space, PI magmatic products span a wide compositional gamut from subalkaline basalt to rhyolite whereby PII magmatic rocks

encompass a slightly more restricted range from subalkaline basalt to dacite (Fig. 3a). The slightly elevated total alkalis of a handful ($n = 8$) of PI rocks may reflect secondary alteration and addition of sodium and/or potassium accompanying hydrothermal alteration or greenschist facies metamorphism. PIII rocks range from subalkaline basalt to rhyolite (Fig. 3b). Subsets of PIII rocks in Panama from Bocas del Toro (BDT, $n = 7$) on the NW Caribbean coast and Costa Rica from the Talamanca Range (Talamancas Intrusive Suite, TR-TIS, $n = 12$) (see Fig. 2 for locations) exhibit elevated total alkalis with the BDT suite plotting as alkalic basaltic trachyandesites. It appears that the BDT and TIS suites represent related low and high SiO₂ shoshonitic series magmatic rocks respectively (Fig. 4) as magmatic rocks from both suites also exhibit elevated K/Na (K₂O/Na₂O ratios typically >0.6, Table 2). According to the architecture of the Costa Rican segment of the Central American Arc of Hoernle *et al.* (2008, their Fig. 1, reproduced in part in our Fig. 2), BDT may have formed in the ‘rear’ arc in Panama. The remaining PIII Panamanian and Nicaraguan samples exhibit less total alkalis at a given SiO₂ content than do the BDT and TR rocks and range from basalt to rhyolite (Panama) and basalt to dacite (Nicaragua) (Fig. 3a). PIV magmatic products span a restricted range of compositions from basalt to andesite (Fig. 3b). PIV Costa Rican samples from the Aguacate Arc (AGA) and TR-TIS (Fig. 2) display elevated total alkalis similar to but at lower SiO₂ than the PIII Talamanca samples and higher total alkalis than most PIII samples at the same silica content (Fig. 3b). In contrast, the PIII Nicaraguan samples plot dissimilar to PIII Costa Rican samples but similarly to PII Nicaraguan samples with low total alkalis (maximum K₂O+Na₂O of 3.59 wt. %). PVa alkalic basalts plot primarily within the alkalic basalt field with minor overlap into the trachybasalt field and PVb adakitic rocks range from basaltic andesite to rhyolite but are primarily andesitic in composition. The vast majority of PVI lavas range from subalkaline basalts

and basaltic andesites to dacite (Fig. 3c); one Nicaraguan lava sample is rhyolitic and six basalts (one from Nicaragua and five from Costa Rica) plot within the alkaline field. Whereas most PVI Nicaraguan lavas are basaltic (63%), the vast majority of PVI Costa Rican lavas are basaltic andesites and andesites (75%) with a very small population of basalts (3%).

3.3. SiO_2 vs. K_2O

Plots of SiO_2 vs. K_2O (Fig. 4) demonstrate a clear, collective chemotemporal shift from initial low-K (PI, $\text{K}_2\text{O}_{55} = 0.61$ wt. %) to medium-K calc-alkaline (PII, $\text{K}_2\text{O}_{55} = 1.01$ wt. %) (Fig. 4a) to high-K and overlapping shoshonitic magmatism (PIII and PIV, $\text{K}_2\text{O}_{55} = 1.47$ wt. % and 1.89 wt. %) (Fig. 4b) between 75-3 Ma. After 3 Ma and the beginning of adakite and arc alkaline volcanism (K_2O_{55} of 1.98 wt. % and 1.93 wt. %), PVI returned to predominantly medium-K calc-alkaline series with overlap to high-K series magmatism ($\text{K}_2\text{O}_{55} = 1.11$ wt. %) roughly intermediate to that of PII and PIII (Fig. 4c). However, the tendency to higher potassium seen in Panama and Costa Rica after 16 Ma is not seen in Nicaragua (Fig. 4b). While the 75-39 Ma PI lavas and intrusives of Panama and Costa Rica plot predominantly as low-K tholeiites with moderate overlap into the fields for the medium-K calc-alkaline series, 84% (55 of 67 samples) of the 35-16 Ma PII lavas and intrusives of all three regions plot as medium-K calc-alkaline series; a small percentage (7%) of PIII samples from Panama and Nicaragua plot within the high-K calc-alkaline or shoshonite series (Fig. 4a). However, whereas PIII (16-6 Ma) Panamanian and Costa Rican magmas evolved to higher potassium and overlap the medium- and high-K calc-alkaline series with a subset of samples from Bocas del Toro (Panama) and the Talamanca Range (Talamanca Intrusive Series, Costa Rica) exhibiting higher-K and shoshonitic affinities, all PIII Nicaraguan lavas and intrusives plot within the medium-K calc-alkaline series, similar to PII

Nicaraguan samples (Fig. 4b). Similarly, the PIV (6-3 Ma) Costa Rican lavas and intrusives (from the Aguacate Arc and Talamanca Intrusives) plot as low-SiO₂, high-K calc-alkaline series while the PIV Nicaraguan samples plot instead within the medium-K calc-alkaline series similar to PII and PIII Nicaraguan samples. The overall shift from initial low-K to final high-K and shoshonitic magmatism between 75-3 Ma is summarized in Fig. 4d which provides best-fit lines through all data and clearly illuminate the trends outlined above.

Intra-phase parsing and best-fit lines through the data demonstrate that both Panama and Costa Rica evolved to higher K₂O between 75-6 Ma whereby Nicaragua did not but instead regressed to lower K₂O with time (Supplementary Fig. S3, Table 2). The data also demonstrate that: (a) the slightly younger (68-39 Ma), easternmost PI Chagres-Bayano Arc exhibits less potassium (K₂O₅₅ = 0.42 wt. %) than the slightly older (73-39 Ma), western Panamanian PI Sona-Azuero Arc (K₂O₅₅ = 0.78 wt. %) (Table 2) indicating an early PI shift to lower incompatible element concentrations with time and towards the east; (b) after 39 Ma, Costa Rican magmas were consistently higher in potassium than similar aged Panamanian magmas; and (c) that while Costa Rican and Nicaraguan trends diverge between 16-6 Ma as described above, 2.6-0 Ma magmatism of both regions converge and demonstrate identical trends and K₂O₅₅ content (1.07 and 1.17 wt. %) (Supplementary Fig. S3, Table 2).

3.4. Tholeiitic vs. calc-alkaline affinities through time

As subalkaline trends in FeO^t/MgO vs. SiO₂ space (Fig. 5a) (Miyashiro 1974) are ambiguous, we rely mostly on the total alkalis-FeO^t-MgO (AFM) subalkaline discrimination schemes and the tholeiitic index (THI) (Zimmer *et al.* 2010) (Figs. 5b, c) to discern tholeiitic vs. calc-alkaline affinities through time. The THI of a magma series is defined as Fe_{4,0}/Fe_{8,0}, where

$Fe_{4.0}$ and $Fe_{8.0}$ represent the average FeO_t of magmas with 3-5 and 7-9 wt. % MgO respectively (Zimmer *et al.* 2010) (Fig. 5c) and is the only scheme which allows for quantifying iron enrichment or depletion of a given magma series ($THI >$ and < 1 are tholeiitic and calc-alkaline respectively). Its applicability is limited by the lack of primitive (~8 wt. % MgO) magmas in CAVAS calc-alkaline suites. Nevertheless, calculating THI is useful for sample sets that contain some primitive lavas and particularly in discriminating between weakly tholeiitic and weakly calc-alkaline series where trends in other subalkaline discrimination plots (e.g., Figs. 5a, b) are less clear.

The plot of THI vs. time (Fig. 5c) suggests that the only tholeiitic suites were those generated at the onset of arc-related magmatism during PI (75-39 Ma) in Costa Rica (~75-65 Ma) and during PII (16-6 Ma) in Nicaragua. A total alkalis- FeO_t -MgO (AFM) plot (Kuno 1968; Irvine and Baragar 1971) generally confirms this (Fig. 5b); e.g., a clear iron enrichment trend is exhibited by the PIII Nicaraguan suite which is not seen in the PII Panamanian and Costa Rican suites. However, the AFM plot disagrees with some THI estimates as for example, the AFM plot also demonstrates significant iron enrichment in the PI Panamanian suite (Fig. 5b) and the mostly basaltic to basaltic andesitic PVI Nicaraguan suite which have calc-alkaline $THI < 1$. Calculated THI for the slightly older PI Panamanian Sona-Azuero (75-40 Ma) and 68-39 Ma Chagres-Bayano arcs are 0.98 and 0.82 respectively (Supplementary Table S1) suggesting that in conjunction with the AFM plot, the THI estimation for PI magmatism in Panama is low. Why an apparent switch from calc-alkaline to tholeiitic occurred in Nicaragua after 16 Ma is uncertain but is possibly related to formation of the Nicaraguan depression (Funk *et al.* 2009; see main text).

3.5. Trends in incompatible major elements

Here we look at CAVAS chemotemporal evolution using X_{55} values for four incompatible major oxides: TiO_2 , P_2O_5 , K_2O , and Na_2O (Fig. 6). All other things being equal, the abundances of the first three oxides and the ratio $\text{K}_2\text{O}/\text{Na}_2\text{O}$ are higher in enriched magmas than in depleted magmas. These behave as incompatible elements in subalkaline magmas until magnetite (Ti host), apatite (P host), biotite or K-feldspar (K host) or sodic plagioclase (Na host) precipitate. However, Ti follows Fe and so is likely to be more abundant in fractionated tholeiites than fractionated calc-alkaline igneous rocks. Comparing the trends of these elements is also useful because Ti and P are not thought to be easily mobilized during low grades of metamorphism but Na and K are commonly redistributed by alteration.

$[\text{TiO}_2]_{55}$ decreases slightly over CAVAS history, for the most part following iron-enrichment trends (Fig. 6a). This could either reflect an increasingly depleted mantle source or the switch from an early tholeiitic to a later calc-alkaline trend of CAVAS magmas. The different Fe-enrichment behavior between tholeiitic and calc-alkaline series magmas is ascribed by many workers (e.g., Sisson and Grove 1993) to the fact that the high oxygen fugacity of the latter results in early precipitation of magnetite, which can contain significant TiO_2 . For example, magnetite in experimental run products designed to reproduce calc-alkaline differentiation contain ~11% TiO_2 (Sisson and Grove 1993). Early fractionation of magnetite is thus likely to cause calc-alkaline differentiation trends and buffer TiO_2 contents in evolved magmas.

Among likely fractionating phases in subalkaline arc sequences, only apatite (~40 wt. % P_2O_5) accepts significant P. Apatite saturation occurs late for low-K tholeiites, at 60-70 wt. % SiO_2 but happens at lower silica contents for calc-alkaline series rocks (Green and Watson 1982). The progressively higher $[\text{P}_2\text{O}_5]_{55}$ observed for increasingly calc-alkaline affinities between PI-

III is therefore likely to reflect the progressively enriched nature of these magmas, and the subsequent decrease in $[P_2O_5]_{55}$ during PV and PVI suggests that the CAVAS magma source was depleted beneath Nicaragua after PIII and beneath Costa Rica after PIV (Fig. 6b).

Potassium behaves as an incompatible element for all subalkaline magmas until high silica magmas form, when biotite and K-feldspar may begin to precipitate. $[K_2O]_{55}$ follows similar enrichment trends as $[P_2O_5]_{55}$, increasing between PI (75-39 Ma) and PIII (16-6 Ma) and decreasing thereafter beneath Nicaragua (Fig. 6c), although the Costa Rica source did not become depleted until after PIV (cf. Figs. 6a and 6c). A similar trend is seen for K_2O_{55}/Na_2O_{55} (Fig. 6d). K_2O/Na_2O ranges widely in igneous rocks, from ~ 0.06 for MORB (Gale et al., 2013) to 0.86 for average upper continental crust (Rudnick and Gao 2003). K_2O_{55}/Na_2O_{55} reached a maximum for Nicaragua lavas during PIII and for Costa Rica lavas during PIV. The coherent behavior of relatively immobile P and more mobile K and Na suggests that alkali abundances are not seriously disturbed by alteration.

4. Regional variations in chemotemporal evolution

Supplementary Fig. S3 provides SiO_2 vs. K_2O plots to highlight regional and local scale differences between Panama, Costa Rica and Nicaragua. These variations are discussed in the main text.

5. Sr isotopes

We plot initial $^{87}Sr/^{86}Sr$ vs. $^{143}Nd/^{144}Nd$ in Supplementary Fig. S4. As seafloor lavas are prone to seawater alteration and such alteration can mobilize Sr, the large spread in $^{87}Sr/^{86}Sr$ in some of the oldest lavas from units interpreted as CLIP in western Costa Rica and the Golfito

lavas of easternmost Costa Rica suggest that these have been subject to alteration. The fact that all of the PI Panama samples from the Sona-Azuero and Chagres-Bayano arcs instead cluster in a tight array below or within the bottom of the compositional field defined by the 2.8-0 Ma Galapagos Plume (i.e., Galapagos Islands) with the highest $^{87}\text{Sr}/^{86}\text{Sr}$ is probably related to the fact that only the most pristine samples based on O isotope analysis, were chosen for subsequent Sr, Pb and Nd analysis by Wegner *et al.* (2011). As well, because the majority of lavas from units interpreted as CLIP also plot similarly to the PI Panama lavas suggest that these CLIP lavas are relatively fresh.

If we assume that the high $^{87}\text{Sr}/^{86}\text{Sr}$ values of the Golfito lavas (0.704365-0.705101) (Hoernle *et al.* 2000a) are indeed a reflection of alteration as opposed to source but that the Sona-Azuero and Chagres-Bayano values (Wegner *et al.* 2011) are pristine, we see that that the differences in Sr isotope composition between central and eastern Panama in PI were slight. For example, the two Sona-Azuero Arc samples (72.3 and 67.5 Ma) from central Panama record 0.703764-0.703923 and the two oldest Chagres-Bayano Arc samples (65.9-68.5 Ma) record similar values with $^{87}\text{Sr}/^{86}\text{Sr}$ that ranges from 0.703736-0.703819. It may be significant that the youngest of these four samples (Chagres-Bayano sample with 65.9 Ma) also records the lowest $^{87}\text{Sr}/^{86}\text{Sr}$ (0.703736) of the four, as the $^{87}\text{Sr}/^{86}\text{Sr}$ of the remaining younger samples are also lower (Fig. S6a); however, this is the only ‘trend’ to be gleaned from this plot as some much younger samples (47.2, 44.8 Ma) record moderately less $^{87}\text{Sr}/^{86}\text{Sr}$ while others of this age (46.9, 47.2, 49.9 Ma) record only slightly less $^{87}\text{Sr}/^{86}\text{Sr}$ (Fig. S4a). Furthermore, there is no trend to less radiogenic Sr with time after PI as all PII and PIII Panama and Costa Rica lavas fall almost completely within the range of PI Chagres-Bayano; one PII Costa Rica outlier with very high $^{87}\text{Sr}/^{86}\text{Sr}$ suggests alteration. Moreover, almost all remaining PIV, PV and PVI lavas fall almost

completely within the range of Chagres-Bayano values (Figs. S4b, c). Whereas the majority of the aforementioned lavas exhibit $^{87}\text{Sr}/^{86}\text{Sr} < 0.703800$ similar to the slightly younger PI lavas (mostly < 66 Ma), some PIII Panama, PIV Costa Rica, PVb adakites and PVI Nicaragua magmas extend to relatively higher $^{87}\text{Sr}/^{86}\text{Sr}$ with a maximum of 0.704248 (adakite sample from Wegner et al., 2011) which or may not reflect alteration. The fact that the majority of NW Nicaragua samples have relatively high $^{87}\text{Sr}/^{86}\text{Sr}$ may suggest that these values mostly reflect source composition as opposed to alteration.

The $^{87}\text{Sr}/^{86}\text{Sr}$ vs. $^{143}\text{Nd}/^{144}\text{Nd}$ plot is of little use in constraining the Sr isotope evolution of the CAVAS apart from demonstrating that the source or sources beneath Panama and Costa Rica both initially became less radiogenic with time during PI and essentially remain unchanged thereafter throughout the remaining of CAVAS evolution.

Supplementary Figure Captions

Fig. S1 Silica histograms of collective magmatic products of (a) PI (75-39 Ma, N = 131, 9 for PAN, CR), (b) PII (35-16 Ma, N = 35, 15, 17 for PAN, CR, NIC), (c) PIII (16-6 Ma, 54, 37, 21 for PAN, CR, NIC) (d) PIV (6-3 Ma, N = 15, 4 for CR, NIC), (e) PV (5.9-0.02 Ma, N = 15, 86 for PVa arc alkalic basalts, PVb adakites) and (F) PVI (2.6-0 Ma, N = 405, 178 for CR, NIC). As data is described in the text from oldest to youngest units, plots here and in subsequent figures are vertically stacked from bottom to top from oldest to youngest to reflect upward-younging stratigraphic, temporal, chemostratigraphic and chemostemporal relations. References for all phases are provided in Section 1 of the Supplementary data.

Fig. S2 SiO₂ versus K₂O plots (Peccerillo and Taylor 1976) of CAVAS magmatism discriminated on the basis of region (Panama, Costa Rica and Nicaragua, a-c) and phase (Phases I and II, Phases III and IV and Phase VI, d-f). Lines represent best-fit linear trends.

Fig. S3 ⁸⁷Sr/⁸⁶Sr vs. ¹⁴³Nd/¹⁴⁴Nd isotope data for (a) CAVAS magmatic products of PI (75-39 Ma) in Panama and Costa Rica vs. 98-82 Ma CLIP units in western Costa Rica; 80-60 Ma accreted OIB units in western Costa Rica; and the Galapagos Plume (GP) at 2.8 Ma; and CAVAS magmatic products of (b) PII-PIV (35-3 Ma) and (c) PVa (arc alkaline basalts, 5.90-0.01 Ma), PVb (adakites, 4.20-0.15 Ma) and PVI (2.6-0 Ma) in Panama, Costa Rica and Nicaragua. In (a) BUR stands for Burica (western Costa Rica accreted OIB unit, Hoernle *et al.* 2000a). Fields, data sources and other abbreviations are as in Fig. 13. References are also listed in Supplementary Table 2.

Fig. S4 Chronostratigraphic chart depicting the temporal and spatial distribution of PI-PVI CAVAS magmatism in Panama, Costa Rica and Nicaragua as bracketed by this study (see the Supplementary data for a synopsis of magmatism over the lifespan of the CAVAS) and the superposition of major tectonic, tectonomagmatic or oceanographic events (numbered 1 through 9 in italics) which occurred along the southern margin of the circum-Caribbean realm during the lifespan of the CAVAS: 1: emplacement of the of CLIP, which instigates 2: NE-dipping subduction initiation (SI) at the proto-CAVAS soon thereafter (Whattam and Stern 2015); 3: Possible collision of an oceanic plateau with CAVAS trench shuts down the CAVAS arc (Kerr and Tarney 2005; Whattam *et al.* 2012) and leads to partial exhumation of the plutonic root of PI arc system in Panama (Montes *et al.* 2012b); 4: left-lateral offset of (originally contiguous) PI

arc system (Lissinna 2005); 5: slab tearing results in partial melting of mafic arc substrate and generation of small volume of adakitic-like intrusives (ALI) in Panama (Whattam *et al.* 2012); 6: incipient formation of the Nicaragua depression (Funk *et al.* 2009); 7: Panama gateway closure cuts off flow of Caribbean Sea into the Pacific and causes “carbonate crash” and resultant U-enrichment in post 7 Ma arc magmas in Nicaragua (Plank *et al.* 2002); 8: CAVAS-Cocos Ridge collision (see Fig. 2 for location of Cocos-Ridge) (see MacMillan *et al.* 2004); 9: subduction of Seamount Province seamounts and generation of enriched magmas in Panama and Costa Rica (enrichment also ascribed to a variety of other mechanisms, see text). Refer to Fig. 2 for the geographical distribution of magmatism. All ages apart from those of the Golfito and Sona-Azuero arc (see Buchs *et al.* 2010) represent radiometric ages only. Ages plus or minus uncertainties have been rounded to nearest Ma. References for ages of magmatism are provided in the text.

Supplementary Table Captions

Supplementary Table S1 Selected whole-rock oxide and trace element compositions of lavas and intrusives of Phases I-VI regressed to 55 wt. % SiO₂. Bold text of some linearly regressed values indicate increasing values of the listed incompatible major and trace elements and ratios that increase from the previous phase; PI data is also in bold text for visual aid. See Supplementary data for methods of linear regression. Abbreviations: NA, not analyzed or not applicable; NC (for THI), not calculable where total number of FeO_{4.0} and/or FeO_{8.0} was < 1. Superscripts: 1, 2 for THI and ΣREE are to indicate that errors for these are STD (for all other element and element

ratios, uncertainties are standard error, SE, of the mean). Notes: (1) This table represents an expanded version of Table 2, which provides collective regressed data at the level of an entire Phase (e.g., Panama plus Costa Rica for PI, Panama plus Costa Rica plus Nicaragua for PII). (2) The collective data in this table are represented as large, light grey 'x's whereas the colored symbols represent distinct regions in our various geochemical plots. (3) $\text{FeO}_{4.0}$ and $\text{FeO}_{8.0}$ are based on non-normalized abundances of FeO^t and MgO . (4) References for datasets are provided in Section 3.2. (5) Raw data from which values were calculated are provided Supplementary Table S2.

Table S2 Raw (unfiltered) major and trace element geochemistry datasets and dataset references of all phases used in this paper. References are also listed in Section 1 of the Supplementary data.

Table S3 Radiogenic isotope (Sr, Nd, Pb) datasets and dataset references of all phases used in this paper. Dataset sources are also listed in the caption of Supplementary Fig. S5).

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Figure S1 Whattam and Stern 2015 (single column)

Figure S2 Whattam and Stern 2015 (single column)

Figure S3 Whattam and Stern 2015

Figure S4 Whattam and Stern 2015

Supplementary Table S1 Selected major and trace element data of CAVAS lavas and intrusives of PI, PII, PIII, PIV, PV and PVI and of these phases discriminated by region linearly regressed to 55 wt. % SiO₂.

