A paleo Tibet-Myanmar connection? Reconstructing the Late Eocene drainage system of central Myanmar using a multi-proxy approach

Supplementary Data

A. Licht, C. France-Lanord, L. Reisberg, C. Fontaine, Aung Naing Soe and J.J. Jaeger

Annexe 1 : Dataset

All samples were collected during the 2011 and 2012 expeditions of the French-Myanmar palaeontological team; nearest village, GPS coordinates, dominant lithology and analytical techniques employed are given in table A1. All samples were selected in a 25 km wide area around Bahin township (area A in figure 1A). A precise geological map of the area is available in Aung Naing Soe et al. (2002).

Sample	Village Locality	Sampling site	Dominant lithology	Formation	Analyses
GA	Ganle	N21°44'03.0", E094°43'26.3"	Mudstones	Pondaung	Nd and Sr isotopic analysis on the <2µm and >63µm fraction, DRX on the <2µm fraction
GAN-08	Ganle	"	Mudstones	"	Nd and Sr isotopic bulk analysis
PA	Pangan	N21°42'31.0", E094°49'21.6"	sandstones	"	Nd and Sr isotopic analysis on the <2µm and >63µm fraction, DRX on the <2µm fraction
PK1-03	Paukkaung	N21°45'10.3", E094°38'12.0"	sandstones	"	QFL point counting, heavy minerals counting
PK2-06	Paukkaung	N21°45'16.3", E094°39'10.2"	sandstones	"	Nd and Sr isotopic bulk analysis, QFL point counting, heavy minerals counting
PK2-17	Paukkaung	"	sandstones	"	QFL point counting, heavy minerals counting
PK2-21	Paukkaung	"	sandstones	"	Nd and Sr isotopic bulk analysis, QFL point counting, heavy minerals counting
TH	Thaminchauk	N21°45'41.0", E094°50'29.4"	Siltstones	"	Nd and Sr isotopic analysis on the <2µm and >63µm fraction, DRX on the <2µm fraction
THT1	Thaminchauk	"	Mudstones	"	DRX
P1 to P2	Than U Daw	N21°41'07.4", E094°48'37.5"	Pebbles	"	Thin section, QFL point counting for P12
YAS-06	Yarshe	N21°44'12.5", E094°38'15.3"	Mudstones	"	Nd and Sr isotopic bulk analysis
YAS-21	Yarshe	"	Mudstones	"	DRX
YPL-11	Nyaungpinle	N21°45'03.8", E094°37'35.3"	sandstones	"	Nd and Sr isotopic bulk analysis, heavy minerals counting
YAW2	Seikche North	N21°42'20.4", E094°42'41.6"	sandstones	Yaw	Heavy minerals counting
YAW-SABLE	Seikche North	"	sandstones	"	Nd and Sr isotopic analysis on the <2µm and >63µm fraction, DRX on the <2µm fraction
YAW-A	Seikche South	N21°42'40.5", E094°42'57.0"	Mudstones	"	Nd and Sr isotopic bulk analysis
YAWS	Seikche South	"	sandstones	"	Nd and Sr isotopic bulk analysis, QFL point counting
YAW-RE	Bahin	N21°43'32.6", E094°40'39.7"	Mudstones	"	Nd and Sr isotopic bulk analysis
YTP	Bahin	N21°43'11.1", E094°40'23.8"	Siltstones	"	Nd and Sr isotopic bulk analysis

***Table A1**: Studied samples*

Annexe 2 : Palaeocurrent data

Palaeocurrent data were acquired in two distinct areas : in the Bahin township, where the Pondaung Formation crops out extensively (area A in figure 1A; precise locations in annexe 1), and in the Kalewa township, where the Yaw Formation crops out (area B in figure 1A; exposure sites along the Kalewa-Kalaymyo road, 23°12′48″N 94°19′06″E to 23°11′N 94°3′E). Data are summarized in table A2. Paleoflow directions were measured on the set axes of trough cross-beddings on 3D exposures. Selected sets are sufficiently large (>40cm) to correspond to the dominant flow direction (Collinson and Thompson, 1989). The structural dip at the selected sites was always below 25°, which is sufficiently small to avoid any tectonic correction (Collinson and Thompson, 1989).

Rock Unit	Location	directional indicators	Data	Mean paleoflow direction
Pondaung Fm	Minbu Sub-Basin, Myaing District	Trough cross bedding (facies St of Aung Naing Soe et al., 2002)	278 crossbeds on 66 distinct channel bodies	243°
Yaw Fm	Chindwin Sub-Basin, Kalewa township	Trough cross bedding (facies St, this paper)	171 crossbeds on 37 distinct channel bodies	257°

Table A2*:Palaeocurrent data*

Annexe 3 : Petrographic analysis

Detailed results of the point-counting analyses are given in table A3; results of the heavy mineral counting are presented in the main document. More samples were initially prepared for heavy-mineral identification, but the very low abundances of heavy minerals in several samples did not allow us to study the results.