	Phase I (PAN+CR)		SE	Phase I (PAN only)		SE	Phase I Sona-Azuero Arc		SE	Phase I Chag-Bay Arc		SE	Phase I (CR only: Golfito Arc)		SE	Phase II (PAN+CR+NIC)		SE	Phase II (PAN only)		SE	Phase II (CR only)		SE	Phase II (NIC only)		SE	Phase III (PAN+CR+NIC)		SE	Phase III (PAN only)		SE	Phase III (CR only)		SE	Phase III (NIC only)		SE
age range (Ma)	75-39			75-39									75-39			35-16			35-16			35-16			35-16			16-6			16-6			16-6			16-6		
mean age (Ma)	57 ± 18												25.5 ± 9.5												11 ± 5														
n (no. samples)	139			131			58			73			8			67			35			15			17			122			54			37			31		
major oxides _{ss} (wt.%)																																							
TiO ₂	0.84	0.03		0.84	0.03		0.96	0.05		0.71	0.07		0.93	0.09		0.92	0.03		0.91	0.05		0.91	0.05		1.10	0.06		0.92	0.02		0.95	0.02		0.79	0.01		1.02	0.06	
FeO ⁱ	8.37	0.15		8.26	0.15		8.66	0.15		8.02	0.49		10.58	0.57		8.47	0.15		8.19	0.13		8.12	0.29		9.49	0.37		8.28	0.09		8.07	0.13		8.30	0.08		8.63	0.22	
MgO	5.21	0.13		5.15	0.13		4.62	0.14		5.68	0.41		5.36	0.37		4.24	0.13		4.53	0.18		3.75	0.33		4.18	0.11		4.02	0.09		3.89	0.10		3.87	0.07		4.20	0.26	
Na ₂ O	3.21	0.09		3.18	0.09		3.39	0.14		3.00	0.36		3.57	0.21		3.05	0.06		3.03	0.10		3.07	0.14		3.08	0.06		3.20	0.05		3.33	0.09		3.19	0.07		3.12	0.07	
K ₂ O	0.60	0.05		0.62	0.05		0.78	0.06		0.42	0.05		0.40	0.04		1.01	0.07		1.03	0.12		1.12	0.06		0.95	0.10		1.45	0.09		1.47	0.14		1.61	0.11		1.04	0.04	
P ₂ O ₅	0.14	0.01		0.14	0.01		0.16	0.01		0.11	0.03		0.12	0.02		0.21	0.01		0.22	0.02		0.23	0.02		0.23	0.02		0.28	0.01		0.32	0.02		0.23	0.01		0.26	0.02	
FeO ⁱ /MgO	1.61	0.05		1.60	0.05		1.87	0.06		1.41	0.13		1.97	0.17		2.00	0.07		1.81	0.08		2.17	0.20		2.27	0.11		2.06	0.05		2.08	0.06		2.15	0.05		2.05	0.14	
Tholeiitic Index ¹	0.92	0.28		0.93	0.28		0.82	0.23		1.00	0.32		1.21	0.24		0.82	0.20		0.83	0.24		0.74	0.09		NC	NC		0.81	0.25		NC	NC		NC	NC		1.03	0.16	
K ₂ O/Na ₂ O	0.19	0.02		0.19	0.02		0.23	0.02		0.14	0.09		0.11	0.01		0.33	0.02		0.34	0.04		0.36	0.03		0.31	0.03		0.45	0.03		0.44	0.04		0.51	0.04		0.33	0.02	
trace elements _{ss} (ppm)																																							
Rb	7.81	0.76		7.87	0.79		10.93	1.07		5.15	0.81		8.11	1.53		22.16	2.31		21.13	3.61		19.33	2.27		19.27	3.75		30.53	2.65		25.98	2.83		41.17	4.42		20.04	1.15	
Sr	258.44	11.63		265.92	12.07		275.35	16.36		227.92	14.69		148.36	10.20		447.90	20.99		448.24	32.28		502.55	48.06		388.84	22.96		612.86	23.20		668.60	43.64		700.08	26.49		480.11	27.06	
Y	22.40	0.87		22.44	0.92		24.52	1.40		20.21	0.83		22.61	1.63		23.55	1.20		22.08	1.69		28.94	1.34		29.22	1.46		23.80	0.92		23.00	1.04		20.06	0.88		29.63	2.08	
Ti	5052.40	#####		5055.12	#####		5755	#####		4256	#####		5597.34	#####		5508.99	#####		5431.42	279.31		5426.92	#####		6575.67	#####		5515.25	#####		5677.61	138.10		4738.89	69.52		6095.55	#####	
Zr	68.44	3.95		68.70	4.18		85.54	6.44		47.00	5.12		75.05	5.21		86.16	3.69		83.04	5.02		87.87	5.21		98.57	5.46		100.33	5.36		112.19	8.14		83.83	8.04		91.80	4.05	
Nb	2.45	0.20		2.46	0.21		3.14	0.32		1.42	0.14		2.77	0.26		4.74	0.40		6.52	0.59		3.22	0.14		2.10	0.18		5.65	0.37		7.41	0.55		5.85	0.63		2.46	0.15	
K	5021.37	#####		5123.43	#####		6474.78	#####		3486.42	#####		3311.27	#####		8402.51	#####		8584.17	1016.49		9268.52	#####		7845.48	#####		12066.77	#####		12233.95	#####		13372.24	#####		8599.84	#####	
Ba	241.11	18.69		248.85	19.66		294.89	27.10		197.57	18.34		58.96	14.80		468.84	30.44		499.50	55.29		405.23	4.08		444.33	18.16		773.85	35.75		675.69	51.05		931.08	68.54		800.65	51.32	
La	6.34	0.50		6.54	0.53		7.41	0.60		4.63	0.45		4.12	0.29		10.29	0.62		12.55	0.98		9.93	0.41		7.26	0.52		14.94	1.12		18.87	1.71		15.92	1.84		9.31	0.44	
Ce	14.70	1.09		15.10	1.15		16.28	1.34		11.01	1.65		10.42	0.75		22.23	1.07		26.04	1.69		21.34	0.82		23.25	6.10		29.84	2.00		36.64	3.08		31.75	3.25		20.26	0.80	
Pr	2.12	0.14		2.18	0.15		2.43	0.17		1.62	0.11		1.57	0.13		3.22	0.14		3.52	0.23		3.46	0.12		2.88	0.14		4.31	0.27		4.85	0.11		3.82	0.32		3.41	0.15	
Nd	10.00	0.60		10.24	0.63		11.44	0.74		7.83	0.73		7.52	0.55		14.67	0.62		15.69	1.05		16.34	0.58		13.73	4.23		18.46	0.98		21.15	1.53		17.17	1.22		16.03	0.72	
Sm	2.81	0.14		2.86	0.14		3.16	0.19		2.34	0.12		2.31	0.16		3.18	0.16		2.67	0.17		4.27	0.15		3.86	0.14		4.27	0.19		4.60	0.26		3.54	0.18		4.28	0.22	
Eu	0.93	0.04		0.94	0.04		1.05	0.07		0.80	0.06		0.84	0.05		1.69	0.20		2.16	0.38		1.34	0.05		1.26	0.04		1.31	0.04		1.36	0.06		0.99	0.02		1.39	0.06	
Gd	3.33	0.14		3.36	0.15		3.70	0.23		2.85	0.17		3.00	0.21		4.05	0.18		3.87	0.27		4.61	0.15		4.58	0.18		4.43	0.17		4.56	0.22		3.47	0.12		4.80	0.25	
Tb	0.57	0.02		0.57	0.03		0.62	0.04		0.50	0.03		0.62	0.05		0.68	0.03		0.62	0.04		0.72	0.02		0.83	0.04		0.70	0.03		0.66	0.03		0.56	0.02		0.84	0.04	
Dy	3.77	0.16		3.77	0.17		4.08	0.26		3.34	0.18		4.22	0.28		4.15	0.21		3.93	0.32		4.64	0.16		4.81	0.22		4.13	0.17		4.01	0.18		3.15	0.11		8.72	0.21	
Ho	0.81	0.03		0.81	0.04		0.87	0.06		0.73	0.04		1.00	0.07		0.86	0.05		0.81	0.07		0.91	0.03		1.03	0.05		0.84	0.04		0.81	0.04		0.64	0.03		1.00	0.06	
Er	2.36	0.09		2.35	0.10		2.52	0.16		2.12	0.20		2.82	0.18		2.51	0.13		2.32	0.21		2.85	0.09		2.91	0.14		2.41	0.11		2.31	0.11		1.85	0.09		2.89	0.19	
Tm	0.35	0.01		0.35	0.01		0.39	0.04		0.31	0.05		0.41	0.03		0.36	0.04		0.37	0.03		NA	NA		NA	NA		0.32	0.02		0.31	0.02		0.26	0.01		NA	NA	
Yb	2.34	0.09		2.31	0.09		2.46	0.16		2.08	0.11		3.22	0.24		2.46	0.13		2.30	0.20		2.94	0.10		2.82	0.14		2.32	0.11		2.20	0.11		1.84	0.11		2.84	0.20	
Lu	0.36	0.01		0.35	0.01		0.37	0.02		0.33	0.02		0.49	0.03		0.38	0.02		0.35	0.03		0.45	0.01		0.45	0.02		0.36	0.02		0.33	0.02		0.26	0.01		0.45	0.03	
Σ REE ²	50.81	1.38		51.73	1.46		56.79	1.72		40.49	1.89		42.56	1.10		70.73	1.45		77.19	2.33		73.80	1.13		69.67	7.45		88.61	2.53		102.66	3.87		85.21	3.95		76.21	8.73	
Pb	1.44	0.09		1.44	0.09		1.94	0.12		0.98	0.14		1.22	0.17		2.88	0.20		2.49	0.26		2.37	0.08		3.75	0.18		4.08	0.30		4.54	0.48		NA	NA		3.75	0.17	
Th	0.86	0.07		0.88	0.08		1.04	0.11		0.64	0.09		0.41	0.02		1.44	0.15		1.87	0.25		0.97	0.11		0.97	0.13		2.18	0.28		2.74	0.36		3.44	0.79		0.86	0.04	
U	0.29	0.02		0.29	0.02		0.37	0.03		0.19	0.05		0.45	0.11		0.61	0.06		0.79	0.09		0.48	0.04		0.44	0.05		0.79	0.09		0.88	0.12		1.41	0.29		0.41	0.02	
V	269.67	10.49		271.25	11.22		279.17	9.30		267.00	9.67	</																											

Table S1 (cont.)

	Phase IV (CR+NIC)	SE	Phase IV (CR only)	SE	Phase IV (NIC only)	SE	PhaseVa (arc alks)	SE	PhaseVb (adak)	SE	Phase VI (CR+NIC)	SE	Phase VI (CR only)	SE	Phase VI (NIC only)	SE
age range (Ma)	6-3		6-3		6-3		5.90-0.01		4.20-0.15		2.6-0		2.6-0		2.6-0	
mean age (Ma)	4.5 ± 1.5						3 ± 3		2.2 ± 2.0		1.3 ± 1.3					
n (no. samples)	19		15		4		15		86		583		405		178	
<i>major oxides₂₅ (wt.%)</i>																
TiO ₂	0.78	0.02	0.79	0.02	0.73	0.03	1.56	0.12	0.86	0.01	0.81	0.01	0.75	0.01	0.91	0.02
FeO [†]	7.95	0.13	7.40	0.07	8.50	0.37	7.78	0.10	6.92	0.03	8.29	0.08	7.75	0.05	9.05	0.09
MgO	3.48	0.22	3.35	0.22	3.11	0.12	6.29	0.11	5.41	0.08	4.55	0.04	4.45	0.04	4.65	0.11
Na ₂ O	3.07	0.07	3.17	0.08	2.95	0.11	4.05	0.04	3.18	0.04	2.99	0.03	3.05	0.02	2.91	0.04
K ₂ O	1.90	0.16	2.56	0.11	0.82	0.02	1.94	0.07	1.98	0.06	1.11	0.03	1.07	0.04	1.17	0.03
P ₂ O ₅	0.28	0.03	0.34	0.02	0.13	0.01	0.69	0.04	0.32	0.81	0.20	0.00	0.22	0.01	0.17	0.01
FeO [†] /MgO	2.28	0.15	2.21	0.15	2.74	0.16	1.24	0.03	1.28	0.02	1.82	0.02	1.74	0.02	1.95	0.05
Tholeiitic Index [†]	0.77	0.09	0.75	0.09	NC	NC	NA	NA	0.81	0.10	0.83	0.18	0.93	0.14	0.92	0.15
K ₂ O/Na ₂ O	0.62	0.05	0.81	0.04	0.28	0.01	0.48	0.02	0.62	0.02	0.37	0.01	0.35	0.01	0.40	0.01
<i>trace elements₂₅ (ppm)</i>																
Rb	38.24	4.34	54.12	3.53	12.99	0.09	48.55	1.60	39.94	1.42	23.91	0.75	22.57	1.00	25.02	0.79
Sr	726.16	91.04	1026.05	53.57	427.25	30.15	894.10	53.10	1400.52	35.03	581.14	6.94	664.91	5.63	415.93	8.53
Y	21.53	1.46	16.76	0.50	24.89	1.01	18.13	0.54	13.42	0.26	20.43	0.28	19.23	0.33	24.59	0.35
Ti	4682.45	117.12	4749.53	###	4363.35	###	9331.73	###	5170.84	60.19	4845.56	###	4519.24	67.23	5428.83	###
Zr	94.18	12.66	130.36	13.05	58.30	0.78	129.88	11.63	137.38	3.45	96.24	2.67	93.72	3.47	93.82	2.70
Nb	4.43	1.12	8.15	0.98	0.96	0.02	36.95	2.56	7.79	0.56	8.31	0.43	8.69	0.55	5.82	0.46
K	15732.12	###	21240.83	###	6837.49	###	16063.74	###	16474.73	###	9220.40	###	8919.08	###	9707.62	###
Ba	876.82	65.93	1082.39	57.49	675.55	15.88	916.46	50.31	981.16	24.48	638.45	9.45	621.16	11.59	681.89	15.77
La	19.24	1.51	33.20	5.20	5.21	0.15	28.56	2.96	32.06	1.36	18.13	0.77	19.95	0.96	9.52	0.53
Ce	35.70	9.04	59.40	9.81	11.38	0.29	50.55	6.22	60.86	2.51	37.79	1.51	40.81	1.88	22.36	1.07
Pr	4.46	1.00	6.81	1.10	1.91	0.02	6.67	0.78	7.40	0.31	4.76	0.17	4.98	0.20	3.46	0.15
Nd	19.23	3.85	27.70	4.27	9.79	0.05	26.29	3.10	28.77	1.06	19.52	0.59	20.48	0.74	14.97	0.53
Sm	4.09	0.57	4.91	0.62	2.97	0.05	5.35	0.55	4.86	0.15	4.24	0.10	4.29	0.12	3.93	0.10
Eu	1.22	0.15	1.42	0.19	0.95	0.01	1.83	0.15	1.35	0.04	1.25	0.02	1.26	0.02	1.21	0.03
Gd	3.90	0.40	4.13	0.44	3.39	0.15	5.40	0.52	3.94	0.09	3.94	0.07	3.90	0.09	4.14	0.09
Tb	0.58	0.04	0.58	0.04	0.55	0.02	0.74	0.06	0.49	0.01	0.60	0.01	0.58	0.01	0.65	0.02
Dy	3.51	0.21	3.18	0.17	3.62	0.14	3.78	0.27	2.60	0.04	3.48	0.05	3.31	0.06	4.05	0.07
Ho	0.70	0.03	0.60	0.03	0.72	0.03	0.67	0.04	0.48	0.01	0.70	0.01	0.66	0.01	0.83	0.01
Er	2.02	0.09	1.76	0.07	2.02	0.24	1.67	0.10	1.27	0.02	1.98	0.03	1.86	0.03	2.39	0.03
Tm	0.42	0.00	0.42	0.00	NA	NA	0.22	0.01	0.18	0.00	0.29	0.00	0.27	0.00	0.36	0.01
Yb	2.01	0.11	1.63	0.03	2.28	0.10	1.29	0.07	1.15	0.02	1.93	0.03	1.81	0.03	2.33	0.03
Lu	0.31	0.02	0.25	0.01	0.35	0.01	0.19	0.01	0.17	0.00	0.30	0.00	0.28	0.00	0.36	0.01
Σ REE ²⁺	97.39	10.02	146.00	11.97	45.14	0.48	133.22	7.63	145.58	3.06	98.92	1.81	104.44	2.04	70.56	1.21
Pb	2.88	0.25	2.25	0.19	2.94	0.48	4.67	0.21	6.73	0.26	3.59	0.09	3.57	0.12	3.24	0.08
Th	4.51	1.37	8.76	1.44	0.64	0.05	4.99	0.42	6.53	0.38	3.00	0.20	3.06	0.25	1.57	0.08
U	1.58	0.42	2.82	0.03	0.48	1.89	2.10	0.12	1.96	0.09	1.08	0.06	1.05	0.07	1.12	0.05
V	217.42	13.43	200.37	13.00	233.30	27.96	NA	NA	239.66	3.65	192.50	2.35	176.69	2.33	226.01	4.35
K/Rb	411.43	58.24	392.45	30.69	526.31	13.95	330.88	15.63	412.53	19.61	385.58	15.16	395.12	22.05	388.04	14.89
Ba/La	45.57	4.95	32.60	5.39	129.66	4.79	32.08	3.76	30.61	1.51	35.22	1.59	31.14	1.61	71.66	4.36
Rb/Zr	0.41	0.07	0.42	0.03	0.22	0.00	0.37	0.04	0.29	0.01	0.25	0.01	0.24	0.01	0.27	0.01
Ba/Zr	9.31	1.43	8.30	0.94	11.59	0.31	7.06	0.74	7.14	0.25	6.63	1.37	6.63	0.27	7.27	0.27
U/Th	0.35	0.14	0.32	0.08	0.74	0.07	0.42	0.04	0.30	0.02	0.36	0.03	0.34	0.04	0.71	0.05
Pb/Ce	0.08	0.02	0.04	0.01	0.26	0.04	0.09	0.01	0.11	0.01	0.10	0.00	0.09	0.00	0.15	0.01
Sr/Nd	37.77	8.93	37.04	6.03	43.64	3.09	26.40	3.71	48.69	2.17	29.77	0.97	32.46	1.21	27.78	1.14
Ba/Th	194.32	60.59	123.56	21.29	1053.58	84.92	183.79	18.47	150.23	9.50	212.83	14.58	202.73	17.14	434.51	23.90
Ba/Nb	197.77	52.21	132.78	17.47	702.34	22.93	24.81	2.19	125.94	9.63	76.82	4.12	71.45	4.73	117.20	9.59
Th/Nb	1.02	0.40	1.07	0.22	0.67	0.05	0.13	0.01	0.84	0.08	0.36	0.03	0.35	0.04	0.27	0.03
Zr/Nb	21.24	6.09	15.99	2.50	60.62	1.59	3.52	0.40	17.63	1.35	11.58	0.68	10.78	0.79	16.13	1.35
Ba/Ti	0.19	0.01	0.23	0.01	0.15	0.01	0.10	0.01	0.19	0.01	0.13	0.00	0.15	0.00	0.13	0.00
Zr/Y	4.37	0.66	7.78	0.81	2.34	0.10	7.16	0.68	10.23	0.33	4.71	0.15	4.87	0.20	3.82	0.12
Nb/Yb	2.21	0.57	5.00	0.61	0.42	0.02	28.56	2.44	6.79	0.50	4.31	0.23	4.81	0.31	2.50	0.20
La/Nb	4.34	1.15	4.07	0.80	5.42	0.20	0.77	0.10	4.12	0.34	2.18	0.15	2.29	0.12	1.64	0.16
La/Sm	4.70	0.75	6.76	1.36	1.75	0.06	5.34	0.77	6.60	0.34	4.27	0.21	4.65	0.26	2.42	0.15
La/Yb	9.59	0.93	20.34	3.21	2.29	0.12	22.08	2.54	27.95	1.26	9.40	0.42	11.04	0.56	4.09	0.24
Ti/V	21.54	1.43	23.70	1.65	18.70	2.38	NA	NA	21.58	0.41	25.17	0.45	25.58	0.51	24.02	0.75

Notes for Supplementary Table S2

Raw, unfiltered major and trace element geochemistry for PI-PVI samples

1. In some cases, radiometric ages are listed in brackets beside the sample no. in column 1.
2. Discarded samples (ones which did not pass our geochemical, i.e., have total oxide abundances that to not total 98-102 wt. %) are listed separately below the samples that did pass our geochemical filter and were used in our study.
3. Sample numbers in italics (PII and PIII sheets, data from Plank et al., 2002) represent ones in which: (a) data was presented as normalized (all other data listed in un-normalized); and (b) Fe was presented as FeO (in all other samples data is presented as Fe₂O₃).
4. Various data are missing from some of the listed samples; for these data, we refer readers to the references listed.
5. On the PIV (6-3 Ma) sheet, three of the four samples do not pass our filter but are used nonetheless for reasons explained in Section 3 of the main text.
6. Oxide totals are not provided for the PVI (2.6-0 Ma) database as all samples are from the CentAm & IBM Geochem database where abundances were already normalized according to our geochemical filter (where only samples with oxides totalling 98-102 wt. % were used) by the database creator (Jordan et al., 2012).
7. Similarly, on the PVI sheet there are no 'discarded' samples listed as all samples are from the CentAm & IBM Geochem Database which list filtered samples only.
8. In contrast to all other datasets which comprise (or may comprise) intrusive rocks in addition to volcanic rocks, the PVI dataset (Jordan et al., 2012) compose lavas only.
9. If a particular descriptive quality is not provided for all samples of one particular sheet (Phase) (e.g., 'Rock Type'), the qualifier and its column is not listed (i.e., no blank columns exist).

Whattam and Stern (2016)

Below are discards which did not pass chemical filter (i.e., oxide totals are not 98-102)

References Key	
1	Wagner et al. (2011)
2	Buchta et al. (2010)
3	Lisanna (2006)

*Reference Key is provided at page bottom

[illegible]References Key

1	Whattam et al. (2012)	6	Kessler et al. (1977)

2	Wegner et al. (2011)	7	Defiant et al. (1992)
3	Hochman (2008)	8	Hochman (2008)

3	Lissina (2005)	8	Lissina (2005)
4	Bonney et al. (2003)	9	Garel et al. (2009)

4	Rooney et al. (2002)	9	Gazni et al. (2009)
5	Drummond et al. (1995)	10	Flarik et al. (2002)

$n = 122$

*Reference Key is provided at page bottom

*Reference	Region	Locality	Phase	Risk Type	SIO2	TIO2	Al2O3	FeO	MnO	CaO	Na2O	K2O	P2O5	Total Oxides	N	O	Rb	Ba	Th	U	Ce	Nb	As	Sb	Pb	Bi	Pd	Ag	Cu	Zn	Co	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Sc	V					
PAN-06-088 (8.7, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-125 (7.19, 0.05) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-134 (8.74, 0.25) Ma	1	Panama	Cort. Div.	Dacite	62.9	0.57	16.84	4.88	0.11	1.82	5.81	5.8995	1.93	1.52	11.9	98.65	7	18.1	1360	2.29	0.58	0.13	7.27	0.38	21.6	41	6.07	5.24	10.5	860	3.95	0.89	27	1.23	3.66	0.43	2.33	0.44	11	1.29	0.56	1.08	0.56	9	139	
PAN-06-137 (8.74, 0.25) Ma	1	Panama	Cort. Div.	Dacite	62.9	0.57	16.84	4.88	0.11	1.82	5.81	5.8995	1.93	1.52	11.9	98.65	7	18.1	1360	2.29	0.58	0.13	7.27	0.38	21.6	41	6.07	5.24	10.5	860	3.95	0.89	27	1.23	3.66	0.43	2.33	0.44	11	1.29	0.56	1.08	0.56	9	139	
PAN-06-180 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-191 (19.1, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.14) Ma	1	Panama	Coche Trower	Andesite	59.1	0.66	16.61	6.13	0.11	3.45	6.30	64.90	N520	12.02	72.7	79.827	39	27.26	2.29	2.96	1.14	0.12	4.3	0.25	18.01	34.96	381	4.54	17.02	3056	3.26	214	84	Eu	0.88	2.73	3.66	1.96	0.38	1.2	0.04	0.14	0.34	0.14	14	170
PAN-06-015 (18.0, 0.																																														

Below are discards which did not pass chemical filter (i.e., oxide totals are not 98-102 wt. %)

Sample	Reference	Region	Locality	Phase	S02	T02	A202	R91	R479R	M08	Mj0	K10	T10	P205	Total Oolites	N1	Cr	Hb	Ba	Th	U	Cs	Nb	Pa	La	Pr	Sm	Eu	Gd	Tb	Dy	Y	Er	Tm	Zn	Yb	Lu	Sc	V									
Pan-06-023 (7.33, 0.35 Ma)	1	Panama	Boquete	Pli	Dionte	43.4	0.94	21.12	8.91	84.979	0.18	3.91	11.21	11.7768	3.03	1.7	67.005	95.187	11	6	29.72	1142	447	1.56	0.42	7.93	41.03	69.48	4.54	9.95	39.82	2794	7.6	2.12	104	2.25	67	0.77	3.94	0.71	2.1	172	0.23	1.43	0.10	1.2	280	
Pan-06-062	1	Panama	Buenos Aires Pili	Pli	Basaltic Andesite	51.7	0.93	19.86	8.4	7.88595	0.18	2.82	9.56	9.536	2.99	0.78	24.27	96.057	2	5	11.81	349	0.82	0.33	0.09	3.99	10.06	20.14	3.72	3.12	14.19	566	340	1.69	65	1.21	0.75	0.57	3.46	0.72	20	0.25	0.28	1.88	0.29	25	174	
Pan-06-065	1	Panama	Basaltic Andesite	Pli	Basaltic Andesite	50.9	0.93	18.82	8.98	8.40086	0.12	2.61	8.9	9.25627	2.98	0.67	0.241	96.151	8	5	11.22	346	0.9	0.31	0.1	4.62	8.83	17.67	1.95	3.72	2.17	12.64	432	333	1.79	68	1.14	3.79	0.59	3.67	0.76	2.1	221	0.3	1.99	0.3	24	202
Pan-06-145 (12.7, 0.48 Ma)	1	Panama	Canagaja	Pli	Andesite	59	0.71	16.08	6.53	6.00955	0.12	3.44	6.27	6.6899	3.33	0.54	0.24	96.924	32	52	18.01	745	1.67	0.77	0.11	5.9	13.43	27.28	2.32	3.75	1.95	598	37	3.48	144	1.02	3.92	0.61	3.74	0.77	2.37	0.32	2.14	0.33	19	162		
Pan-06-167 (14.17, 0.74 Ma)	1	Panama	Chiriqui	Pli	Chlorite Tuff	51.6	0.93	19.86	8.98	8.40086	0.12	2.61	8.9	9.25627	2.98	0.67	0.241	96.151	8	5	11.22	346	0.9	0.31	0.1	4.62	8.83	17.67	1.95	3.72	2.17	12.64	432	333	1.79	68	1.14	3.79	0.59	3.67	0.76	2.1	221	0.3	1.99	0.3	24	202
Pan-06-067	1	Panama	Quito Traverser	Pli	Andesite	61.7	0.7	15.6	15.2	51.0271	0.12	1.77	8.44	4.9935	3.37	0.44	0.26	96.96	106	9	92.236	166	1.67	1.73	3.57	10.47	20.48	44.07	6.31	5.11	20.25	442	428	4.47	170	1.08	4.31	0.62	3.18	0.78	2.3	0.33	2.32	0.36	13	104		

TIS Talamancas Intrusive Suite
(for other abbreviations consult relevant reference)

Phase IV B-3 Mat

n = 19

*Reference key is provided at page bottom

Sample	*Reference	Region	Locality	Phase	Rock Type	SiO2	TiO2	Al2O3-N	Fe2O3	MnO	MgO	CaO	Na2O	K2O	P2O5	Total Oxides	Ni	Cr	Rb	Ba	Th	U	Cs	Nb	Ta	Pb	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Sr	Hf	Zr	Y	Sc	V
CK1 (3.37, 0.00)	1	Costa Rica	Talamanca	IV	Andesite	56	0.67	16.7	7.43	0.15	3.98	7.89	2.7	2.95	0.32	98.79	59	50	80	1300	15	5	8.9	1	1	46.6	83.6	9.3	36.9	6	1.73	4.5	0.6	3.1	1.6	0.2	1.5	0.23	1200	150	17	20.1	200			
CSH (6.30, 1.24)	1	Costa Rica		IV	Monzonite	55.4	0.85	16.5	7.65	0.16	3.85	7.29	3.98	3.01	0.36	99.05			70	1100	6	2	11	1		31.8	96	6.3	26.8	4.6	1.28	4.1	0.6	3.4	0.63	1.9	0.3	1.7	0.26	970	180	15	33.8	170		
CA-021106-6	1	Costa Rica	Grifo Alto Fm.	IV	Basaltic Andesite	49.62	0.84	19.4	10.34	0.2	3.97	10.03	2.62	0.98	0.27	98.27	22	83	15	1568.51	1.8	0.42	3.88	0.15	2.09	18.05	35.97	5.01	21.64	4.79	1.46	4.51	0.61	3.4	0.61	1.81	1.78	0.27	850	1.5	66.44	20.42	255.59			
CA-021106-7	1	Costa Rica	Grifo Alto Fm.	IV	Basaltic Andesite	46.58	0.85	19.23	10.8	0.2	4.67	9.9	2.6	0.94	0.32	98.09	29	89	12	837.84	4.69	0.86	1.92	0.09	3.02	17.13	30.13	3.92	16.94	3.65	1.19	3.53	0.48	2.81	0.52	1.67			1.69	0.26	883	1.94	51.09	17.89	239.37	
CA-021106-8	1	Costa Rica	Grifo Alto Fm.	IV	Basalt	49.91	0.75	18.28	10.31	0.18	5.08	9.85	2.72	1.04	0.22	98.34																														
ACZ	1	Costa Rica	Grifo Alto Fm.	IV		51.78	0.82	18.26	9.34	0.18	3.93	8.81	3.09	1.98	0.42	98.61																														
CC-1	1	Costa Rica	Grifo Alto Fm.	IV	Basalt	50.99	0.87	18.78	8.93	0.15	4.11	9.87	2.42	1.83	0.3	98.45																														
CC-1	1	Costa Rica	Grifo Alto Fm.	IV	Basaltic Dyke	49.95	0.85	18.18	9.53	0.17	4.41	9.97	2.45	2.21	0.38	98.1																														
CC-2	1	Costa Rica	Grifo Alto Fm.	IV	Basaltic Dyke	49.13	0.84	18.14	9.86	0.17	4.59	9.7	2.38	2.16	0.38	97.95																														
CA-1	1	Costa Rica	Grifo Alto Fm.	IV	Basalt	51.77	0.82	18.63	9.13	0.18	3.71	8.84	3.05	2	0.43	98.54																														
FR-1	1	Costa Rica	Grifo Alto Fm.	IV	Basalt	51.06	0.82	18.1	9.93	0.19	4.51	9.33	2.62	1.49	0.25	98.3																														
LG-04005-3	1	Costa Rica	La Garita Fm.	IV	Basaltic Dyke	49.49	1.05	17.83	10.13	0.24	3.9	8.62	3.32	2.3	0.49	97.44																														
LG-010405-3	1	Costa Rica	La Garita Fm.	IV	Basalt	46.85	0.86	17.53	11.19	0.17	6.71	11.37	1.89	1.21	0.26	98.04																														
LC-1	1	Costa Rica	Grifo Alto Fm.	IV	Basaltic Dyke	44.63	0.92	16.2	12.45	0.21	8.68	11.55	1.84	0.91	0.49	97.88	30	79	36	654.7	4.93	1.53	5.91	0.22	2.61	40.52	79.61	10.07	41.72	7.88	2.3	6.97	0.85	4.27	0.63	1.53			1.75	0.22	1095	1.75	104	20.7	264.01	
P-06 (6.47, 0.21)	1	Costa Rica	La Garita Fm.	IV	Olivine Basalt Sill	46.18	1.03	17.87	11.46	0.19	6.46	10.73	2.33	1.28	0.29	97.82	38	35.66	30	675.61	1.51	0.59	2.95	0.12	2.79	11.68	24.77	3.71	16.55	4.98	1.02	4.12	0.62	3.64	0.71	1.93	1.83	0.27	869	1.48	55.51	19.61	351.19			
C-06-Nic-6 (3.60, 0.03)	2	Nicaragua	Encanto (NIC)	IV		49.35	0.82	17.79	10.97	0.2	3.85	10.3	2.36	0.65	0.13	96.42	21	4	9	533	0.39	0.41	0.79	0.04	2.31	3.94	9.25	1.52	8.03	2.5	0.86	2.71	0.48	3.27	0.65	1.94	2.06	0.31	409	1.32	43	21.71	345			
C-06-Nic-17 (3.181, 0.011)	2	Nicaragua	Encanto (NIC)	IV		38.99	0.64	16.25	7.87	0.14	2.11	6.36	3.33	1.05	0.13	96.57	24	1	19	875	0.83	0.98	1.22	0.12	3.41	6.7	14.23	2.49	12.78	3.9	1.12	4.18	0.7	4.68	0.94	2.86	2.98	0.47	340	2.44	86	33.83	169			
C-51 (3.590, 0.03)	2	Nicaragua	Encanto (NIC)	IV		47.14	0.74	20.43	10.06	0.17	3.92	11.40	2.23	0.47	0.1	96.75	21	3	7	438	0.5	0.32	0.64	0.02	3.97	3.62	7.86	1.27	6.59	2.04	0.76	2.28	0.4	2.58	0.52	1.57	1.57	0.24	518	1.01	29	16.5	288			
C-06-Nic-3 (3.653, 0.020)	2	Nicaragua	Encanto (NIC)	IV		49.42	0.69	20.68	9.23	0.17	3.33	9.98	2.83	0.66	0.13	97.12	33	5	9	583	0.61	0.49	0.84	0.03	1.83	4.59	10.23	1.57	7.74	2.21	0.84	3.27	0.4	2.52	0.49	1.5			1.55	0.24	561	1.09	38	36.47	212	

Below are discards which did not pass chemical filter (i.e., oxide totals are not 98-102 wt. %)

	*Reference	Region	Locality	Phase	Rock Type	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅	Total Oxides	Ni	Cr	Rb	Ba	Th	U	Cs	Nb	Ta	Pb	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Sr	Hf	Zr	Y	Sc	V		
GE-021306-4 (3.59, 0.06)	1	Costa Rica	Paso Real Fm.	IV	Andesite	56.16	0.63	17.74663	6.570106	0.11	3.48	6.59	3.26	2.24	0.26	96.08	38	93	37	1988.91	4.07	2.24	8.03	0.45	6.17	27.42	51.75	6.28	22.33	4.28	1.25	4.37	0.59	2.57	0.47	1.39	1.37	0.2	1014	2.48	101	13.9	169.4					
GE-021306-5 (3.65, 0.3)	1	Costa Rica	Paso Real Fm.	IV	Basalt	46.12	0.75	15.51666	10.88943	0.25	5.17	9.31	2.4	1.8	0.46	95.23	26	76	41	799.04	3.55	1.37	8	0.39	2.53	26.47	54.32	7.17	24.13	5.21	0.68	3.19	0.58	1.62	1.61	0.23	941	2.45	99	17.41	279.91							
GE-021306-6	1	Costa Rica	Paso Real Fm.	IV	Basalt	47.04	0.72	18.18129	10.38864	0.2	5.51	9.05	2.55	1.51	0.32	93.66	26	98	22	833.8	2.54	0.82	4.5	0.22	3.42	24.32	46.02	6.28	24.82	5.14	1.53	4.77	0.63	3.03	0.56	1.6	1.61	0.23	988	1.82	57	16.94	257.87					
GE-021306-7	1	Costa Rica	Paso Real Fm.	IV	Basaltic Andesite	55.82	0.63	18.2964	6.598296	0.12	3.34	6.82	3.3	1.83	0.25	96.45	30	82	28	895.25	2.51	0.94	5.99	0.16	4.56	20.6	39.21	4.88	18.3	3.68	1.14	3.73	0.53	2.44	0.46	1.34	1.34	0.2	892	2.14	80	13.36	172.15					
GE-021306-8	1	Costa Rica	Paso Real Fm.	IV	Basaltic Andesite	51.62	0.67	18.72141	8.783784	0.17	4.02	8.36	3.07	1.67	0.36	96.2	30	94	24	964	1.48	0.57	4.33	0.23	4.1	22.96	43.3	5.86	21.21	4.72	1.47	4.53	0.62	3	0.56	1.63	1.68	0.25	1105	1.67	51	17.11	226.03					
GE-021306-9	1	Costa Rica	Paso Real Fm.	IV	Basaltic Andesite	44.16	0.87	17.91839	11.12438	0.22	6	9.96	2.27	1.51	0.39	92.14	33	99	8	1090.65	3.91	1.17	5.53	0.26	4.51	37.47	70.83	9.76	39.24	7.73	2.28	6.96	0.84	3.79	0.66	1.76	1.77	0.25	1029	2.22	60	19.5	303.35					
GE-021306-10	1	Costa Rica	Paso Real Fm.	IV	Basaltic Andesite	49.09	0.78	18.4797	10.01867	0.18	4.96	8.5	2.73	1.22	0.29	96.42	29	82	15	706.64	1.44	0.5	3.29	0.16	2.41	17.82	34.4	4.81	19.71	4.33	1.38	4.12	0.57	3.04	0.56	1.63	1.67	0.25	1028	1.39	37	17.07	238.06					
CA-021106-5	1	Costa Rica	Grifo Alto Fm.	IV	Basalt	47.03	0.8	19.73043	11.23898	0.18	4.92	10.31	2.37	0.73	0.24	96.45	32	96	10	635.97	1.57	0.38	2.54	0.09	2.3	15.12	29.63	4.27	19.18	4.41	1.39	4.23	0.58	3.42	0.62	1.89			1.92	0.29	802	1.36	57.54	21.31	269.42			
SAB-1	1	Costa Rica	Grifo Alto Fm.	IV	Andesite	55.16	0.64	15.3415	6.45161	0.14	5.51	8.21	2.91	2.3	0.5	96.34	89	177	56																													
LG-04005-1	1	Costa Rica	La Garita Fm.	IV	Olivine Basalt Sill	43.06	1.1	15.53307	13.45712	0.19	8.37	12.11	2.26	0.65	0.33	95.86	70	79	25																													

References Key

- 1 Gazel et al. (2009)
2 Sapin et al. (2011)

Phase Va (5.90-6.01 Ma)   n = 15

*Reference Key is provided at page bottom

Sample	*Reference	Region	Phase	Rock Type	Group	SiO2	TiO2	Al2O3	Fe2O3	MnO	MeO	CaO	CaO-Ni	Na2O	K2O	P2O5	Total	Cr	Ni	Rb	Ba	Th	U	Cs	Nb	Ta	La	Ce	Pb	Pr	Nd	Sr	Sm	Hf	Zr	Eu	Gd	Tb	Dy	Ho	Y	Er	Tm	Yb	Lu	Sc	V		
SO-96-1 (1.3, 0.1)	1	Panama	Va	basalt	arc alk	47.74	1.54	14.62	10.54	0.15	9.62	10.09	10.1662	3.15	1.16	0.64	99.25	288	237	24.95	595	4.88	1.88		28.79	1.21	46.81	94.14	3.34	10.98	41.19	1118	7.27	3.63	127	2.2	6.08	0.83	4.45	0.82	26	2.11	0.29	1.77	0.25				
SO-96-1H	1	Panama	Va	basalt	arc alk	47.8	1.55	14.59	10.76	0.15	9.55	10.07	10.1338	3.11	1.16	0.63	99.37	280	230																														
SO-96-2	1	Panama	Va	basalt	arc alk	46.81	1.63	14.13	10.92	0.15	10.21	10.36	10.452	2.99	1.15	0.77	99.12	322	240	20.92	673	5.61	1.89		30.06	1.21	52.27	103.68	3.33	11.85	41.95	1222	7.6	3.5	138	2.24	6.05	0.81	4.26	0.77	27	1.96	0.27	1.67	0.23				
SO-96-3	1	Panama	Va	basalt	arc alk	48	1.54	14.64	10.78	0.15	9.65	10.09	10.1143	3.14	1.14	0.63	99.76	291	174																														
SO-96-4	1	Panama	Va	basalt	arc alk	47.61	1.54	14.64	10.77	0.15	9.55	10.09	10.1703	3.05	1.17	0.62	99.21	291	177																														
SO-96-5	1	Panama	Va	basalt	arc alk	45.5	1.66	14.21	11.11	0.15	10.75	11.06	11.1301	2.94	1.08	0.91	99.37	363	207																														
CP-97-1 (0.7, 0.3)	1	Panama	Va	basalt	arc alk	44.2	1.51	13.41	11.51	0.17	11.54	11.86	12.0406	2.47	0.99	0.84	98.5	356	315	17.59	663	7.13	2.13		26.36	0.98	66.67	133.13	3.43	15.26	55.98	1304	9.3	3.41	135	2.61	7.14	0.93	4.81	0.87	26	2.21	0.29	1.81	0.25				
M184H	1	Panama	Va	basalt	arc alk	47.13	2.77	13.03	10.82	0.15	9.57	10.35	10.4789	3.1	1.02	0.83	98.77	356	218	16.44	760	6.13	1.86		49.57	3.09	51.28	106.08	3.47	13.65	55.97	1282	10.91	6.96	242	3.23	9.76	1.27	6.57	1.15	27	2.85	0.37	2.22	0.31				
M174 KH	1	Panama	Va	basalt	arc alk	45.83	2.31	12.91	10.76	0.16	10.99	11.25	11.3236	2.97	1.21	0.96	99.35	377	228	19.08	1058	6.47	1.95		48	2.9	56.34	115.75	3.76	14.73	58.52	1342	10.83	6.37	222	3.13	9.47	1.19	6.14	1.08	26	2.75	0.36	2.17	0.31				
M98a KH	1	Panama	Va	basalt	arc alk	46.1	2.75	12.93	10.9	0.15	9.62	10.96	11.145	3.01	0.99	0.93	98.34	333	145	14.59	812	6.27	1.79		46.53	2.74	58.66	117.48	3.51	14.37	57.22	1382	10.75	5.87	238	3.2	9.01	1.25	6.19	1.08	26	2.68	0.34	2.11	0.29				
M105BH (1.4, 0.12)	1	Panama	Va	basalt	arc alk	47.67	1.43	14.26	9.24	0.15	10.07	10.91	11.008	3.12	1.4	0.86	99.11	387	163	22.12	852	7.03	1.95		29.65	1.54	60.54	109.61	3.99	12.9	47.07	1415	7.68	3.71	160	2.17	6.09	0.81	3.94	0.7	20	1.82	0.24	1.52	0.22				
M118aKH	1	Panama	Va	basalt	arc alk	47.49	1.84	13.94	10.17	0.16	9.86	9.68	9.77778	3.33	1.8	0.73	99	360	200	32.9	1085	8.42	2.68		34.8	2.35	67.66	138.25	5.11	16.77	63.63	1417	10.88	6.04	192	3.07	9.32	1.33	5.53	0.96	24	2.35	0.29	1.81	0.26				
M118bKH (1.2, 0.1)	1	Panama	Va	basalt	arc alk	48.62	1.74	14.14	9.74	0.15	9.44	9.41	9.50121	3.3	1.82	0.68	99.04	343	186	36.76	1180	8.38	2.72		32.68	2.22	66.33	134.72	5.07	16.38	62.03	1408	10.64	5.87	187	2.99	8.98	1.11	5.42	0.94	21	2.34	0.3	1.85	0.25				
M121 a KH (4.5, 0.17)	1	Panama	Va	basalt	arc alk	44.35	2.06	12.88	10.46	0.16	10.34	12.32	12.5331	3.08	1.49	1.16	98.3	340	136	20.8	946	8.85	2.5		35.65	2.25	84.58	173.47	4.69	21.6	83.46	2061	14.06	6.5	229	3.9	11.51	1.37	6.61	1.13	26	2.79	0.35	2.2	0.3				
9-12-4-03	1	Panama	Va	basalt	arc alk	45.11	1.38	12.92	10.7	0.17	11.66	11.87	12.0544	2.7	0.95	1.01	98.47	425	234	17.29	724	9.36	2.76		28.91	1.21	77.22	157.72	4.63	17.57	64.12	1278	10.55	3.38	139	2.68	8.51	1.32	5.49	0.97	25	2.5	0.33	2.13	0.3				

References Key

1   Lissinna (2005)

*Reference Key is provided at page bottom

Sample	*Reference	Region	Locality	Phase	Rock Type	Group	SiO2	TiO2	Al2O3	Fe2O3	MnO	MgO	CaO	Na2O	K2O	P2O5	Cr2O3	Cl	Br	Ba	Th	U	Sc	Zr	Hf	Ta	Nb	Y	Er	Tm	Yb	La	Ce	V													
PAN-05-047		1	Parana	La Yeaguda	Dacite	Andesite	68.4	0.32	15.8	2.34	0.06	6.9	3.11	4.6	2.73	0.41	84.01			29.36	139	11.1	3.12	0.72	14.95	0.75	20.01	8.67	7.22	5.96	582	29	2.12	52	0.77	2.1	0.24	11.9	0.21	6	0.8	0.53	0.08	2	35		
PAN-05-048		1	Parana	La Yeaguda	Dacite	Andesite	68.4	0.32	15.8	2.34	0.06	6.9	3.11	4.6	2.73	0.41	84.01			29.36	139	11.1	3.12	0.72	14.95	0.75	20.01	8.67	7.22	5.96	582	29	2.12	52	0.77	2.1	0.24	11.9	0.21	6	0.8	0.53	0.08	2	35		
PAN-05-050		1	Parana	San Santa Clara Loop	Dacite	Andesite	58	1.08	10.51	6.45	0.09	1.06	7.89	3.41	2.36	0.536	88.66			50.57	901	11.63	2.83	0.5	11.07	0.56	18.88	128.24	7.02	17.56	63.89	1007	9.73	5.8	22.7	2.53	7.09	0.71	3	0.56	1.6	1.21	1.07	1.05	1.5	18	205
PAN-05-051		1	Parana	San Santa Clara Loop	Dacite	Andesite	57.7	0.73	15.3	2.91	0.06	1.06	7.89	3.41	2.36	0.536	88.66			50.57	901	11.63	2.83	0.5	11.07	0.56	18.88	128.24	7.02	17.56	63.89	1007	9.73	5.8	22.7	2.53	7.09	0.71	3	0.56	1.6	1.21	1.07	1.05	1.5	18	205
PAN-05-052		1	Parana	San Santa Clara Loop	Dacite	Andesite	59.9	0.67	16.44	6.42	0.1	1.04	6.42	2.99	2.67	0.209	88.69			52.68	1000	6.34	2.79	0.74	0.67	0.22	2.24	4.27	13.81	5.28	20.76	1467	4.05	1.66	1.26	1.15	3.18	0.92	0.35	10	0.89	0.12	0.8	0.12	17	196	
PAN-05-054		1	Parana	San Santa Clara Loop	Dacite	Andesite	55.6	0.91	17.17	7.45	0.11	1.21	7.47	2.66	1	0.345	92.05			62.73	1721	12.35	3.77	0.71	0.64	0.31	0.56	89.24	12.78	10.7	40.99	2218	4.47	1.51	1.95	1.73	4.53	4.09	2.36	0.42	13	1.06	0.14	0.92	0.13	22	257
PAN-05-055		1	Parana	San Santa Clara Loop	Dacite	Basaltic Andesite	55.6	0.91	17.17	7.45	0.11	1.21	7.47	2.66	1	0.345	92.05			62.73	1721	12.35	3.77	0.71	0.64	0.31	0.56	89.24	12.78	10.7	40.99	2218	4.47	1.51	1.95	1.73	4.53	4.09	2.36	0.42	13	1.06	0.14	0.92	0.13	22	257
PAN-05-056		1	Parana	San Santa Clara Loop	Dacite	Andesite	57.5	0.66	15.72	6.34	0.1	1.78	7.33	2.67	1.56	0.189	98.649			35.93	875	2.51	1.06	0.41	0.1	0.39	14.54	28.13	7.05	3.52	14.1	12.9	2.82	2.24	1.01	0.89	0.25	0.33	1.84	11	0.87	0.11	0.73	0.11	15	209	
PAN-05-057		1	Parana	San Santa Clara Loop	Dacite	Andesite	59.1	0.68	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-058		1	Parana	Holly Chama Traverse	Dacite	Andesite	69	0.22	16.8	2.48	0.06	0.86	4.28	1.78	2.85	0.18	98.649			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-059		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-060		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-061		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-062		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-063		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-064		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-065		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-066		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-067		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-068		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-069		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-070		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-071		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-072		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-073		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-074		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-075		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-076		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-077		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86	0.24	25.31	44.87	8.97	6.02	23.12	13.00	1.93	1.4	130	1.22	3.21	0.38	2	0.38	1.0	1.01	0.14	0.88	0.13	17	235
PAN-05-078		1	Parana	Quile Traverse	Dacite	Andesite	59.1	0.66	16.61	6.07	0.1	2.82	6.07	2.74	2.56	0.178	88.48			32.75	988	4.39	1.48	0.45	0.86																						

Below are discards which did not pass chemical filter (i.e., oxide totals are not 98-102 wt. %)

Sample	Reference	Region	Locality	Phase	Rock Type	Group	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅	Cl ⁻ Tot	Cr	Ni	Co	Th	U	Sc	Sm	Eu	Gd	Tb	Dy	Y	Er	Tm	Yb	Lu	Sc	V											
PAN-06-004	1	Region	n° Santa Clara Loop	Vol	Andesite	And	68.6	16.06	49.1	0.07	2.84	5.28	16.89	2.57	0.201	0.021	96.221		35.64	827	5.83	1.77	0.46	9.05	0.52	20.84	6.67	4.53	16.9	30.06	2.41	93	0.84	2.39	0.28	1.44	0.26	7	0.66	0.09	0.61	0.09	13	178		
PAN-06-005	1	Region	n° Santa Clara Loop	Vol	Andesite	And	68.6	16.06	49.1	0.07	2.84	5.28	16.89	2.57	0.201	0.021	96.221		35.64	827	5.83	1.77	0.46	9.05	0.52	20.84	6.67	4.53	16.9	30.06	2.41	93	0.84	2.39	0.28	1.44	0.26	7	0.66	0.09	0.61	0.09	13	178		
PAN-06-003	1	Region	Haito Chame Traverser	Vol	Andesite	And	68.6	16.06	49.1	0.07	2.84	5.28	16.89	2.57	0.201	0.021	96.221		35.64	827	5.83	1.77	0.46	9.05	0.52	20.84	6.67	4.53	16.9	30.06	2.41	93	0.84	2.39	0.28	1.44	0.26	7	0.66	0.09	0.61	0.09	13	178		
PAN-06-043	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-044	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	64.7	0.56	17.3	0.03	0.03	1.26	1.31	0.22	1.67	0.106	96.226		4.98	811	2.6	0.62	0.26	10.22	0.45	11.88	25.95	1.51	3.44	13.72	40.2	2.55	2.92	117	0.79	2.04	0.24	1.22	0.21	4	0.49	0.07	0.42	0.06	3	63
PAN-06-045	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-046	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-047	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-048	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-049	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-050	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-051	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-052	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-053	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-054	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-055	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-056	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-057	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-058	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-059	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-060	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-061	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-062	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-063	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-064	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-065	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-066	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-067	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-068	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62	1.58	0.18	0.87	0.14	3	0.32	0.04	0.23	0.03	3	63
PAN-06-069	1	Region	Haito Chame Traverser	Vol	Dacite	Dac	62.9	16.1	18	3.25	0.04	1.23	2.66	17.7	1.66	0.106	94.266		42.1	678	106	0.26	0.18	10.84	0.49	10.01	21.24	1.18	2.65	10.87	156	0.21	10.2	32	0.62											

References Key

1	Wagner et al. (2011)	3	Defant et al. (1992)
2	Drummond et al. (1995)	4	Lisinna (2005)

Phase VI (2.6-0 Ma)

n = 583

*Reference Key is provided at page bottom

Sample	*Reference	Region	Locality	Phase	SiO2	Al2O3	FeO*	MgO	CaO	Na2O	K2O	P2O5	MnO	Cr	Ni	Cs	Rb	Ba	Th	U	Nb	Ce	Pb	Zr	Hf	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Sc	V	Y	21	
P86	full refs. provided in 1	Costa Rica	Botos Cone	VI	49.9677	15.8757	10.0682	7.82591	9.62719	3.3685	1.59775	0.44778	0.173	334	112	24	659				21			165															
P47	full refs. provided in 1	Costa Rica	Botos Cone	VI	51.2784	16.6502	8.94503	7.83477	9.66323	2.4822	1.54244	0.41881	0.15322	297	112	29	598				18			163															
P9	full refs. provided in 1	Costa Rica	Botos Cone	VI	51.8548	16.3322	9.18259	7.82526	9.12563	2.48046	1.64343	0.3981	0.14291	306	114	29	650				18			166															
P4	full refs. provided in 1	Costa Rica	Botos Cone	VI	50.2955	16.8662	8.90259	8.54417	9.8268	2.45418	1.54522	0.40398	0.16159	292	111	29	650				17			159															
P218	full refs. provided in 1	Costa Rica	Botos Cone	VI	51.4207	17.7801	7.98821	7.4353	9.80934	2.6367	1.44463	0.38389	0.14143	280	95	26	641				17			161															
P49	full refs. provided in 1	Costa Rica	Botos Cone	VI	52.0768	17.5963	7.89939	7.21141	9.65251	2.5835	1.485	0.38651	0.1424	236	84	25	748				17			161															
P19A	full refs. provided in 1	Costa Rica	Botos Cone	VI	60.8749	16.3223	7.45576	5.28693	5.11226	3.50056	2.85383	0.23611	0.12319	9	8	62	923				20			172															
P198	full refs. provided in 1	Costa Rica	Botos Cone	VI	60.9825	16.4572	7.45601	2.5544	5.3471	3.26115	2.49575	0.21203	0.12116	45	15	54	868				18			164															
P80B	full refs. provided in 1	Costa Rica	Botos Cone	VI	56.6759	17.2892	8.40803	3.28393	7.33513	1.45785	2.1586	0.26599	0.16368	9	10	42	716				16			141															
P81	full refs. provided in 1	Costa Rica	Botos Cone	VI	53.5666	17.3865	9.17805	4.77376	9.01486	3.10545	1.59795	0.2814	0.1809	21	14	32	603				15			129															
P22	full refs. provided in 1	Costa Rica	Botos Cone	VI	60.9604	16.7921	7.65368	2.44249	5.02745	3.22612	2.64603	0.21372	0.11195	37	15	52	1010				19			163															
P65	full refs. provided in 1	Costa Rica	Botos Cone	VI	59.5867	18.854	5.92162	2.89363	6.84591	3.15577	1.84507	0.15124	0.12099	16	17	37	631				14			132															
P40	full refs. provided in 1	Costa Rica	Botos Cone	VI	56.9067	16.8723	8.3503	3.57414	9.92536	2.42602	1.61735	0.22962	0.13977	21	15	42	718				16			136															
P26	full refs. provided in 1	Costa Rica	Botos Cone	VI	56.3155	17.6362	8.52238	3.40699	7.97636	3.01619	1.88386	0.20041	0.13027	15	16	35	614				15			117															
P18	full refs. provided in 1	Costa Rica	Botos Cone	VI	65.7067	16.8556	4.43757	1.61491	4.65297	3.48215	1.5233	0.12112	0.11109	5	15	48	1243				15			153															
P2	full refs. provided in 1	Costa Rica	Poás	VI	54.8633	19.3534	7.3678	3.82879	9.49014	3.07597	0.99843	0.12102	0.12102																										
P84	full refs. provided in 1	Costa Rica	Poás	VI	62.8496	18.1179	4.5587	2.26218	6.34638	3.0626	1.76061	0.16378	0.16378	30	798																								
P7	full refs. provided in 1	Costa Rica	Poás	VI	57.7245	18.4078	6.80048	3.7816	7.89335	2.89123	1.57067	0.14006	0.13006																										
P13	full refs. provided in 1	Costa Rica	Poás	VI	58.8545	18.4109	6.33707	3.22465	7.59575	3.02824	1.49903	0.12073	0.14085																										
P55	full refs. provided in 1	Costa Rica	Poás	VI	58.9031	18.0703	6.87326	3.25464	7.49766	3.05497	1.49754	0.1198	0.13977																										
P1	full refs. provided in 1	Costa Rica	Poás	VI	59.918	17.0766	7.15965	3.29549	6.40124	3.11574	2.05719	0.1498	0.11984																										
P3A	full refs. provided in 1	Costa Rica	Poás	VI	63.0168	17.532	4.64579	1.73317	5.45998	3.71679	2.30421	0.12022	0.1102																										
A14	full refs. provided in 1	Costa Rica	Arenal	VI	55.3372	21.5704	6.56184	2.30824	9.71676	3.2658	0.50398	0.14111	0.1008																										
A12	full refs. provided in 1	Costa Rica	Arenal	VI	54.8603	19.7217	7.88686	3.47382	9.3603	3.10341	0.52057	0.19021	0.14015	33	20	13	593																						
A9	full refs. provided in 1	Costa Rica	Arenal	VI	53.9753	20.002	7.70912	4.03056	9.81003	3.06563	0.58297	0.14072	0.12062	24	17	11	525																						
A15	full refs. provided in 1	Costa Rica	Arenal	VI	54.8036	19.6894	7.00294	4.12057	9.84472	3.10565	0.56835	0.18266	0.12179	50	25	12	571																						
A19	full refs. provided in 1	Costa Rica	Arenal	VI	54.995	20.1816	6.84157	3.97578	9.48537	3.10797	0.59536	0.19173	0.1111	36	24	15	590																						
AA	full refs. provided in 1	Costa Rica	Arenal	VI	54.9651	19.9413	6.77194	4.22108	9.6366	3.11772	0.53649	0.1822	0.12147	44	21	12	470																						
AA	full refs. provided in 1	Costa Rica	Arenal	VI	54.925	20.5715	6.31334	3.89137	9.72842	3.26307	0.51682	0.18241	0.11147	39	23	11	588																						
A10	full refs. provided in 1	Costa Rica	Arenal	VI	55.1556	20.2778	6.46862	3.8832	9.76376	3.09237	0.53736	0.1825	0.11153																										
A11	full refs. provided in 1	Costa Rica	Arenal	VI	54.4739	20.0746	7.1724	4.10551	9.6469	3.05659	0.53465	0.18158	0.11097	31	14	11	599																						
A11	full refs. provided in 1	Costa Rica	Arenal	VI	54.8096	19.5391	7.21443	4.73944	9.30862	3.05611	0.501	0.18036	0.12024	50	29	12	586																						
91-60-2	full refs. provided in 1	Costa Rica	Irazú	VI	51.9367	16.0581	7.9181	8.47587	9.56224	2.80412	1.63405	0.43373	0.14121	372	136	0.5	42.2	701	6.87	247	19.2	84.8	4.29	157.2	3.74	1.9	5.66	0.88	4.31	0.769	2.05		1.79	0.274	27.1	221	21.4		
CR-RV1	full refs. provided in 1	Costa Rica	Rincón de la Vi	VI	57.2889	17.1087	7.21806	4.51508	8.39239	3.04718	1.8692	0.18222	0.10916	65.78	23.5	0.73	24.8	752.9	2.51	1.25	1.6	37.31	5.67	109.6															
CR-TE1	full refs. provided in 1	Costa Rica	Tenorio	VI	53.6243	18.9928	8.79055	4.75571	9.10384	2.94353	0.76091	0.16019	0.1702	16.04	11.64	0.31	10.38	510.84	1.09	0.48		2.96	21.38	1.45	60.16	1.75	1.32	4.52	0.68	4.08	0.84	2.38	0.36	2.24	0.35	31.49	234.13	26.03	
CR-PP11	full refs. provided in 1	Costa Rica	Platanar	VI	50.3746	19.0322	9.37437	4.63657	9.26301	2.86495	2.84471	0.58716	0.16098	7	16																								
CR-PP8	full refs. provided in 1	Costa Rica	Platanar	VI	47.4182	15.0881	9.81739	10.2769	11.545	2.24659	1.33864	0.5234	0.17111	479	208																								
CR-R10	full refs. provided in 1	Costa Rica	Barva	VI	52.8266	19.7153	7.73269	5.07992	9.07531	3.21018	1.03977	0.28266	0.14133	30.97	28.77	0.26	13.93	640.75	2.51	0.88		7.99	45.7	3.32	82.47	2.06	1.37	3.87	0.55	2.85	0.55	1.51	0.22	1.42	0.21	23.99	221.75	15.79	
CR-8-02-10	full refs. provided in 1	Costa Rica	Barva	VI	61.2135	16.6039	6.78001	1.50909	4.30622	4.74028	3.64451	0.74877	0.13234	1.13	10.6	1.38	96.65	1421.88	20.23	6.16		30.99	154.9	10.28	321.2	7.79	2.49	10.79	1.53	7.41	1.52	4.3	0.66	4.17	0.67	17.82	114.43	47.41	
CR-87	full refs. provided in 1	Costa Rica	Barva	VI	52.7716	17.6917	10.0749	4.52155	8.54744	2.88286	1.87133	0.43471	0.17196	28.71	18.24	0.42	43.82	846.84	9.96	3.07		15.71	86.41	5.18	164.24	4.21	1.81	7.12	0.99	4.92	0.97	2.63	0.39	2.48	0.38	29.52	239.67	27.11	
CR-89	full refs. provided in 1	Costa Rica	Barva	VI	53.8291	17.3267	8.90079	4.85957	9.24409	2.995	2.22627	0.49505	0.14144	73.21	40.17	0.47	49.62	1041.71	12.43	3.96		20.76	116.63	4.69	198.42	4.88	2.11	7.65	1.05	4.66	0.87	2.3	0.35	2.22	0.33	23.72	196.67	21.11	
T-37-5	full refs. provided in 1	Costa Rica	Turrialba	VI	52.7638	16.9659	7.26653	6.0117	9.52489	3.22776	1.47286	0.24514	0.14136	122	57	0.401	36.3	69.9	5.49	1.84		29.3	86.1	4.05	183.1	4.04	2.02	5.8	0.89	4									

ARC2	full refs. provided in 1	Costa Rica	Arenal	VI	59.6071	18.7719	6.52129	2.6332	7.31331	3.54865	0.70973	0.24686	0.20572	0.218	0.57	0.335	13.758	615.423	0.966	0.397	4.139	27.982	3.618	60.798	1.645	1.021	3.367	0.491	2.949	0.607	1.762	0.277	1.796	0.286	10.49	56.836	18.898	
CT2	full refs. provided in 1	Costa Rica	Arenal	VI	62.9888	17.8372	5.33287	2.11383	6.34866	3.96156	0.82279	0	0.19099	7.1	0.61	0.452	16.14	61.7	1.09	0.431	27.17			56.68		1.16	3.1	0.504	2.64	0.573	1.71	0.273	1.8	0.286	8.8	54.7	15.97	
MAC2L	full refs. provided in 1	Costa Rica	Arenal	VI	60.166	18.2674	6.05202	2.21282	6.74949	3.86121	0.80963	0.24289	0.21253	0.164	0.536	0.365	14.277	662.605	1.067	0.438	4.41	29.86	3.823	65.46	1.746	1.088	3.473	0.507	3.004	0.619	1.796	0.286	1.839	0.298	9.35	48.729	19.238	
MAC2M	full refs. provided in 1	Costa Rica	Arenal	VI	59.9532	18.6733	6.03871	2.15835	7.07055	3.53802	0.58117	0.22367	0.2135	0.076	0.564	0.353	13.633	610.91	1.009	0.424	4.243	29.031	3.649	62.058	1.666	1.051	3.089	0.616	1.798	0.283	1.814	0.291	10.301	55.34	18.986	15.9		
MAC2U	full refs. provided in 1	Costa Rica	Arenal	VI	59.5041	18.7838	6.7034	2.71401	7.3666	3.367	0.6734	0.23467	0.20406	0.959	0.564	0.317	12.968	578.41	0.958	0.382	4.001	27.598	3.416	60.032	1.566	0.981	3.31	0.48	2.919	0.599	1.749	0.274	1.762	0.281	10.940	63.507	18.612	
RET2B	full refs. provided in 1	Costa Rica	Arenal	VI	59.9628	18.5817	6.60325	2.64734	7.28773	2.0934	0.58851	0	0.20836	0.054	0.367	0.343	10.966	568.058	0.953	0.414	25.887			56.25	1.59	1.072	3.296	0.485	2.936	0.598	1.747	0.275	1.818	0.29	9.907	53.294	17.989	
RET2B	full refs. provided in 1	Costa Rica	Arenal	VI	59.4126	18.5331	6.88842	2.79842	7.57521	3.45446	0.65604	0	0.21116	0.331	1.36	0.34	12.893	480.4	0.89	0.392	24.811			53.91	1.529	1.044	3.287	0.485	2.934	0.599	1.746	0.273	1.808	0.285	11.122	62.803	18.012	
RET3A	full refs. provided in 1	Costa Rica	Arenal	VI	51.9588	20.5007	7.95287	2.49448	8.48465	11.0064	2.46441	0.4055	0	0.15415	46.493	0.28626	0.162	70.933	318.78	0.543	0.212	16.486			31.675	0.907	0.804	2.363	0.35	2.139	0.435	1.216	0.187	1.192	0.184	28.81	156.103	12.753
RET3B	full refs. provided in 1	Costa Rica	Arenal	VI	51.9977	20.4327	8.12902	5.00653	7.1072	2.49277	0.38843	0	0.15157	43.05	27.901	0.166	70.103	367.267	0.561	0.216	17.458			32.983	0.906	0.849	2.536	0.374	2.285	0.464	1.302	0.196	1.247	0.191	28.972	164.42	12.963	
RET3C	full refs. provided in 1	Costa Rica	Arenal	VI	51.7123	20.4764	8.25004	5.13644	10.2482	2.40957	0.36193	0	0.15469	47.563	17.797	0.165	6.748	314.3	0.62	0.233	17.977			34.621	0.981	0.855	2.377	0.399	0.463	1.304	0.195	0.192	0.147	173.229	14.402			
RET3D	full refs. provided in 1	Costa Rica	Arenal	VI	52.9488	19.7125	8.91353	2.30333	9.94248	2.2562	0.38552	0	0.17044	56.001	35.807	0.187	6.838	361.243	0.679	0.239	20.121			39.405	1.086	0.907	2.734	0.402	2.424	0.487	1.385	0.21	1.353	0.204	25.495	168.219	14.013	
RET3E	full refs. provided in 1	Costa Rica	Arenal	VI	53.5825	19.3016	8.23656	5.14767	9.84005	2.64924	0.42428	0	0.16334	55.458	33.563	0.19	7.109	371.38	0.622	0.233	20.156			38.699	1.086	0.912	2.722	0.401	2.436	0.494	1.397	0.214	1.377	0.212	22.385	173.109	14.078	
SEI31L	full refs. provided in 1	Costa Rica	Arenal	VI	51.6518	20.8756	7.88407	5.06860	10.7823	2.45237	0.40535	0.14187	0.14187	48.849	28.217	0.156	6.915	358.494	0.52	0.204	24.34	16.767	1.947	32.891	0.929	0.791	2.394	0.357	2.165	0.44	1.235	0.188	1.178	0.183	25.475	174.965	12.896	
SEI31M	full refs. provided in 1	Costa Rica	Arenal	VI	52.766	19.5643	8.26748	5.27862	10.132	2.59372	0.42553	0.16211	0.16211	56.358	31.68	0.189	7.55	427.959	0.67	0.248	27.102	2.082	40.985	1.102	0.903	0.736	0.411	2.412	0.491	1.382	0.211	1.335	0.208	24.948	185.385	14.769		
SEI31U	full refs. provided in 1	Costa Rica	Arenal	VI	57.9963	18.7462	7.48832	3.15328	7.67121	3.40278	0.55027	0.22353	0.18268	2.762	1.627	0.31	12.262	659.5	1.369	0.513	21.771	2.215	44.673	1.173	0.904	2.766	0.411	2.475	0.506	1.439	0.29	1.386	0.219	24.287	174.234	15.443		
MACAL	full refs. provided in 1	Costa Rica	Arenal	VI	59.4215	18.8429	6.68555	2.48812	6.55406	4.18732	0.76869	0.29331	0.29127	0.257	1.266	0.343	13.993	624.754	1.435	0.507	4.931	32.324	4.41	71.56	1.967	1.287	0.409	0.605	3.407	0.699	1.985	0.309	1.399	0.315	12.653	64.632	20.247	
RET4A	full refs. provided in 1	Costa Rica	Arenal	VI	60.4556	18.0055	6.66122	2.54337	6.66122	4.11784	0.82155	0	0.18873	2.302	1.071	0.366	15.109	699.256	1.354	0.524	33.366			66.441	1.867	1.256	3.901	0.571	3.411	0.696	2.004	0.312	2.017	0.317	13.411	64.6	20.657	
RET4B	full refs. provided in 1	Costa Rica	Arenal	VI	56.7179	19.6783	7.21368	2.96439	8.63011	3.42979	0.62354	0	0.172	3.904	3.091	0.29	11.96	520.931	1.043	0.402	26.178			52.524	1.523	1.13	3.397	0.505	3.003	0.599	1.721	0.265	1.708	0.268	15.372	97.417	17.689	
CT5A	full refs. provided in 1	Costa Rica	Arenal	VI	58.4306	18.3212	7.38135	3.10098	7.61519	3.51783	0.68323	0.22978	0.19318	5.77	8.93	0.303	11.93	507	1.11	0.457	25.45			50.51		1.09	2.86	0.47	2.54	0.552	1.51	0.242	1.66	0.255	11.3	14.34		
CT5B	full refs. provided in 1	Costa Rica	Arenal	VI	57.4872	18.8784	7.57599	3.15326	7.44024	3.53136	0.66418	0.20942	0.19318	5.23	11.44	0.303	11.77	526	1.25	0.49	26.09			49.47		1.02	2.94	0.49	2.61	0.556	1.58	0.261	1.65	0.254	13.8	15.9		
MAC50K	full refs. provided in 1	Costa Rica	Arenal	VI	57.9963	18.7462	7.48832	3.15328	7.67121	3.40278	0.55027	0.22353	0.18268	2.762	1.627	0.31	12.262	659.5	1.369	0.513	21.771	2.215	44.673	1.173	0.904	2.766	0.411	2.475	0.506	1.439	0.29	1.386	0.219	24.287	174.234	15.443		
MAC51L	full refs. provided in 1	Costa Rica	Arenal	VI	61.0415	18.0384	6.33974	2.54628	6.67341	3.70071	0.63701	0.273	0.20222	7.25	4.1	0.117	10.196	594.421	0.968	0.378	22.259	2.598	2.25	59.001	1.711	1.228	3.901	0.584	3.357	0.693	1.992	0.316	0.201	0.323	13.231	69.888	20.341	
MAC51U	full refs. provided in 1	Costa Rica	Arenal	VI	57.3323	18.9434	7.60604	3.29488	8.07758	3.4545	0.61812	0	0.18964	5.331	3.286	0.32	12.107	516.593	1.328	0.497	26.17			53.066	1.471	1.067	3.335	0.463	2.771	0.565	1.633	0.254	1.655	0.26	14.248	89.904	16.609	
CAS6 SC	full refs. provided in 1	Costa Rica	Arenal	VI	52.3901	20.083	8.19323	5.20559	10.0972	2.61318	0.42536	0.16204	0.16204	53.502	30.512	0.179	7.018	498.584	0.671	0.246	2.66	19.678	2.118	37.765	1.076	0.89	2.67	0.4	2.325	0.474	1.341	0.202	1.306	0.202	24.909	179.823	13.86	
CT6A	full refs. provided in 1	Costa Rica	Arenal	VI	51.4355	19.4596	8.98923	5.09199	10.3899	2.46836	0.42527	0.14713	0.16236	62.65	45.21	0.154	64.55	34.54	0.187	15.57			50.83	2.09	0.347	1.95	0.417	1.11	0.181	1.15	0.177	0.37	11.05	11.77	30.7			
CT6B	full refs. provided in 1	Costa Rica	Arenal	VI	53.9315	20.0385	7.9329	4.45133	9.2405	2.50762	0.43583	0	0.15407	45.12	35.382	0.16	6.748	314.3	0.62	0.233	20.121			34.621	0.981	0.855	2.377	0.399	0.463	1.304	0.195	0.192	0.147	173.229	14.402			
CT7A1	full refs. provided in 1	Costa Rica	Arenal	VI	53.2434	22.1477	7.31188	3.18127	9.90739	2.8177	0.41324	0.16559	0.15553	10.81	33.97	0.163	6.65	328	0.43	0.202	17.81			34.55		0.95	2.51	0.418	2.38	0.527	1.39	0.224	1.42	0.223	15.9	13.68		
CT7A2	full refs. provided in 1	Costa Rica	Arenal	VI	52.5234	21.9455	7.15547	3.36177	10.7382	2.86419	0.47204	0.16658	0.15069	12.28	15.21	0.2	8.05	343	0.39	0.195	16.701			35.13		0.93	2.44	0.404	2.45	0.51	1.45	0.208	1.34	0.212	14.5	13.2		
CT7B	full refs. provided in 1	Costa Rica	Arenal	VI	51.6035	20.5361	8.50607	5.38718	10.1972	2.39993	0.401	0.14987	0.16	49.91	36.24	0.181	6.66	326	0.34	0.184	14.58			30.04		0.84	2.29	0.385	2.11	0.432	1.24	0.192	1.2	0.199	27.4	11.63		
CT7C	full refs. provided in 1	Costa Rica	Arenal	VI	52.0571	19.3318	8.93229	5.68075	9.86418	2.6668	0.46595	0.14276	0.17547	44.37	35.2	0.174	7.49	347	0.37	0.162	17.77			29.5		0.87	2.24	0.377	2.3	0.488	1.34	0.203	1.4	0.208	28.4	13.69		
CT7D	full refs. provided in 1	Costa Rica	Arenal	VI	51.9932	19.2188	9.11738	5.62305	9.9508	2.60066	0.45185	0.14961	0.171472	54.32	35.54	0.167	7.26	340	0.36	0.183	16.92			30.08		0.87	2.2	0.372	2.14	0.475	1.33	0.203	1.32	0.2	31.1	12.72		
RET5	full refs. provided in 1	Costa Rica	Arenal	VI	53.4021	19.8866	8.24762	5.05156	9.41237	2.08258	0.43608	0	0.16082	45.14	32.491	0.192	7.809	420.165	1.362	0.534	23.775			47.504	1.084	0.927	2.766	0.423	2.553	0.51	1.447	0.295	1.497	0.217	24.552	153.507	12.966	
RET5B	full refs. provided in 1	Costa Rica	Arenal	VI	52.7018	21.8412	7.18342	3.18349	10.6949	2.86955	0.45348	0	0.1525	17.115	12.563	0.201	7.859	337.269	0.459	0.223	17.075			35.713	1.083	0.94	2.812	0.43	2.644	0.537								

AR11-1982	full refs. provided in 1	Costa Rica	Arenal	VI	55.6244	20.7979	6.47935	3.17968	9.0191	3.31967	0.67993	0.16998	0.14999	12.5	13.9	0.315	12.9	565	0.914	0.386	4.27	23.8	3.6	54.6	1.44	1.03	2.97	0.456	2.75	0.585	1.63	0.24	1.59	0.246	16.8	154	17.1	
ARM100	full refs. provided in 1	Costa Rica	Arenal	VI	55.13	19.18	7.19	4.8	9.29	2.94	0.55	0.15	0.15	36.7	27.9	0.256	10.4	502	0.841	0.32	3.75	21.4	2.64	49.4	1.32	0.984	2.78	0.426	2.53	0.538	1.48	0.222	1.44	0.226	20.4	178	15.1	
AR3-160+	full refs. provided in 1	Costa Rica	Arenal	VI	54.7845	19.718	7.14929	4.59955	9.18808	3.06969	0.60994	0.15998	0.14999	42.3	28.3	0.28	11.5	519	0.795	0.329	3.82	21.9	3.09	49.5	1.34	0.995	2.85	0.445	2.65	0.551	1.52	0.232	1.46	0.228	22.3	188	16.1	
AR10-1-84	full refs. provided in 1	Costa Rica	Arenal	VI	55.0555	18.7719	7.18074	4.51051	9.24092	2.93026	0.60995	0.15002	0.16003	48	38.1	0.272	11.3	497	0.819	0.339	3.66	21.3	3.83	48.2	1.32	0.934	2.75	0.414	2.45	0.514	1.42	0.211	1.39	0.214	20.9	178	15	
AR1E	full refs. provided in 1	Costa Rica	Arenal	VI	54.5055	19.742	7.07071	4.50046	9.50055	3.04015	0.60106	0.16002	0.15002	47.9	31.7	0.269	11.4	500	0.887	0.347	3.69	21.7	2.91	47.5	1.27	0.982	2.71	0.418	2.5	0.521	1.44	0.216	1.36	0.215	22	179	15.2	
AR2-0-3	full refs. provided in 1	Costa Rica	Arenal	VI	54.3746	18.7481	7.34927	4.52894	9.74903	2.91971	0.60994	0.16998	0.15998	62.1	38	0.262	11.1	517	1.003	0.381	3.72	23.4	2.94	50.1	1.29	0.98	2.87	0.432	2.62	0.545	1.53	0.22	1.42	0.221	27.9	191	15.7	
AR3-1-19	full refs. provided in 1	Costa Rica	Arenal	VI	54.7255	19.772	7.0307	4.61046	9.29093	3.0103	0.62006	0.17002	0.15002	50.2	34.1	0.267	11.5	528	1.003	0.39	3.87	23.9	2.97	50.7	1.34	1	2.79	0.416	2.49	0.519	1.47	0.208	1.39	0.214	21	182	15.2	
AR4-74	full refs. provided in 1	Costa Rica	Arenal	VI	55.1045	19.618	6.85931	4.45595	9.36006	3.04097	0.60994	0.16998	0.14999	50.4	33	0.267	11.6	535	1.054	0.383	3.9	24	2.89	52.2	1.33	1.01	2.77	0.418	2.51	0.525	1.45	0.21	1.39	0.213	22	194	15.3	
AR5-1-59A	full refs. provided in 1	Costa Rica	Arenal	VI	55.2355	18.4718	7.43074	4.53053	9.15011	2.91029	0.60006	0.16002	0.16002	63.2	38	0.244	10.8	494	0.957	0.358	3.64	22.4	3.13	50.4	1.29	0.986	2.73	0.421	2.5	0.514	1.44	0.215	1.38	0.214	26.7	203	15	
AR6-750	full refs. provided in 1	Costa Rica	Arenal	VI	55.24	19.29	6.87	4.67	9.5	2.94	0.58	0.16	0.15	45.9	34	0.267	11.3	525	1.02	0.386	3.78	23.8	2.91	51.7	1.34	0.988	2.79	0.422	2.49	0.521	1.44	0.209	1.39	0.207	23.1	180	15	
AR6/750	full refs. provided in 1	Costa Rica	Arenal	VI	55.2711	19.2539	7.15143	4.60393	9.06181	3.08062	0.61002	0.17003	0.15003	48.4	32	0.261	11.5	531	1.073	0.386	3.9	23.8	2.71	52.8	1.33	1.02	2.75	0.421	2.52	0.527	1.47	0.211	1.38	0.214	26.2	195	15.2	
AR9/83	full refs. provided in 1	Costa Rica	Arenal	VI	55.2	18.76	7.35	5.04	8.92	3.11	0.65	0.18	0.16	50.2	36.1	0.281	12.3	581	1.155	0.449	4.02	25.7	3.02	56.4	1.43	0.99	2.81	0.418	2.53	0.517	1.45	0.221	1.39	0.215	22.9	191	15.3	
AR1/85	full refs. provided in 1	Costa Rica	Arenal	VI	55.4945	19.1781	6.91931	4.61954	9.00591	3.16968	0.65993	0.17998	0.14999	41.8	30.1	0.282	12.9	583	1.209	0.449	4.09	25.9	3.23	58.5	1.48	0.99	2.76	0.42	2.45	0.513	1.45	0.221	1.39	0.214	21	178	14.9	
AR5/92	full refs. provided in 1	Costa Rica	Arenal	VI	55.4955	18.9919	7.05071	4.74047	8.9509	3.14031	0.68007	0.18002	0.15002	41.7	33.1	0.283	12.5	606	1.254	0.446	4.07	26	3.19	58.7	1.44	1.01	2.76	0.424	2.5	0.52	1.48	0.216	1.4	0.218	21.9	185	15.1	
AR9/92-5A	full refs. provided in 1	Costa Rica	Arenal	VI	55.4899	18.9652	7.06859	4.74095	8.94821	3.14037	0.67986	0.17996	0.14997	41.7	35.5	0.29	12.9	605	1.18	0.442	4.19	26	3.21	57.7	1.41	1.01	2.76	0.408	2.45	0.517	1.47	0.214	1.41	0.217	21.8	180	15.1	
AR8/93	full refs. provided in 1	Costa Rica	Arenal	VI	55.5689	18.8662	7.16857	4.80043	8.85823	3.08938	0.67986	0.17996	0.15997	43	34.5	0.291	12.9	613	1.205	0.455	4.18	26.5	3.44	58.7	1.46	1	2.77	0.417	2.5	0.524	1.46	0.218	1.4	0.216	21.8	182	15.2	
AR11/93	full refs. provided in 1	Costa Rica	Arenal	VI	55.6089	19.0462	7.03859	4.63907	8.92821	3.09938	0.68986	0.17996	0.14997	38.2	33	0.291	12.5	615	1.218	0.456	4.22	26.4	3.25	58.9	1.45	1.01	2.78	0.419	2.47	0.522	1.5	0.212	1.4	0.213	21.4	175	15.1	
AR1/95	full refs. provided in 1	Costa Rica	Arenal	VI	55.5444	18.9281	7.07929	4.73953	8.90911	3.17968	0.67993	0.17998	0.14999	42.6	34.2	0.29	12.6	612	1.229	0.46	4.14	26.5	3.28	58.7	1.47	1.01	2.79	0.414	2.49	0.508	1.44	0.217	1.4	0.217	21.6	182	15.1	
AR12/95	full refs. provided in 1	Costa Rica	Arenal	VI	55.5356	19.0219	7.05071	4.64046	8.9909	3.1201	0.69007	0.18002	0.15002	43.2	33.5	0.286	12.3	593	1.188	0.442	4.04	25.8	3.05	57.7	1.44	0.98	2.73	0.417	2.4	0.504	1.4	0.212	1.37	0.208	21.1	178	14.7	
AR3/01-1	full refs. provided in 1	Costa Rica	Arenal	VI	55.8012	19.1038	7.0114	4.58092	8.73175	3.12062	0.70014	0.18004	0.15003	35.2	31.7	0.292	12.8	619	1.234	0.463	4.18	26.5	3.26	58.9	1.47	0.99	2.77	0.423	2.48	0.513	1.43	0.215	1.38	0.217	20.4	174	15	
AR3/01-2	full refs. provided in 1	Costa Rica	Arenal	VI	55.82	19.31	6.9	4.36	8.77	3.18	0.71	0.18	0.15	33.1	29.6	0.297	13	631	1.383	0.471	4.3	27.1	3.27	61.1	1.52	1.02	2.84	0.439	2.56	0.523	1.45	0.223	1.4	0.219	20.7	173	15.3	
AR9/03	full refs. provided in 1	Costa Rica	Arenal	VI	56.4156	18.9419	6.73067	4.53104	8.62086	3.16032	0.69007	0.17002	0.15002	41.7	33.2	0.284	12.5	603	1.274	0.451	4.11	25.8	3.13	58.7	1.46	0.97	2.72	0.409	2.41	0.507	1.43	0.212	1.37	0.209	21.3	185	14.9	
NMNH ET3GA-1	full refs. provided in 1	Costa Rica	Arenal	VI	58.3501	16.9014	8.75252	4.59424	7.02213	3.47082	0.90543	0.35211	0																									
AR0301	full refs. provided in 1	Costa Rica	Arenal	VI	51.2871	20.4751	8.34907	5.33744	7.20542	4.05042	0.39757	0.13915	0.15903	37.3	27.9			6	364	0.604	0.237	3.03	18.3	21.4	37.5	1.06	1.037	2.63	0.391	2.37		1.3			23.88	204	13.7	
AR0302	full refs. provided in 1	Costa Rica	Arenal	VI	50.6852	21.0601	7.99073	5.1189	11.2858	2.5796	0.41314	0.12092	0.15115	33.34	25.8			7	325	0.499	0.205	2.77	15.6	1.94	32	0.91	0.941	2.35	0.335	2.08		1.16		1.19		21.52	179	12.1
NMNH ET6G	full refs. provided in 1	Costa Rica	Arenal	VI	56.2049	18.8037	7.0227	3.39685	8.8322	3.04869	0.65692	0.16583	0.15003	0																								
ARPF 93	full refs. provided in 1	Costa Rica	Arenal	VI	67.875	12.6177	7.3603	1.26177	3.57501	3.87543	2.20308	0																										
AR9-4-90	full refs. provided in 1	Costa Rica	Arenal	VI	67.0706	12.8092	7.47121	1.5323	3.8568	4.30646	1.84276	0																										
AR9-1-98	full refs. provided in 1	Costa Rica	Arenal	VI	68.5966	12.7216	7.13122	1.32225	3.7063	3.37574	2.10358	0																										
AR 3-24-25-01	full refs. provided in 1	Costa Rica	Arenal	VI	69.418	12.351	6.97185	1.12191	3.3357	3.59611	2.20375	0																										
8B.CH011	full refs. provided in 1	Costa Rica	Arenal	VI	66.1859	12.7204	7.06823	1.38394	3.53566	1.88301	0.45072	0.17027																										
1/59A	full refs. provided in 1	Costa Rica	Arenal	VI	68.4766	14.7141	10.6257	2.93881	6.62735	3.9984	0.91963	0.34986	0.19902																									
1/85CA	full refs. provided in 1	Costa Rica	Arenal	VI	67.0176	12.4248	7.68151	1.07830	3.83073	4.52447	1.5343	0.58163	0.15042																									
8/93A	full refs. provided in 1	Costa Rica	Arenal	VI	67.5795	12.6292	6.83118	1.3241	3.76166	4.0325	2.21687	0.51159	0.10031																									
I203-17A	full refs. provided in 1	Costa Rica	Irazu	VI	54.3398	17.3751	7.34484	4.66943	8.9581	3.50708	0.20409	0.09099	0.13828	69	39.8	0.725	54.7	857	8.77	3.09	23	96.2	5.55	229	4.68	2.14	6.84	0.97	4.79	0.91	2.49		2.23	0.347	22.4	217	26.2	
I203-19818	full refs. provided in 1	Costa Rica	Irazu	VI	56.4778	16.6495	6.65783	5.49048	7.97357	3.37343	1.94887	0.38582	0.12267	136	80.2	0.902	57.6	824	9.18	3.51	20.6	79.6	5.79	202	4.28	1.65	5.28	0.75	3.66	0.7	1.91		1.75	0.272	20.8	184	20	
I203-1982	2 full refs. provided in 1	Costa Rica	Orosi	VI	56.4892	16.4541	7.14285	5.50522	7.21682	3.45622	0.38582	0.12267	113	49.6	0.917	62.1	859	10.59	3.76	24.8	92.2	6.24	242	5.05	1.87	6.19	0.89	4.38	0.83	2.28		2.06	0.319	21.8	202	23.9		
CR-OR03	1 full refs. provided in 1	Costa Rica	Orosi	VI	55.8844	18.7468	8.97																															

AR-JAR14A_FAI	full Refs. provided in 1	Costa Rica	Arenal	VI	54.1864	19.419	8.64408	4.30194	9.12655	2.84451	0.54277	1.08092	0.17087	19.36	14.8	0.25	10.35	390.27	0.63	0.32	3.6	20.24	2.73	42.47	1.26	1.02	3.1	0.48	2.82	0.58	1.67	0.26	1.66	0.26	22.67	155.89	17.25
AR-BOMB_80_5	full Refs. provided in 1	Costa Rica	Arenal	VI	54.0567	19.0141	8.36144	5.08819	9.2442	2.78715	0.46618	0.1587	0.17854	46.88	25.3	0.18	7.15	345.91	0.61	0.25	2.63	19.44	2.05	41.51	1.25	0.98	1.13	0.47	2.86	0.59	1.69	0.26	1.67	0.26	24.21	154.11	17.06
AR-BOMB_80_7	full Refs. provided in 1	Costa Rica	Arenal	VI	54.3876	18.8353	8.22289	4.85994	9.25703	2.93173	0.51205	0.19076	0.18702	47.61	24.33	0.21	8.09	375.31	0.68	0.27	2.81	20.66	2.21	45.37	1.34	1.04	3.22	0.49	2.93	0.6	1.73	0.27	1.74	0.27	23.28	155.97	17.27
AR-BOMB_80_7	full Refs. provided in 1	Costa Rica	Arenal	VI	53.3448	18.7869	8.60775	5.58501	9.54089	2.68241	0.43039	0.18016	0.18016	53.06	30.03	0.18	6.82	355.96	0.6	0.23	2.48	18.66	2	38.52	1.15	0.98	1.98	0.46	2.74	0.56	1.61	0.25	1.57	0.25	25.15	164.94	16.13
AR-OLD_BOMB	full Refs. provided in 1	Costa Rica	Arenal	VI	53.7167	19.9058	8.51533	4.02725	9.36686	2.92527	0.54067	0.21038	0.15027	26.46	33.77	0.21	8.93	467.31	0.89	0.32	3.23	24.44	2.54	49.91	1.36	1.02	3	0.45	2.64	0.54	1.54	0.24	1.52	0.24	21.05	159.93	16
CR-P1-05	full Refs. provided in 1	Costa Rica	Platanar	VI	54.8865	19.6656	8.07126	4.07075	7.98169	3.09514	1.17436	0.21938	0.16919	4.2	5.79	0.61	27.55	639.6	4.02	1.5	7.61	32.67	3.1	87.75	2.34	1.21	4.14	0.62	3.63	0.75	2.15	0.32	0.202	0.31	25.5	223.88	23.28
CR-PLA-14	full Refs. provided in 1	Costa Rica	Platanar	VI	54.0286	17.8376	9.40629	4.40885	9.09072	2.52801	1.5977	0.20202	0.19213	4.82	2.34	0.61	61.84	191.11	12.43	3.8	17.86	102.29	4.22	188.08	4.59	1.98	6.37	0.89	4.6	0.89	2.55	0.39	2.53	0.4	15.33	113.07	28
CR-PLA-25	full Refs. provided in 1	Costa Rica	Platanar	VI	55.0455	19.3719	7.76078	4.14041	7.9708	3.15032	1.40014	0.21004	0.16002	16.32	10.9	0.7	27.49	826.71	6.12	2.03	11.13	55.19	5.26	129.33	3.43	1.4	4.99	0.74	4.15	0.84	2.39	0.37	2.33	0.36	24.82	221.53	25.02
CR-PLA-43	full Refs. provided in 1	Costa Rica	Platanar	VI	52.1625	19.8521	9.50066	4.40596	8.6296	3.24116	0.98248	0.26344	0.17129	14.43	14.18	0.23	14.5	621.97	2.65	0.98	8.39	43.75	4.64	76.21	2.03	1.31	4.07	0.59	3.27	0.64	1.8	0.27	1.68	0.26	23.37	232.76	18.39
CR-PP10	full Refs. provided in 1	Costa Rica	Platanar	VI	56.131	18.4532	7.78401	3.5676	3.44602	1.3324	1.18032	0.17031	4.38	5.87	0.39	27.83	665.39	4.73	1.77	9.95	40.68	3.87	103.26	2.68	1.2	4.15	0.62	3.56	0.73	2.1	0.32	0.12	0.12	18.84	174.58	21.47	
CR-PP-02-21	full Refs. provided in 1	Costa Rica	Platanar	VI	52.1246	20.4371	9.08539	3.29826	8.23715	2.86321	1.6289	0.38466	0.15176	3.66	8.31	0.36	30.75	868.68	6.11	2.12	13.2	48.74	1.18	147.49	3.76	1.7	5.44	0.8	3.73	0.72	2.01	0.31	1.89	0.29	17.1	167.7	20.3
CR-PP-02-22	full Refs. provided in 1	Costa Rica	Platanar	VI	50.4023	18.4973	11.1245	5.45162	6.96624	2.54476	0.95554	0.25166	0.18105	15.03	18.2	0.13	15.07	562.88	3.79	1.14	6.57	52.55	3.19	68.48	1.87	1.43	5.04	0.72	3.7	0.74	2.02	0.3	1.85	0.28	27.72	249.1	21.09
CR-PP-02-24	full Refs. provided in 1	Costa Rica	Platanar	VI	52.1058	18.887	9.69599	4.2521	9.14049	2.58779	1.7069	0.3535	0.1616	6.37	10.59	0.5	31.21	854.89	6.24	2.21	11.52	75.45	6.24	132.41	3.38	1.74	6.12	0.88	4.22	0.82	2.23	0.33	2.12	0.32	22.12	194.56	21.56
CR-PP-02-26	full Refs. provided in 1	Costa Rica	Platanar	VI	49.6917	20.6105	9.69372	4.26564	11.7796	2.4765	0.88952	0.20216	0.17184	9.57	11.56	0.15	13.89	449.8	2.79	0.99	4.75	39.55	1.84	58.95	1.62	1.22	1.92	0.57	2.97	0.59	1.63	0.24	1.55	0.23	26.01	209.39	14.81
CR-PP-02-29	full Refs. provided in 1	Costa Rica	Poás	VI	54.4566	19.9517	7.54356	4.27052	7.98026	3.19821	1.98409	0.40286	0.1	17.43	12.38	0.81	50.55	1027.09	9.5	3.28	17.92	87.01	6.03	192.57	4.75	1.96	6.99	0.99	5.21	1.01	2.81	0.42	2.65	0.4	25.55	216.84	28.65
CR-PP-06	full Refs. provided in 1	Costa Rica	Poás/Sabana R	VI	59.1936	17.0702	7.2637	2.83565	6.46338	3.68757	2.14771	0.2634	0.16209	0.23	0.43	0.81	58.44	853.67	9.45	3.28	13.71	60.16	7.5	159.92	4.23	1.47	5.5	0.82	4.65	0.94	2.69	0.41	2.65	0.41	23.45	161.27	26.82
CR-PP-07	full Refs. provided in 1	Costa Rica	Poás/Sabana R	VI	55.8555	16.8189	8.90115	3.69293	7.82724	3.32613	0.07313	0.31109	0.1706	1.34	4.29	1.16	61.88	968.3	9.63	3.27	13.93	70.99	6.83	163.67	4.07	1.66	6.11	0.89	4.77	0.96	2.69	0.41	2.59	0.39	30.01	237.1	28.81
CR-PP-09	full Refs. provided in 1	Costa Rica	Poás/Sabana R	VI	57.1963	17.0305	8.94482	3.14332	7.02446	3.13231	0.20153	0.283	0.17182	4.82	2.34	0.61	61.84	191.11	12.43	3.8	17.86	102.29	4.22	188.08	4.59	1.98	6.37	0.89	4.6	0.89	2.55	0.39	2.53	0.4	15.33	113.07	28
CR-PP-02-28	full Refs. provided in 1	Costa Rica	Poás	VI	54.32	16.665	10.5958	4.00374	8.27704	2.90352	1.67356	0.2722	0.17139	12.37	10.69	0.92	45.66	699.44	6.1	2.31	10.53	51.61	5.79	125.03	3.23	1.27	4.99	0.74	4.06	0.83	2.34	0.36	2.26	0.34	31.89	249.68	21.74
CR-PP-02-29	full Refs. provided in 1	Costa Rica	Poás	VI	53.8725	16.9625	10.7604	4.08431	8.26345	2.89031	1.65389	0.2622	0.17144	9.56	6.83	0.9	39.24	642.4	6.28	2.32	11.16	53.85	5.73	128.62	3.31	1.31	5.21	0.77	4.24	0.86	2.43	0.37	2.35	0.35	33.32	248.64	22.57
CR-81	full Refs. provided in 1	Costa Rica	Barva	VI	54.2559	17.7068	7.86856	5.11506	7.98915	3.14541	2.37162	0.39192	0.16079	121.69	68.18	0.41	53.95	1013.87	14.68	4.77	24.57	106.49	6.8	232.45	5.54	1.93	6.87	0.94	4.62	0.87	2.39	0.35	2.26	0.34	24.09	203.28	26.14
CR-86	full Refs. provided in 1	Costa Rica	Barva	VI	52.0861	17.7038	7.90188	3.12778	9.1254	2.84508	1.2265	0.23122	0.15068	181.78	68.08	0.51	28.57	582.87	19.9	1.63	9.81	44.58	2.94	102.56	2.51	1.16	3.71	0.54	2.98	0.59	1.63	0.25	1.54	0.24	31.56	225.44	17.18
CR-8H-02-01	full Refs. provided in 1	Costa Rica	Barva	VI	50.5577	19.8168	9.06194	3.477	9.9801	2.87197	0.89624	0.26887	0.14937	19.92	29.36	0.2	14.52	503.03	1.92	0.77	13.38	35.01	3.28	69.03	1.84	1.15	3.41	0.5	2.83	0.56	1.55	0.23	1.43	0.22	27.82	289.02	16.29
CR-8-02-11	full Refs. provided in 1	Costa Rica	Barva	VI	53.9022	18.2407	9.41691	3.56559	7.98664	2.95776	2.2067	0.35243	0.17471	24.89	17.52	0.74	54.26	880.99	10.55	3.78	19.45	88.57	5.23	208.56	5.06	1.67	6.27	0.87	4.18	0.81	2.2	0.33	2.07	0.31	23.27	180.56	23.01
CR-8-02-12	full Refs. provided in 1	Costa Rica	Barva	VI	55.1583	17.1294	8.45626	3.54587	8.40626	3.54587	1.4092	0.2318	0.1802	90.02	39.05	0.85	59.06	102.3	4.2	4.18	20.32	105.33	5.2	209.66	5.2	1.94	7.3	1.03	4.65	0.89	2.41	0.36	2.24	0.35	23.82	180.81	24.63
CR-8-02-13	full Refs. provided in 1	Costa Rica	Barva	VI	53.6756	17.9121	8.96112	4.37551	8.47509	2.92629	1.97468	0.37847	0.13163	20.42	15.1	0.37	46.51	827.53	2.99	2.92	16.01	80.53	3.68	166.91	4.15	1.61	5.92	0.81	3.87	0.75	2.02	0.3	1.94	0.29	23.07	199.1	20.3
CR-8-02-14	full Refs. provided in 1	Costa Rica	Barva	VI	53.7026	18.3212	8.91848	4.21711	8.62591	2.90557	1.89669	0.37828	0.14124	40.05	2.34	0.58	41.88	983.92	3.29	2.87	18.59	103.62	5.68	184.76	4.42	2.32	10.98	1.52	8.73	1.91	5.51	0.83	5.24	0.88	25.81	175.55	61.56
CR-8-02-15	full Refs. provided in 1	Costa Rica	Barva	VI	54.0283	16.5486	9.0587	5.06067	8.0668	2.94534	2.31781	0.45547	0.13158	121.76	57.03	0.4	56.28	948.40	11.26	3.93	19.85	110.84	5.08	207.34	4.9	1.95	7.39	1	4.63	0.87	2.35	0.34	2.17	0.32	25.28	188.16	23.81
CR-8-02-16	full Refs. provided in 1	Costa Rica	Barva	VI	54.2291	16.8555	8.77175	5.29138	8.08377	2.83286	2.3877	0.4654	0.15716	112.16	56.95	0.9	58.08	1002.99	11.24	4.04	20.64	115.37	5.93	215.64	5.09	2.02	7.89	1.06	4.95	0.94	2.48	0.37	2.3	0.34	25.79	188.79	26.01
CR-8-8	full Refs. provided in 1	Costa Rica	Barva	VI	53.9014	17.9907	9.24803	4.75312	8.52032	3.06246	1.67356	0.30321	0.14145	17.24	10.37	0.47	34.19	750.59	7.2	2.23	12.61	66.69	7.04	132.6	3.38	1.57	5.47	0.77	3.76	0.73	2	0.3	1.9	0.29	27.83	223.8	19.76
CR-IZ-05	full Refs. provided in 1	Costa Rica	Irazú	VI	54.6039	16.6735	7.53061	4.91837	8.69388	3.45918	2.2551	0.24888	0.12625	76.44	37.79	0.67	52.86	946.97	10.16	3.43	22.5	104.13	5.51	171.49	5.03	2.11	6.83	0.95	4.74	0.89	2.42	0.34	2.24	0.34	22.23	198.41	25.66
CR-IZ-02-1	full Refs. provided in 1	Costa Rica	Irazú	VI	56.1695	16.7817	3.80138	1.02709	2.60637	4.4813	4.95519	0.18543	0.12362	7.22	34.9	2.34	132.31	1557.43	30.68	9.98	66.62	168.3	11.53	494.66	1.14	2.26	8.5	1.23	5.46	1.06	2.97	0.46	1.97	0.47	27.91	27.27	29.94
CR-IZ-02-2	full Refs. provided in 1	Costa Rica	Irazú	VI	52.901	16.2494	8.35596	2.74984	8.77828																												

Z2D	full Refs. provided in 1	Costa Rica	Irazu	VI	55.0685	16.9118	7.04493	5.11358	8.39588	3.46242	2.35165	0.40209	0.1401	106.7	44.7	0.85	65	876.1	10.96	3.88	23.4	97.4	5.88	233.5	5.38	1.96	6.19	0.968	4.78	0.877	2.38	2.15	0.336	23.79	201	25.4		
Z2L	full Refs. provided in 1	Costa Rica	Irazu	VI	54.2278	17.1867	7.56964	5.40408	8.81977	3.25819	2.04745	0.37405	0.13781	129.7	56.8	0.75	56.9	811.5	9.65	3.47	20.7	88.3	5.47	210.7	4.79	1.87	5.66	0.889	4.41	0.807	2.17	1.97	0.306	23.84	196.3	23.4		
NIC-CO59A	25 full Refs. provided in 1	Costa Rica	Irazu	VI	54.89	17.27	7.16	5.007	8.18	3.46	2.26	0.44	0.13	101.8	49.8	0.82	61.2	855.1	10.45	3.42	24.7	95.9	5.81	237.3	5.41	1.9	6.09	0.948	4.7	0.854	2.32	2.12	0.326	22.82	206.2	25.1		
	full Refs. provided in 1	Costa Rica	Coisguina	VI	54.5652	18.3951	7.08959	5.58573	7.55589	3.12538	2.1875	0.15969	0.138	10.72	0.95	1.24	22.86	922.4	1.33	1.05	1.58	19	3.91	90.81	2.75	1.23	0.42	0.71	4.53	0.95	1.73	1.71	0.42	20.52	113.58	27.91		
NIC-S2	full Refs. provided in 1	Nicaragua	San Cristobal	VI	49.0589	18.7225	10.3724	5.53712	11.6139	2.56308	0.5807	0.15058	0.20024	24	26	15	457																					
NIC-CN1	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	50.8203	19.5078	9.70388	4.73189	11.5046	2.20088	0.46018	0.12001	0.08077	211.8	17.81	0.49	7.9	406.6	0.41	0.38	2.4	9.15	29	47.85	1.1	0.77	2.53	0.46	2.95	1.73	1.62	0.26	31.69	332.3	16.63			
NIC-CN10	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	49.4944	18.8188	10.4104	6.00601	11.9119	2.002	0.37037	0.10101	0.09199	54	27	0.41	5	350	0.29	0.26	2.5	7.78	2.68	47		0.69	2.34		2.39		1.44	1.42		36	331	14.8		
NIC-CN11	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	49.6026	19.4185	9.96076	5.24198	12.3755	2.00221	0.35215	0.12074	0.09117	43	24		6	352																	325			
NIC-CN12	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	49.4528	18.2608	10.1338	6.54641	12.1605	2.06729	0.34455	0.11147	0.09429	77	30		6	357																	325			
NIC-CN13	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	50.0051	19.4204	9.71469	4.8778	12.2712	2.21904	0.40904	0.12409	0.09429	31	9	0.88																			331			
NIC-CN13	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	50.0051	19.4294	9.71469	4.8778	12.2712	2.21904	0.40904	0.12409	0.09429	12.16	12.28	0.35	7	358.65	0.34	0.29	1.2	7.66	1.56	33.18	1	0.74	2.27	0.38	2.51	0.53	1.53	0.24	1.48	0.22	31	283.69	15.26	
NIC-CN2	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	50.1853	19.9339	9.91686	4.48763	11.8201	2.2338	0.4107	0.07012	0.18031	27	138		10	393																	304			
NIC-CN3	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	50	17.1053	10.3239	7.67206	11.4372	2.05466	0.4251	0.08097	0.19231	92	49		8	370																	281			
NIC-CN5	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	49.2695	19.4156	10.8816	9.66427	11.5869	1.86398	0.35264	0.11083	0.02131	75.85	38.16	0.32	6.79	335.01	0.32	0.26	1.16	7.21	1.46	33.15	0.98	0.69	2.21	0.36	2.42	0.51	1.48	0.22	1.43	0.22	40.88	273.6	14.77	
NIC-CN6	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	50.8629	20.1837	9.68816	3.72389	11.5047	2.40186	0.47432	0.14129	0.18165	13	22		5	448																	319			
NIC-CN7	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	50.3138	20.652	9.41486	3.93804	11.9577	2.21705	0.45453	0.14173	0.07151	6.94	8.67	0.36	7.34	368.18	0.36	0.3	1.23	7.89	1.62	34.76	1.02	0.75	2.29	0.37	2.49	0.53	1.52	0.23	1.48	0.22	29.48	270.97	15.29	
NIC-CN8	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	50.559	18.9344	10.1722	4.9854	11.4815	2.27616	0.46329	0.16114	0.18129	24.42	18.31	0.37	7.37	369.91	0.36	0.3	1.25	7.92	1.65	35.21	1.04	0.75	2.33	0.38	2.56	0.54	1.56	0.22	1.5	0.23	32.77	276.89	15.81	
NIC-MT01	full Refs. provided in 1	Nicaragua	Montomombo	VI	54.9884	17.0828	9.19842	4.51835	9.2995	2.92126	0.19184	0.15612	0.08149	14.69	13.58	0.69	15.9	693.3	0.81	0.73	3	14.77	45	77.58	1.8	0.94	3.61	0.57	3.86		2.16	1.84	0.34	29.69	304.8	22.64		
NIC-CP012	full Refs. provided in 1	Nicaragua	Nejapa-Ticomana	VI	48.1952	17.1283	11.1689	7.49925	11.9988	2.34977	0.15998	0.12999	0.18988	205	146		4	351																	178			
NIC-M010	full Refs. provided in 1	Nicaragua	Nejapa	VI	54.8811	15.5513	9.51718	5.60851	8.62847	3.1805	0.53175	0.1806	0.16353	215.54	103.78	0.29	10.24	751.06	0.68	0.54	8.8	15.53	1.51	116.71	3.14	1.35	4.48	0.7	4.24	0.82	2.21	0.33	1.99	0.29	23.48	177.9	23.51	
NIC-M11	full Refs. provided in 1	Nicaragua	Nejapa	VI	56.0652	15.4551	9.19285	5.06112	8.28367	2.83116	0.86904	0.19194	0.16163	137.17	85.14	0.41	12.27	431.41	0.85	0.71	7.63	16.68	1.92	123.64	3.19	1.42	4.68	0.72	4.31	0.84	2.26	0.34	2.1	0.31	21.47	157.25	23.01	
NIC-M12	full Refs. provided in 1	Nicaragua	Nejapa	VI	56.3622	15.4265	9.17524	4.90018	8.6768	3.18613	0.64529	0.20165	0.16132	135.27	87.17	0.24	11.44	442.37	0.85	0.73	7.75	10.73	1.63	124.52	3.49	1.46	4.76	0.74	4.39	0.85	2.3	0.34	2.11	0.32	21.9	164.64	24.16	
NIC-M13	full Refs. provided in 1	Nicaragua	Nejapa	VI	48.5651	18.5731	11.0074	6.15091	12.0911	2.67059	0.3813	0.16055	0.19065	9.75	20.08	0.42	0.08	359	326.95	0.45	0.4	0.71	7.84	1.35	32.04	0.99	0.72	2.24	0.36	2.39	0.5	1.43	0.22	1.37	0.21	38.54	324.79	14.37
NIC-M2	full Refs. provided in 1	Nicaragua	Nejapa	VI	48.1952	18.607	11.3879	6.34525	12.0996	1.98271	0.2847	0.12201	0.20336	9.6	20.95	0.2	5.27	309.58	0.41	0.36	0.67	7.32	1.15	29.2	0.89	0.68	2.07	0.34	2.23	0.46	1.32	0.2	1.27	0.2	33.91	317.3	13.67	
NIC-M201	full Refs. provided in 1	Nicaragua	Nejapa	VI	48.296	15.4265	11.4136	10.0323	11.0909	2.33052	0.19157	0.10083	0.19157	303	140		10	305																	256			
NIC-M202	full Refs. provided in 1	Nicaragua	Nejapa	VI	48.1549	15.6123	11.4135	9.646112	10.8476	2.54622	0.19157	0.10083	0.19157	334	145	0.08	3.14	0.26	0.12	6.1	9.75	1.23	71	1.7	0.93	3.22	0.54	3.19					2.07	1.76	0.26	34.6	251	20.2
NIC-M203	full Refs. provided in 1	Nicaragua	Nejapa	VI	47.7483	14.9779	11.5903	11.0776	10.5855	2.20345	0.14073	0.09047	0.18094	352	186	0.02	2.3	82	0.2	0.11	7.3	8.41	1.34	59	2.1	0.9	3.34	0.51	3.44				1.83	1.52		35.2	301	19
NZ04	full Refs. provided in 1	Nicaragua	Nejapa	VI	50.0801	18.4295	9.1847	6.13982	12.1194	2.33173	0.54087	0.13021	0.17027	38	35		16	361																	281			
NIC-M3	full Refs. provided in 1	Nicaragua	Nejapa	VI	48.7559	18.636	10.9459	6.08442	11.9472	2.13559	0.40294	0.09066	0.20147	23	27	0.36	11.3	448	0.8	0.65	5.4	14.71	2.21	80	1.82	0.9	2.98				3.12		1.59		1.6	34.3	326	18.2
NIC-M4	full Refs. provided in 1	Nicaragua	Nejapa	VI	48.6252	18.702	10.8168	5.98463	12.3332	2.05216	0.4448	0.1112	0.2224	6.08	16.06	0.26	7.5	388.76	0.59	0.62	0.84	8.71	14.31	35.23	1.11	0.76	2.32	0.38	2.46	0.51	1.46	0.22	1.4	0.22	37.36	260.52	14.22	
NIC-M5	full Refs. provided in 1	Nicaragua	Nejapa	VI	48.8998	16.6055	9.7995	8.17033	12.6324	2.26161	0.47169	0.21394	0.19356	142	64		9	365																	181			
NIC-M6	full Refs. provided in 1	Nicaragua	Nejapa	VI	48.5397	15.2201	10.5923	8.92685	13.6775	1.62485	0.41135	0.10284	0.18511	275	80	0.32	9.2	338	0.64	0.58	2.9	12.07	2.54	54	1.32	0.77	3.8						1.43		43.2	177	16.6	
NIC-M8	full Refs. provided in 1	Nicaragua	Nejapa	VI	50.9573	16.1078	12.5221	4.51116	10.3559	2.75881	0.69902	0.23301	0.23301	138	7.38	0.38	13.21	421.17	0.79	0.68	3.35	16.07	2.01	64.68	1.78	1.07	3.49	0.56	3.54	0.73	2.09	0.32	2	0.31	36.19	266.58	21.5	
NIC-M9	full Refs. provided in 1	Nicaragua	Nejapa	VI	53.5171	17.4336	9.83175	4.70302	9.9331	2.77721	0.6791	0.17231	0.18244	173	14.87	0.51	12.18	578.81	0.86	0.64	1.62	12.28	1.11	55.06	1.66	0.92	2.91	0.47	3.04	0.64	1.9	0.29	1.88	0.29	25.93	236.99	18.2	
NIC-AP3	full Refs. provided in 1	Nicaragua	Apoyo	VI	48.3773	15.7226	9.97783	8.65753	13.6061	2.08627	0.30236	0.09071	0.18142	225	84	0.05	12.2	205	0.33	0.21	29	11.86	1.53	65	1.39	0.94	2.83	3.1			1.56		1.44		44.4	320	17.4	
GM-92-4	full Refs. provided in 1	Nicaragua	Cerro Negro	VI	51.0403	16.3985	11.6532	4.98104	10.618	2.7365	1.0659	0.25623	0.22548	80	34	0.762	22.2	797	1.54	1.273	2.64	20	3.45	95.6	2.47	1.25	4.04	0.706	3.95	0.82	2.3	2.23	0.353	30.2	406	17.3		
NIC-GR010	full Refs. provided in 1	Nicaragua	Granada Antic	VI	47.5509	16.1776	8.8483	6.16418	10.8433	2.06418	0.30236	0.09071	0.18142	225	84	0.05	12.2	205	0.33	0.21	29	11.86	1.53	65	1.39	0.94	2.83	3.1			1.56		1.44		44.4	320	17.4	
NIC-GR3	full Refs. provided in 1	Nicaragua	Granada	VI	48.913	16.5056	11.2702	9.07583	12.1779																													

Supplementary Table 3

Sr, Pb and Nd isotope data for PI-VI samples

Notes for Supplementary Table 3

1. All Sr, Pb and Nd isotope values listed are 'initial'.
2. Various data are missing from some of the listed samples; for these data, we refer readers to the references listed.
3. The location of many (but not all) localities and/or units listed for various samples are shown in Fig. 2 of main text.
4. The datasets of Lissinna (2005), Hoernle et al. (2008) and Gazel et al. (2011) comprise overlapping PVa and PVb samples (i.e., samples with same sample number in each dataset).
5. On the PVI dataset sheet, the numbers in square brackets beside the GEOROC sample names represent references as listed at GEOROC.
6. On the PVI dataset sheet, the ages listed for the GEOROC samples are presumed to be 'assumed' as opposed to 'measured' but this is not certain; readers should consult GEOROC and the appropriate reference(s) listed therein.
7. Samples are listed geographically from west to east (NIC, CR, PAN) and thereafter, chronologically (i.e., from oldest to youngest publication data of dataset).
8. PVI samples from the CentAm & IBM Geochem Database Version 1.02 (as compiled by Jordan et al., 2012) were not plotted and are not listed (here).
9. If a particular descriptive quality is not provided for all samples of one particular sheet (Phase) (e.g., 'Material'), the qualifier and its column is not listed (i.e., no blank columns exist).
10. In some cases, the uncertainty of a measured age is not listed (by us) although it may in the particular dataset; for these data we refer readers to the appropriate reference(s).

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Supplementary Table S3

Phase I (75-39 Ma) $n = 23$

*Reference Key is provided at page bottom

Sample	*Reference	Region	Locality	Unit	Phase	Measured Age (Ma)	Age uncertainty (Ma)	Assumed Age (Ma)	Material	$^{87}\text{Sr}/^{86}\text{Sr}$	$^{143}\text{Nd}/^{144}\text{Nd}$	$^{206}\text{Pb}/^{204}\text{Pb}$	$^{207}\text{Pb}/^{204}\text{Pb}$	$^{208}\text{Pb}/^{204}\text{Pb}$
GO1	1	Costa Rica	Golfito	Golfito Arc	I			80			0.512944	18.57	15.54	38.198
GO2	1	Costa Rica	Golfito	Golfito Arc	I			80		0.704365	0.512922	18.765	15.552	38.325
GO4	1	Costa Rica	Golfito	Golfito Arc	I			80		0.705101	0.512959	18.697	15.543	38.315
AZ3-1	2	Panama	Soná-Azuero	Soná-Azuero Arc	I	60.9				0.703536	0.512897	18.63		38.28
AZ34-2	2	Panama	Soná-Azuero	Soná-Azuero Arc	I	52.3				0.703635	0.512882	18.75		38.47
CO-87-2	2	Panama	Soná-Azuero	Soná-Azuero Arc	I	54.3				0.703828	0.512955	18.88		38.56
M113KH	2	Panama	Soná-Azuero	Soná-Azuero Arc	I	40				0.703644	0.512951	18.72		38.38
M132aKH	2	Panama	Soná-Azuero	Soná-Azuero Arc	I	53.9				0.703692	0.512934			
PAN-05-008	3	Panama	Soná-Azuero	Soná-Azuero Arc	I	67.46	1.92		Amphibole	0.703923	0.512866	18.65	15.614	38.405
PAN-05-017	3	Panama	Soná-Azuero	Soná-Azuero Arc	I	72.34	2.5		Amphibole	0.703764	0.512864	18.528	15.57	38.113
PAN-03-004	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	61.49	2.32		Amphibole	0.703305	0.512939	18.981	15.68	38.665
PAN-03-007	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	49.38	1.04		Amphibole	0.703701	0.512855	18.972	15.568	38.677
PAN-03-14-1	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I				Amphibole	0.70354	0.512903	18.876	15.565	38.435
PAN-03-022	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	68.52	5.02		Amphibole	0.703819	0.512829	18.815	15.573	38.42
PAN-03-023	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	65.85	2.88		Amphibole	0.703726	0.512851	19.065	15.595	38.828
PAN-03-029	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	47.15	1.44		Amphibole	0.703679	0.512911	18.916	15.574	38.601
PAN-04-004	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	49.49	1.01		Amphibole	0.703612	0.512925	18.923	15.539	38.513
PAN-04-011	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	47.18	1.29		Amphibole	0.703567	0.512853	19.039	15.566	38.743
PAN-06-100	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	64.58	2.24		Amphibole	0.703382	0.512902	18.748	15.584	38.327
PAN-06-103	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	44.75	1.43		Amphibole	0.703542	0.512846	19.02	15.697	38.847
PAN-06-104	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I				Amphibole	0.70341	0.512925	18.979	15.596	38.585
PAN-06-206	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	49.9	2.16		Amphibole	0.703715	0.512902	18.778	15.59	38.499
PAN-06-210	3	Panama	Chagres-Bayano	Chagres-Bayano Arc	I	46.92	3.55		Amphibole	0.703773	0.512929	18.811	15.608	38.579

References Key

- 1 Hauff et al. (2000a)
- 2 Lissinna (2005)
- 3 Wegner et al. (2011)

Phase II (35-16 Ma) *n* = 26

*Reference Key is provided at page bottom

Sample	*Reference	Region	Locality	Unit	Phase	Measured Age (Ma)	Age uncertainty (Ma)	Material	⁸⁷ Sr/ ⁸⁶ Sr	¹⁴³ Nd/ ¹⁴⁴ Nd	²⁰⁶ Pb/ ²⁰⁴ Pb	²⁰⁷ Pb/ ²⁰⁴ Pb	²⁰⁸ Pb/ ²⁰⁴ Pb
P-125	1	Costa Rica	Trinidad		II				0.703501	0.512981	18.634	15.56	38.33
P-126*	1	Costa Rica	Trinidad		II	29.2	1.1		0.703507	0.512989	18.649	15.552	38.32
P-127*	1	Costa Rica	Trinidad		II	28.43	0.1		0.703604	0.512976	18.688	15.585	38.453
BT-020406-2	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II	22.2	1.15		0.703601	0.513018	18.596	15.515	38.2
IN-020506-2	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II				0.703552		18.614	15.512	38.217
IN-020506-6	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II				0.703557	0.512967	18.587	15.508	38.205
PS-020706-1	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II				0.703711		18.62	15.534	38.263
IN-020806-1	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II				0.703724		18.592	15.523	38.242
AR-020206-2	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II				0.703597	0.513003	18.581	15.56	38.259
AR-020206-3	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II				0.703563	0.513011	18.603	15.527	38.212
AR-020206-4	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II				0.703519	0.51304	18.555	15.535	38.214
AR-020206-6	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II				0.70358	0.513004	18.544	15.528	38.192
AR-020206-7	1	Costa Rica	Sarapiquí	Sarapiquí Arc	II				0.703563	0.512993	18.609	15.555	38.285
TC-10a	1	Costa Rica	Domincal		II	18.32	0.33		0.704518	0.513006	18.614	15.547	38.293
M46KH	2	Panama	central cordillera		II	16.7			0.703788	0.512962	18.82		38.48
M76aKH	2	Panama	central cordillera		II	32.4			0.70374	0.512944	18.84		38.52
M78aKH	2	Panama	central cordillera		II	16.5			0.703897	0.512963	18.85		38.54
M81aKH	2	Panama	central cordillera		II	17			0.703556	0.513	18.72		38.35
M84aKH	2	Panama	central cordillera		II	18.5			0.703765	0.512977	18.91		38.58
M136KH	2	Panama	central cordillera		II	20			0.703718	0.512995	18.9		38.61
M143aKH	2	Panama	central cordillera		II	20.1			0.703545	0.512944	19.07		38.72
CP98KH	2	Panama	central cordillera		II	34.4			0.703502	0.512949	18.77		38.42
M137aKH	2	Panama	eastern Panama		II	21			0.703714	0.512994	19.18		39
M210KH	2	Panama	eastern Panama		II	21.7			0.704358	0.51294	18.99		38.67
M212KH	2	Panama	eastern Panama		II	21.9			0.703704	0.513013	19.12		38.79
PAN-05-056	3	Panama	central cordillera	Cordilleran Arc	II	19.16	0.5	Feldspar	0.703413	0.513	19.033	15.644	38.826

References Key

- 1 Gazel et al. (2009)
- 2 Lissinna (2005)
- 3 Wegner et al. (2011)

Phase II (16-6 Ma) n = 28

*Reference Key is provided at page bottom

	*Reference	Region	Locality	Unit	Phase	Measured Age (Ma)	Age uncertainty (Ma)	Material	⁸⁷ Sr/ ⁸⁶ Sr	¹⁴³ Nd/ ¹⁴² Nd	¹⁷⁶ Yb/ ¹⁷⁴ Yb	¹⁸⁷ Sm/ ¹⁴⁷ Sm	¹⁰⁷ Pb/ ²⁰⁶ Pb	²⁰⁷ Pb/ ²⁰⁶ Pb	²³⁵ U/ ²³⁸ U	Rb	Ba	Th	U	Cs	Nb	Ta	La	Ce	Pb	P	Nd	Sr	Sm	Hf	Zr	Eu	Gd	Tb	Dy	Ho	Y	Er	Tm	Yb	Lu	Sc	V						
CH-020406-2	1	Costa Rica	Sarapiquí	III					0.703560	0.513005	18.4265	15.524	38.201	27.26	729	2.96	1.14	0.12	4.43	0.25	18.01	34.96	3.81	4.54	17.92	1056	3.36	2.14	84	0.98	2.73	0.36	1.96	0.38	12	1.03	0.14	0.94	0.14	14	170								
CH-020406-5	1	Costa Rica	Sarapiquí	III					0.703701	0.513005	18.468	15.553	38.352	33	633	1.95	0.83	0.44	12.4	0.5	21.15	44.54	4.02	6.22	27.1	289	6.61	5.12	231	1.8	7.17	1.15	7.04	1.48	43	4.35	0.6	3.99	0.61	35	322								
TA-021206-4	1	Costa Rica	Talamanca	III					0.703848	0.512998	18.827	15.592	38.22	4	287	0.81	0.39	0.05	4.43	0.2	9.67	19.88	2	2.78	12.05	450	2.99	2.41	102	0.99	3.24	0.52	3.2	0.67	18	1.93	0.27	1.8	0.28	22	190								
TC-1**	1	Costa Rica	Talamanca	III		11.98	0.06		0.704162	0.513022	18.882	15.536	38.332	21.86	488	1.49	0.66	0.14	5.4	0.3	11.45	24.77	2.23	3.31	14.23	453	3.54	3.27	131	1.05	3.82	0.63	3.95	0.83	23	2.49	0.36	2.59	0.4	20	160								
TC-2**	1	Costa Rica	Talamanca	III		13.8	0.9		0.703856	0.512997	18.399	15.537	38.265	11.96	371	1.02	0.35	0.07	4.31	0.2	10.54	20.26	1.89	2.68	11.09	486	2.49	2.14	88	0.86	2.51	0.39	2.36	0.48	14	1.38	0.19	1.32	0.21	17	150								
TC-4**	1	Costa Rica	Talamanca	III		14.1	0.15		0.703744	0.512995	18.8	15.549	38.475	66.15	1281	4.08	1.1	0.88	9.69	0.49	14.05	26.74	6.5	3.55	13.85	350	2.95	2.59	89	0.78	2.99	0.46	2.83	0.61	17	1.86	0.27	1.96	0.3	7	74								
TC-9**	1	Costa Rica	Talamanca	III		11.76	0.12		0.704008	0.512993	18.739	15.539	38.38	82.61	1258	3.18	1.09	0.97	11.31	0.66	16.97	32.43	7.21	4.19	16.51	248	3.4	3.15	105	0.79	3.27	0.51	3.26	0.69	19	2.15	0.33	2.16	0.35	7	58								
EG-1**	1	Costa Rica	Talamanca	III					0.703839	0.512975	18.424	15.528	38.243	65.52	1377	4.21	1.6	0.39	7.81	0.43	17.99	34.57	4.62	4.29	16.7	369	3.55	3.9	167	0.94	3.56	0.56	3.43	0.74	21	2.26	0.34	2.3	0.37	9	61								
CA-021106-1	1	Costa Rica	Aguacate	Aguacate Arc	III	10.9	0.1		0.703708	0.513008	18.758	15.539	38.395	18.65	546	1.82	0.51	0.17	4.71	0.3	11.88	20.44	2.23	3.99	13.26	380	2.85	2.78	93	0.87	3.12	0.49	3.2	0.7	23	2.15	0.31	2.03	0.33	13	128								
CA-021106-2	1	Costa Rica	Aguacate	Aguacate Arc	III	11.35	0.1		0.703747	0.513008	18.687	15.531	38.291	69.23	1689	4.96	1.17	1.1	8.49	0.5	20.2	35.13	6.72	4.23	15.85	393	2.84	1.21	41	1.02	2.64	0.37	2.25	0.46	13	1.26	0.19	1.28	0.19	8	86								
M38H	2	Panama	Central Cordillera	III		7.4			0.703736	0.512968	18		38.45	10	864	0.6			8		10.9	20.2			16.1	723	3.7		88	1.19	3.6	0.5	3.6	0.67	18	1.9	0.2	2	0.29										
M42H	2	Panama	Central Cordillera	III		10.9			0.703722	0.512968	18.83		38.5	45	880	2.7	1				30			15.8	32.5			17.7	534	3.7		130	1.07	3.6	0.5	3.2	0.65	22	1.8	0.2	1.9	0.28							
M54H	2	Panama	Central Cordillera	III		14.4			0.703886	0.512969	18.79		38.42	28	160																																		
M50AH	2	Panama	Central Cordillera	III		14.5			0.703881	0.512966	18.79		38.44	92	1300	4.4	1.6				12			20.1	35			17.4	284	3.2		101	0.76	2.6	0.4	3	0.59	24	1.8	0.2	2	0.29							
M17H	2	Panama	Central Cordillera	III		10			0.70388	0.512977	18.81		38.44	46	862	2.7	1.2				11			17.2	35.8			15.9	365	3.4		146	1.08																
M122AH	2	Panama	Central Cordillera	III		9			0.703695	0.512977	18.83		38.51	80.81	1812	6.3	2.14				14.45	0.86	46	91.7	8.2	12.05	48.18	824	9.79	5.47	197	2.56	9.14	1.28	7.46	1.49	37	4.16	0.61	4.15	0.64								
M124AH	2	Panama	Central Cordillera	III		8.7			0.70388	0.512962	18.95		38.61	59.39	1344	6.49	2.28				11.82	0.73	41.11	81.1	17	10.45	41.27	1404	7.87	5.03	178	2.23	7.07	0.94	5.21	1.02	26	2.78	0.4	2.69	0.41								
M155AH	2	Panama	Eastern Panama	III		12.6			0.703842		19.09		38.77	50.21	1387	6.41	2.79				15.68	1.09	50.47	93.43	7.3	11.14	45.44	1191	6.79	4.61	150	1.79	5.38	0.63	3.03	0.54	14	1.4	0.18	1.21	0.17								
M157AH	2	Panama	Eastern Panama	III		12.4			0.703776	0.512982	19.07		38.75	6.72	274	1.08	0.41				6.4	0.46	12.94	27.79	1.76	3.91	17.29	468	4.35	3.61	113	1.51	4.85	0.8	5.08	1.04	29	2.95	0.44	2.94	0.45								
PAN-06-219	3	Panama		III				Amphibole	0.703572	0.512999	19.02	15.605	38.697																																				
PAN-06-032	3	Panama		III		14.68	0.45	Amphibole	0.703876	0.512982	19.118	15.569	38.803																																				
PAN-06-023	3	Panama		III		7.51	0.25	Amphibole	0.703952	0.512999	18.382	15.622	38.864																																				
PAN-06-041	3	Panama		III		14.17	0.42	Matrix	0.70403	0.512971	18.787	15.593	38.552																																				
PAN-06-058	3	Panama		III		6.78	0.14	Amphibole	0.703649	0.5131	19.037	15.607	38.758																																				
PAN-06-125	3	Panama		III		7.1	0.05	Feldspar	0.703665	0.51296	19.021	15.572	38.696																																				
PAN-06-131	3	Panama		III		8.74	0.25	Amphibole	0.703761	0.512963	18.994	15.594	38.72																																				
PAN-06-185a	3	Panama		III		8.62	0.1	Feldspar	0.703769	0.512955	19.075	15.647	38.304																																				
PAN-06-218	3	Panama		III		10.72	0.11	Feldspar	0.703591	0.512985	18.96	15.623	38.77																																				

References Key	
1	Gardel et al. (2008)
2	Ussama (2007)
3	Werner et al. (2011)

Phase IV (6-3 Ma) $n = 16$

*Reference Key is provided at page bottom

Sample	*Reference	Region	Locality	Unit/Volcano	Phase	Measured Age (Ma)	Age uncertainty (Ma)	$^{87}\text{Sr}/^{86}\text{Sr}$	$^{143}\text{Nd}/^{144}\text{Nd}$	$^{206}\text{Pb}/^{204}\text{Pb}$	$^{207}\text{Pb}/^{204}\text{Pb}$	$^{208}\text{Pb}/^{204}\text{Pb}$
GE-021306-4	1	Costa Rica	Paso Real		IV	3.59	0.06	0.703775	0.512977	19.098	15.575	38.801
GE-021306-8	1	Costa Rica	Paso Real		IV			0.703734	0.512983	18.956	15.519	38.649
GE-021306-9	1	Costa Rica	Paso Real		IV			0.703511	0.512964	19.03	15.574	38.765
CA-021106-5	1	Costa Rica	Aguacate	Aguacate Arc	IV	5.1	0.1	0.703911	0.512951	18.861	15.527	38.541
CA-021106-6	1	Costa Rica	Aguacate	Aguacate Arc	IV	4.04	0.04	0.703943	0.512996	18.916	15.547	38.629
CA-021106-7	1	Costa Rica	Aguacate	Aguacate Arc	IV			0.703866	0.512968	18.903	15.536	38.583
CA-021106-8	1	Costa Rica	Aguacate	Aguacate Arc	IV					19.085	15.573	38.817
LG-040105-1	1	Costa Rica	Aguacate	Aguacate Arc	IV			0.70404	0.512986			
CC-2	1	Costa Rica	Aguacate	Aguacate Arc	IV			0.703811	0.512979	19.113	15.571	38.858
LC-1	1	Costa Rica	Aguacate	Aguacate Arc	IV			0.703913	0.512959	18.911	15.534	38.637
P-95	1	Costa Rica	Aguacate	Aguacate Arc	IV	6.47	0.21	0.703743	0.512985	18.86	15.556	38.564
D68	2	Costa Rica	Central CR, BVF	Victoria Dikes	IV			0.704119	0.512966	19.048	15.569	38.738
CR271	2	Costa Rica	Central CR, BVF	Victoria Dikes	IV			0.703914	0.512975	19.048	15.571	38.746
AM-081906-1	2	Costa Rica	Central CR, BVF	Victoria Dikes	IV			0.703744	0.512954	19.122	15.579	38.8
P-145	2	Costa Rica	Central CR, BVF	Guayacan	IV			0.70345	0.51298	19.051	15.562	38.684
P-163B	2	Costa Rica	NE CR, BVF	Azules (Lomas Azules)	IV	3.25	0.21	0.70369	0.512978	19.061	15.559	38.704

References Key

- 1 Gazel et al. (2009)
- 2 Gazel et al. (2011)

Abbreviations

BVF Behind Volcanic Front (if not otherwise indicated, sample is from Volcanic Front)
(for other abbreviations consult relevant reference)

Phase Va (5.90-0.01 Ma) n = 39

*Reference Key is provided at page bottom

Sample	*Reference	Region	Broad Locality	Specific Locality	Phase	Measured Age (Ma)	Assumed Age (Ma)	87Sr/86Sr	143Nd/144Nd	206Pb/204Pb	207Pb/204Pb	208Pb/204Pb
P-145	1	Costa Rica	Southern CR, BVF	Siquirres	Va		<5		0.512980	19.04	15.555	38.673
P-163B	1	Costa Rica	Southern CR, BVF	Lomas Azules	Va		<5		0.512978	19.05	15.552	38.692
P-164	1	Costa Rica	Southern CR, BVF	Lomas Azules	Va		<5		0.512976	19.036	15.558	38.679
CR-85	1	Costa Rica	Central CR, BVF	C. Mercedes	Va		≤2		0.512918	19.225	15.564	38.993
P-152	1	Costa Rica	Central CR, BVF	Aquas Zarcas Buenos Aires	Va		≤2		0.512925	19.277	15.569	39.096
P-153	1	Costa Rica	Central CR, BVF	AZ Juan Murillo	Va		≤2		0.512940	19.173	15.57	38.893
P-154B	1	Costa Rica	Central CR, BVF	AZ Pital	Va		≤2		0.512964	19.082	15.556	38.747
P-155A	1	Costa Rica	Central CR, BVF	AZ C. Chiles	Va		≤2		0.512968	19.074	15.569	38.785
P-130A	1	Costa Rica	Central CR, BVF	Rio Colorado	Va		≤2		0.512971	19.16	15.58	38.846
P-128	1	Costa Rica	Central CR, BVF	Rio San Juan	Va		≤2		0.512955	19.099	15.567	38.782
P-129	1	Costa Rica	Central CR, BVF	Rio San Juan	Va		≤2		0.512961	19.14	15.564	38.83
P-138	1	Costa Rica	Central CR, BVF	Puerto Lindo	Va		≤2		0.512978	19.016	15.563	38.702
P-132B	1	Costa Rica	Central CR, BVF	Tortugero	Va		≤2		0.512956	19.189	15.583	38.911
P-133	1	Costa Rica	Central CR, BVF	Tortugero	Va		≤2		0.512957	19.177	15.566	38.869
3-12-4-03	2	Panama			Va	1		0.703547	0.512978	19.1		38.77
CP97-1	2	Panama			Va	0.7		0.703545	0.512993	19.04		38.68
SO96-1	2	Panama			Va	1.3		0.703501	0.512994	19.07		38.69
M36KH	2	Panama			Va	4.5		0.703484	0.512992	19.02		38.63
M37KH	2	Panama			Va	4.5		0.703489	0.512999	19.03		38.64
M105KH	2	Panama			Va	1.4		0.703474	0.512989	19.06		38.7
M118aKH	2	Panama			Va	1.4		0.703505	0.512983	19.04		38.69
M121aKH	2	Panama			Va	4.5		0.703521	0.512984	19.06		38.7
3-12-4-03	1	Panama	Island west of Sona		Va		<5		0.512983	19.11	15.572	38.776
CP97-1	1	Panama		Chiriquí	Va		<5		0.512997	19.045	15.54	38.648
SO96-1	1	Panama	Sona		Va		<5		0.512999	19.073	15.559	38.698
M36KH	1	Panama	West of Sona		Va		<5		0.512999	19.07	15.567	38.715
M37KH	1	Panama	West of Sona		Va		<5		0.513005	19.052	15.553	38.665
M105 KH	1	Panama	Sona		Va		<5		0.512995	19.063	15.562	38.705
M 118aKH	1	Panama	Sona		Va		<5		0.512989	19.051	15.561	38.697
M121aKH	1	Panama	Sona		Va		<5		0.512990	19.079	15.565	38.731
SO96-1	3	Panama			Va			0.703495	0.512999	19.084	15.566	38.709
CP97-1	3	Panama			Va			0.703538	0.512997	19.056	15.548	38.659
M36KH	3	Panama			Va			0.70348	0.512999	19.081	15.574	38.726
M37KH	3	Panama			Va			0.703485	0.513005	19.063	15.56	38.677
M99a KH	3	Panama			Va			0.703533	0.513006	19.08	15.564	38.708
M105 KH	3	Panama			Va			0.703468	0.512995	19.075	15.569	38.716
M 118aKH	3	Panama			Va			0.703499	0.512989	19.062	15.568	38.708
M121aKH	3	Panama			Va			0.703516	0.51299	19.09	15.572	38.743
3-12-4-03	3	Panama			Va			0.70354	0.512983	19.121	15.579	38.787

References Key

- 1
- Hoernle et. al. (2008)
- 2
- Lissinna (2005)
- 3
- Gazel et al. (2011)

Abbreviations

BVF Behind Volcanic Front
(for other abbreviations consult relevant reference)

Phase Vb (4.20-0.15) Ma) *n* = 39

*Reference Key is provided at page bottom

Sample	*Reference	Region	Broad Locality	Specific Locality	Phase	Measured Age (Ma)	Assumed Age (Ma)	Material	⁸⁷ Sr/ ⁸⁶ Sr	¹⁴³ Nd/ ¹⁴⁴ Nd	²⁰⁶ Pb/ ²⁰⁴ Pb	²⁰⁷ Pb/ ²⁰⁴ Pb	²⁰⁸ Pb/ ²⁰⁴ Pb
TC-3	1	Costa Rica	Southern CR	Talamanca	Vb		Pliocene-Quaternary			0.512981	19.006	15.544	38.663
TC-5A	1	Costa Rica	Southern CR	Talamanca	Vb		Pliocene-Quaternary			0.512973	19.145	15.566	38.782
TC-6A	1	Costa Rica	Southern CR	Talamanca	Vb		Pliocene-Quaternary			0.512979	19.103	15.56	38.727
TC-7	1	Costa Rica	Southern CR	Talamanca	Vb		Pliocene-Quaternary			0.51298	19.095	15.56	38.734
TC-8	1	Costa Rica	Southern CR	Talamanca	Vb		Pliocene-Quaternary			0.512937	19.322	15.571	38.958
TC-3	2	Costa Rica	Southern CR	Talamanca	Vb				0.703667	0.512981	19.017	15.551	38.674
TC-5A	2	Costa Rica	Southern CR	Talamanca	Vb				0.703509	0.512973	19.156	15.573	38.793
TC-6A	2	Costa Rica	Southern CR	Talamanca	Vb				0.703481	0.512979	19.114	15.567	38.738
TC-6b	2	Costa Rica	Southern CR	Talamanca	Vb						19.106	15.567	38.745
TC-7	2	Costa Rica	Southern CR	Talamanca	Vb				0.703501	0.51298	19.106	15.567	38.745
TC-8	2	Costa Rica	Southern CR	Talamanca	Vb				0.703347	0.512937	19.333	15.578	38.969
M44KH	1	Panama		Barva	Vb		<1			0.512989	19.202	15.574	38.875
M53KH	1	Panama		Barva	Vb		<1			0.512948	19.324	15.577	38.991
M55KH	1	Panama		Barva	Vb		<1			0.512968	19.191	15.575	38.869
M57aKH	1	Panama		Tizingal Volcanic Complex	Vb		<1			0.512993	19.119	15.561	38.77
M64c KH	1	Panama		Burica	Vb		<1			0.512965	19.296	15.58	38.98
M65a KH	1	Panama		Chiriquí	Vb		<1			0.51297	19.263	15.572	38.925
M99a KH	1	Panama			Vb					0.513006	19.069	15.557	38.697
M53KH	3	Panama			Vb	1.0			0.703411	0.512946	19.32		38.99
M44KH	3	Panama			Vb	1.0			0.703552	0.512986	19.2		38.87
M55KH	3	Panama			Vb	1.0			0.703472	0.512964	19.19		38.86
M57aKH	3	Panama			Vb	1.0			0.703574	0.512989	19.12		38.77
M64cKH	3	Panama			Vb	1.0			0.70336	0.512961	19.29		38.98
M65aKH	3	Panama			Vb	0.1			0.70336	0.512965	19.26		38.92
M99aKH	3	Panama			Vb	1.0			0.703541	0.513002	19.07		38.69
PAN-05-047	4	Panama			Vb	0.26		Amphibole	0.703677	0.512963	19.126	15.661	38.964
PAN-05-049	4	Panama			Vb	0.46		Amphibole	0.70379	0.512973	19.081	15.612	38.82
PAN-06-006	4	Panama			Vb	1.32		Amphibole	0.703516	0.512963	19.27	15.685	39.133
PAN-06-010	4	Panama			Vb	1.49		Amphibole	0.703528	0.512979	19.139	15.568	38.823
PAN-06-014	4	Panama			Vb	0.63		Amphibole	0.703633	0.51296	19.138	15.613	38.912
PAN-06-043	4	Panama			Vb	0.82		Amphibole	0.703577	0.513001	19.151	15.624	38.897
PAN-06-044	4	Panama			Vb	0.92		Amphibole	0.703645	0.512983	18.955	15.62	38.737
PAN-06-073	4	Panama			Vb	1.37		Amphibole	0.704248	0.513007	19.049	15.584	38.738
PAN-06-136	4	Panama			Vb	0.32		Amphibole	0.703336	0.512955	19.324	15.598	39.066
PAN-06-165	4	Panama			Vb			Amphibole	0.704103	0.512981	19.289	15.716	39.235
PAN-06-166	4	Panama			Vb	0.18		Amphibole	0.703389	0.512964	18.892	15.604	38.687
PAN-06-168	4	Panama			Vb	0.19		Amphibole	0.70359	0.513016	19.138	15.575	38.804
PAN-06-176	4	Panama			Vb	0.48		Amphibole	0.7036	0.512962	19.212	15.625	38.988
PAN-06-177	4	Panama			Vb			Amphibole	0.703389	0.512951	19.342	15.608	39.076

References Key

- 1 Hoernle et al. (2008)
- 2 Gazel et al. (2011)
- 3 Lissinna (2005)
- 4 Wegner et al. (2011)

Phase VI (2.6-0 Ma)

n = 149

*Reference Key is provided at page bottom

Sample	*Reference	Region	Broad Locality	Specific Locality	Volcano/Rock Unit	Phase	Measured Age (Ma)	Age uncertainty (Ma)	Assumed Age (Ma)	Rock Type	Material	87Sr/86Sr	143Nd/144Nd	206Pb/204Pb	207Pb/204Pb	208Pb/204Pb		
s MS-1 [4789]	1	Nicaragua	SW NIC VF	Masaya	Masaya Tuff	VI			Quaternary [4789]	Basalt	Whole-rock	0.704157						
s MA-70 [4789]	1	Nicaragua	SW NIC VF	Masaya	Masaya Tuff	VI			0.704216	Basalt	Whole-rock	0.703976						
s LM-10 [4789]	1	Nicaragua	SW NIC VF	Masaya	Masaya Tuff	VI			0.704121	Basalt	Whole-rock	0.703862	0.513024					
s MS-14 [4789]	1	Nicaragua	SW NIC VF	Masaya	Masaya Tuff	VI			Quaternary [4789]	Basalt	Whole-rock	0.704207	0.513067					
s MS-11 [4789]	1	Nicaragua	SW NIC VF	Masaya	Masaya Tuff	VI			Quaternary [4789]	Basalt	Whole-rock	0.704186						
s SC2 [3918] / s NISC2 [3439]	1	Nicaragua	NW NIC VF	San Cristobal		VI			Prehistoric [3918]	Basalt	Whole-rock	0.70406	0.51308					
s NIE02 [4224] / s NINE202 [4092] / s NE-202 [4190]	1	Nicaragua	NW NIC VF	Nejapa		VI			0.703976	Basalt	Whole-rock	0.703976	0.513088	18.638	15.529	38.192		
s NE203 [4224] / s NINE203 [4092] / s NE-203 [4190]	1	Nicaragua	NW NIC VF	Nejapa		VI			Prehistoric [2492]	Basalt	Whole-rock	0.703852	0.51299	18.61	15.54	38.24		
s CH-011507-1 [14915]	1	Nicaragua	Eastern NIC BVF	Cukra Hill		VI			Pleistocene [14915]	Basalt (Alkaline)	Whole-rock	0.703163	0.513018	18.988	15.567	38.684		
s CH-011507-9 [14915]	1	Nicaragua	Eastern NIC BVF	Cukra Hill		VI			0.703351	Basalt (Alkaline)	Whole-rock	0.703351	0.512986	18.948	15.569	38.599		
s CH-011507-9 [14915]	1	Nicaragua	Eastern NIC BVF	Cukra Hill		VI			Pleistocene [14915]	Basalt (Alkaline)	Whole-rock	0.703323	0.51303	18.956	15.567	38.643		
P-58A	2	Nicaragua	NW NIC VF	Coiguilina		VI			0.513068			18.464	15.518	38.091				
P-60	2	Nicaragua	NW NIC VF	Coiguilina		VI			0.513084			18.425	15.507	38.023				
P-27A	2	Nicaragua	NW NIC VF	San Cristobal		VI			0.513061			18.475	15.519	38.099				
P-13	2	Nicaragua	NW NIC VF	Casitas		VI			0.513057			18.483	15.533	38.14				
P2-16	2	Nicaragua	NW NIC VF	Telica		VI			0.51305			18.506	15.515	38.118				
P-7A	2	Nicaragua	NW NIC VF	Telica		VI			0.51306			18.513	15.52	38.139				
P-9	2	Nicaragua	NW NIC VF	Telica		VI			0.513042			18.532	15.534	38.188				
P-43	2	Nicaragua	NW NIC VF	Cone3		VI			0.513051			18.554	15.521	38.18				
P-51	2	Nicaragua	NW NIC VF	Cone2		VI			0.513067			18.481	15.52	38.114				
P-56G	2	Nicaragua	NW NIC VF	C. Las Palmitas		VI			0.513073			18.493	15.525	38.131				
P-4	2	Nicaragua	NW NIC VF	C. Negro		VI			0.513078			18.557	15.529	38.205				
P-6	2	Nicaragua	NW NIC VF	C. Negro		VI			0.513066			18.546	15.529	38.195				
P2-3a	2	Nicaragua	NW NIC VF	C. Negro		VI			0.513071									
P2-3b	2	Nicaragua	NW NIC VF	C. Negro		VI			0.513072			18.538	15.522	38.171				
P2-3d	2	Nicaragua	NW NIC VF	C. Negro		VI			0.513074			18.533	15.526	38.172				
P2-11	2	Nicaragua	NW NIC VF	C. Negro		VI			0.513072			18.549	15.523	38.184				
P2-13	2	Nicaragua	NW NIC VF	C. Negro		VI			0.513077			18.555	15.53	38.205				
P-50	2	Nicaragua	NW NIC VF	C. Diablo		VI			0.513057			18.48	15.519	38.107				
P-19	2	Nicaragua	NW NIC VF	Las Pilas		VI			0.513055			18.514	15.518	38.133				
P-40A	2	Nicaragua	NW NIC VF	Cabeza de Vaca		VI			0.513084			18.532	15.526	38.175				
P-42	2	Nicaragua	NW NIC VF	Cabeza de Vaca		VI			0.513067			18.549	15.526	38.187				
P-23	2	Nicaragua	NW NIC VF	Ojo de Agua		VI			0.513063			18.537	15.52	38.157				
P-46A	2	Nicaragua	NW NIC VF	Laguna Asos		VI			0.513065			18.55	15.523	38.18				
P-47A	2	Nicaragua	NW NIC VF	C. Buena vista		VI			0.513063			18.548	15.521	38.176				
P-48B	2	Nicaragua	NW NIC VF	Cone4		VI			0.513065			18.552	15.525	38.188				
P-32	2	Nicaragua	NW NIC VF	Momotombo		VI			0.513071			18.557	15.527	38.202				
P-34	2	Nicaragua	NW NIC VF	Momotombo		VI			0.513073			18.564	15.533	38.217				
P2-32d	2	Nicaragua	SW NIC VF	Nejapa	Nejapa Crater	VI			0.513024			18.472	15.525	38.111				
P2-53	2	Nicaragua	SW NIC VF	Nejapa	Nejapa Crater	VI			18.599			15.52	38.215					
P-68B	2	Nicaragua	SW NIC VF	Masaya		VI			0.513061			18.603	15.53	38.251				
P-72A	2	Nicaragua	SW NIC VF	Masaya		VI			0.513059									
P2-47	2	Nicaragua	SW NIC VF	Masaya		VI			0.513055			18.597	15.528	38.244				
P-63	2	Nicaragua	SW NIC VF	Cone near Mombacho		VI			0.513024			18.628	15.526	38.26				
P2-58	2	Nicaragua	SW NIC VF	Cone near Mombacho		VI			0.513015			18.567	15.526	38.211				
P-86A	2	Nicaragua	SW NIC VF	Concepcion		VI			0.513004			18.652	15.529	38.295				
P-80A	2	Nicaragua	SW NIC VF	Maderas		VI			0.513018			18.663	15.528	38.323				
AZUL-2	3	Nicaragua	Eastern NIC	Pearl Lagoon	Volcan Blue Cinder Cone	VI			0.703457			0.513004	18.948	15.56	38.601			
AZUL-5	3	Nicaragua	Eastern NIC	Pearl Lagoon	Volcan Blue Cinder Cone	VI			0.703146			0.513024	18.985	15.556	38.634			
CH-011507-1	3	Nicaragua	Eastern NIC	Cukra Hill		VI			0.703163			0.513018	18.988	15.567	38.684			
CH-011507-7	3	Nicaragua	Eastern NIC	Cukra Hill		VI			0.703351			0.512986	18.948	15.569	38.599			
CH-011507-9	3	Nicaragua	Eastern NIC	Cukra Hill		VI			0.703223			0.51303	18.956	15.567	38.643			
NIC-C59A	4	Nicaragua	NW NIC VF			VI			0.70399			0.51311	18.5	15.54	38.2			
NIC-CN-1	4	Nicaragua	NW NIC VF			VI			0.70397			0.51311			38.182			
NIC-CN10	4	Nicaragua	NW NIC VF			VI			0.70392			0.51309	18.558	15.525	38.187			
NIC-MT101	4	Nicaragua	NW NIC VF			VI			0.70405			0.513027	18.6	15.55	38.31			
NIC-NE202	4	Nicaragua	NW NIC VF			VI			0.703976			0.51308	18.638	15.529	38.192			
NIC-NE203	4	Nicaragua	NW NIC VF			VI			0.703862			0.51299	18.61	15.54	38.24			
NIC-NE3	4	Nicaragua	NW NIC VF			VI			0.70393			0.51305	18.585	15.521	38.207			
NIC-NE6	4	Nicaragua	NW NIC VF			VI			0.70405			0.51307	18.555	15.507	38.148			
NIC-AP3	4	Nicaragua	SW NIC VF			VI			0.70394			0.51305						
NIC-TE1	4	Nicaragua	NW NIC VF			VI			0.70402			0.51309	18.526	15.542	38.178			
NIC-TE11A	4	Nicaragua	NW NIC VF			VI			0.70391									
NIC-TE3	4	Nicaragua	NW NIC VF			VI			0.70408			0.51306						
NIC-TE-6	4	Nicaragua	NW NIC VF			VI			0.70391			0.51303	18.53	15.52	38.16			
NIC-MS4	4	Nicaragua	NW NIC VF			VI			0.70419				18.63	15.53	38.24			
NIC-CR01	4	Nicaragua	NW NIC VF			VI			0.70403			0.51307						
s ARB2 [9608] / s CHARB2 [4092] / s AR-82 [4190]	1	Costa Rica	NW CR VF	Arenal		VI			0.70389			0.51302	18.953	15.547	38.629			
s ET6 [6310]	1	Costa Rica	NW CR VF	Arenal		VI			RECENT [9608]	Basaltic Andesite	Whole-rock	0.70389						
s P-152 [14915]	1	Costa Rica	NW CR VF	Aguas Zarcas Buenos Aires		VI			PREHISTORIC [6310]	Basalt	Whole-rock	0.703814	0.513014					
s P-153 [14915]	1	Costa Rica	NW CR VF	Az Juan Murillo		VI			PLIOCENE [14915]	Basalt (Alkaline)	Whole-rock	0.703532	0.512922	19.288	15.576	39.107		
s P-154B [14915]	1	Costa Rica	NW CR VF	Az Pital		VI			PLIOCENE [14915]	Basalt (Alkaline)	Whole-rock	0.703542	0.51294	19.184	15.577	38.904		
s P-155A [14915]	1	Costa Rica	NW CR VF	Az C. Chiles		VI			0.7036			0.512964	19.093	15.564	38.758			
s P-130A [14915]	1	Costa Rica	NW CR BVF	Rio Colorado		VI			PLIOCENE [14915]	Basalt (Alkaline)	Whole-rock	0.703653	0.512968	19.085	15.577	38.796		
s P-128 [14915]	1	Costa Rica	NW CR BVF	Rio San Juan		VI			PLIOCENE [14915]	Basalt (Alkaline)	Whole-rock	0.703623	0.512971	19.171	15.587	38.857		
s P-129 [14915]	1	Costa Rica	NW CR BVF	Rio San Juan		VI			PLIOCENE [14915]	Basalt (Alkaline)	Whole-rock	0.703807	0.512955	19.11	15.575	38.793		
s P-138 [14915]	1	Costa Rica	NW CR BVF	Puerto Limbo		VI			PLIOCENE [14915]	Basalt (Alkaline)	Whole-rock	0.703497	0.512961	19.151	15.571	38.842		
s P-130 [14915]	1	Costa Rica	NW CR BVF	Tortugero		VI			0.703623			0.512978	19.028	15.571	38.713			
s P-133 [14915]	1	Costa Rica	NW CR BVF	Tortugero		VI			PLIOCENE [14915]	Basalt (Alkaline)	Whole-rock	0.703674	0.512948	19.201	15.593	38.922		
s P-145 [14915]	1	Costa Rica	NW CR BVF	Siquirres		VI			PLIOCENE [14915]	Basalt (Alkaline)	Whole-rock	0.703673	0.512957	19.188	15.573	38.88		
s P-163B [14915]	1	Costa Rica	NW CR BVF	Lomas Azules		VI			PLIOCENE [14915] / NEOGENE [11572]	Basalt (Alkaline)	Whole-rock	0.70345	0.51298	19.051	15.562	38.684		
s P-164 [14915]	1	Costa Rica	NW CR BVF	Lomas Azules		VI			PLIOCENE [14915] / NEOGENE [11572]	Basalt (Alkaline)	Whole-rock	0.70369	0.512978	19.061	15.559	38.704		
CR-44	2	Costa Rica	NW CR VF	Orosi		VI			0.703591			0.512976	19.047	15.565	38.69			
CR-35	2	Costa Rica	NW CR VF	Rincon		VI			0.513054			18.683	15.528					
CR-56	2	Costa Rica	NW CR VF	Rincon		VI			0.513031			18.714	15.536	38.378				
P2-118	2	Costa Rica	NW CR VF	Miravalles		VI			0.513027			18.714	15.53	38.367				
CR-30	2	Costa Rica	NW CR VF	Canas		VI			0.513025			18.777	15.539	38.447				
CR-51B	2	Costa Rica	NW CR VF	Monteverde		VI			0.513001			18.882	15.54	38.546				
CR-55	2	Costa Rica	NW CR VF	Monteverde		VI			0.513007			18.897	15.539	38.578				
CR-58	2	Costa Rica	NW CR VF	Arenal		VI			0.512969			19.052	15.554	38.791				
CR-61B	2	Costa Rica	NW CR VF	Arenal		VI			0.513025			18.903	15.54	38.583				
CR-61C	2	Costa Rica	NW CR VF	Arenal		VI			0.51301			18.976						

P-124	2	Costa Rica	Central CR VF	Bosque Alegre	VI			0.512966	19.182	15.577	38.981
P-151D	2	Costa Rica	Central CR VF	Platanar	VI			0.512958	19.198	15.565	38.966
P-119A	2	Costa Rica	Central CR VF	Chococuella	VI			0.512948	19.171	15.557	38.908
P-169	2	Costa Rica	Central CR VF	Povenir	VI			0.512967	19.174	15.565	38.94
P-109	2	Costa Rica	Central CR VF	Polás	VI			0.512979	19.141	15.564	38.899
P-112	2	Costa Rica	Central CR VF	Redonda cone 2	VI			0.51296	19.173	15.567	38.879
P-113	2	Costa Rica	Central CR VF	Redonda cone 3	VI			0.512967	19.172	15.562	38.926
P-171	2	Costa Rica	Central CR VF	Barva	VI			0.512959	19.111	15.562	38.832
P-102C	2	Costa Rica	Central CR VF	Zurque	VI			0.512971	19.093	15.562	38.79
P-139	2	Costa Rica	Central CR VF	Cone Oratorio	VI			0.512957	19.114	15.57	38.833
P-140	2	Costa Rica	Central CR VF	Cone Boqueron	VI			0.512955	19.115	15.571	38.834
P-143	2	Costa Rica	Central CR VF	Cerro Pasiquí	VI			0.512958	19.104	15.567	38.814
P-160A	2	Costa Rica	Central CR VF	Irazú	VI			0.512956	19.108	15.565	38.809
P-162	2	Costa Rica	Central CR VF	Irazú	VI			0.512961	19.1	15.566	38.804
P2-72	2	Costa Rica	Central CR VF	Irazú	VI			0.512958	19.093	15.558	38.779
P-96	2	Costa Rica	Central CR VF	Forearc Flow	VI			0.512944	19.143	15.562	38.877
P-97A	2	Costa Rica	Central CR VF	Turrialba	VI			0.512962	19.08	15.563	38.769
P-149A	2	Costa Rica	Central CR VF	Turrialba	VI			0.512944	19.144	15.56	38.88
P-130A	3	Costa Rica	Central	Lomas del Colorado	VI			0.512971	19.171	15.587	38.857
P-138	3	Costa Rica	Central	Lomas del Colorado	VI			0.703623	0.512978	19.028	15.571
CR-85	3	Costa Rica	Central	Lomas del Colorado	VI			0.703511	0.512918	19.236	15.571
P-128	3	Costa Rica	Central	Lomas del Colorado	VI	2.01	0.21	0.703807	0.512955	19.11	15.575
P-129	3	Costa Rica	Central	Lomas del Colorado	VI			0.704997	0.512961	19.151	15.571
P-132B	3	Costa Rica	Central	Cerro Tortugero Cinder Cone	VI			0.703674	0.512956	19.201	15.591
P-133	3	Costa Rica	Central	Cerro Tortugero Cinder Cone	VI			0.703673	0.512957	19.188	15.573
P-152	3	Costa Rica	Central	Aguas Zarcas Cinder Cone	VI			0.703532	0.512925	19.288	15.576
P-153	3	Costa Rica	Central	Aguas Zarcas Cinder Cone	VI			0.703542	0.51294	19.184	15.577
P-154B	3	Costa Rica	Central	Aguas Zarcas Cinder Cone	VI			0.7036	0.512964	19.093	15.564
P-155A	3	Costa Rica	Central	Aguas Zarcas Cinder Cone	VI			0.703653	0.512968	19.085	15.577
CR-RV1	4	Costa Rica	NW CR					0.70391	0.51304	18.612	15.525
CR-B7	4	Costa Rica	Central CR					0.70358	0.51299	19.085	15.542
AR1	4	Costa Rica	NW CR					0.70417			
AR196BJT	4	Costa Rica	NW CR					0.703789	0.513006	19.006	15.561
AR-1B	4	Costa Rica	NW CR					0.703786	0.512994	19.004	15.561
AR1C	4	Costa Rica	NW CR					0.703785	0.513005	19.007	15.561
AR2	4	Costa Rica	NW CR					0.70392			
AR7/03	4	Costa Rica	NW CR					0.703784	0.513008	18.948	15.552
AR8/89	4	Costa Rica	NW CR					0.703812	0.513006	18.948	15.554
AR99-1	4	Costa Rica	NW CR					0.703799		18.949	15.554
AR1F	4	Costa Rica	NW CR					0.703798		19.003	15.561
AR1-2-83+	4	Costa Rica	NW CR							19.006	15.559
AR33	4	Costa Rica	NW CR							18.965	15.554
AR59	4	Costa Rica	NW CR					0.703811	0.513006	18.963	15.555
AR62	4	Costa Rica	NW CR							18.96	15.556
AR3/84	4	Costa Rica	NW CR							18.961	15.556
AR6/84	4	Costa Rica	NW CR							18.963	15.555
AR5/87	4	Costa Rica	NW CR							18.951	15.555
CR-TE9	4	Costa Rica	NW CR					0.70379	0.51302		
CR-ARB2	4	Costa Rica	NW CR					0.70389	0.51302		
16	4	Costa Rica	Central CR					0.703725	0.512934		
22B	4	Costa Rica	Central CR					0.703717	0.51294		

References Key

1	GEOROC (http://georoc.mpch-mainz.gwdg.de/georoc/)
2	Hoernle et al. (2008)
3	Gazel et al. (2011)
4	CentAm & IBM Geochem Database Version 1.02 (http://www.earthchem.org/gri , as compiled by Jordan et al., 2012)

Abbreviations

BVF Behind Volcanic Front (if not otherwise indicated, sample is from, or assumed to be from, Volcanic Front, VF)
(for other abbreviations consult relevant reference)