	Q	F	L	Lv	Ls	Lm	MI
PK1-03	16	13	71	29	15	27	137
PK2-06	15	18	67	28	18	21	124
PK2-17	13	17	70	32	17	20	130
PK2-21	19	16	65	32	18	16	115
YAW-S	23	16	61	28	16	17	143

Table A3: *results of the point-counting analyses. Q: Quartz, F: Feldspars, L: Lithics, Lv: volcanic lithics, Ls: sedimentary lithics, Lm: metamorphic lithics, MI: Metamorphic Index (Garzanti and Vezzoli, 2003). Chert lithics and ultramafic lithics were not detected. YAW-S delivered numerous carbonate lithics (gastropods and bivalve fragments), which are considered as intrabasinal and have not been counted.*

Annexe 4: isotopic results

Powdered sediments were analyzed for Sr, Rb, Sm and Nd concentrations using a Thermo Elemental IRIS ICP-OES spectrometer at the Service d'Analyse des Roches et des Minéraux (CRPG, Vandoeuvre les Nancy - France). Nd and Sr chemical separation for isotopic measurements and mass spectrometric analyses were performed at the CRPG, according to the standard procedures of the laboratory. Briefly, after decarbonation, the silicate fractions were dissolved in HF-HNO_4 and a small amount of $HClO_4$. Sr and Nd were separated using Eichrom Sr-spec, TRU-spec and Ln-spec resins, following procedures closely adapted from those of Pin et al. (1994). Sr isotopic composition was measured by thermal ionization mass spectrometry, using a Triton Plus instrument operated in static mode. The $^{87}Sr/^{86}Sr$ ratios were corrected for mass fractionation assuming $^{86}Sr/^{88}Sr = 0.1194$. During these measurements the $^{87}Sr/^{86}Sr$ value for the NBS 987 standard was 0.710263 ± 0.000023 (2σ). Nd isotopic compositions were measured using a Neptune Plus MC-ICP-MS. Nd isotopic ratios are normalized to $^{146}Nd/^{144}Nd = 0.7219$. During the period of sample measurement the JNdi Nd standard yielded a mean value of $^{143}Nd/^{144}Nd = 0.512077 \pm 0.000017$ (2σ). Detailed results are given in table A4. Nd and Sr procedural blanks were insignificant compared to the amount of Sr and Nd measured in the samples.

Sample	Grain size	Sm (ppm)	Nd (ppm)	Rb (ppm)	Sr (ppm)	87Sr/86Sr	Standard error (2σ)	143Nd/144Nd	Standard error (2σ)	ε Nd
TH (<2µm fraction)	Mudstones	3.58	17.53	60.3	111.5	0.714727	0.000013	0.512263	0.000021	-7,32
TH (>63µm fraction)	Sandstones	5.3	26.06	84.23	103.4	0.715563	0.000005	0.512237	0.000003	-7,82
PA (<2µm fraction)	Mudstones	3.86	15.61	7.85	369.5	0.705455	0.000006	0.512651	0.000007	0,26
PA (>63µm fraction)	Sandstones	2.69	11.81	20.56	888.1	0.705741	0.000010	0.512442	0.000005	-3,83
GA (<2µm fraction)	Mudstones	7.3	39.88	95.9	142.8	0.717205	0.000010	0.512438	0.000004	-3,9
GA (>63µm fraction)	Sandstones	4.58	21.89	42.54	82.94	0.714055	0.000012	0.512342	0.000005	-5,78
GAN08	Mudstones	4.22	22.09	98.07	118.9	0.717786	0.000014	0.512319	0.000005	-6,23
PK2-06	Sandstones	4.32	20.48	46.71	256.9	0.705905	0.000008	0.512627	0.000006	-0.21
PK2-21	Sandstones	4.12	19.41	55.18	96.05	0.708842	0.000009	0.512521	0.000005	-2.28
YAS-06	Mudstones	4.58	21.51	84.99	119	0.715201	0.000014	0.512240	0.000004	-7.76
YPL-11	Sandstones	9.59	47.32	68.41	96.05	0.711181	0.000020	0.512553	0.000006	-1.66
YAWS	Sandstones	8.43	35.84	59.73	173.5	0.711771	0.000015	0.512254	0.000003	-7,49
YS (<2µm fraction)	Mudstones	4.91	24.34	76.14	113.6	0.712084	0.000013	0.512511	0.000004	-2,48
YS (>63µm fraction)	Sandstones	3.63	16.31	42.34	108.5	0.709754	0.000014	0.512371	0.000020	-5,2
YTP	Siltstones	5.06	23.09	37.93	269.7	0.708533	0.000011	0.512363	0.000009	-5.36
YAW-A	Mudstones	5.27	24.72	99.38	101.3	0.713161	0.000008	0.512268	0.000013	-7,22
YAW-RE	Mudstones	4.68	22.91	97.25	129.5	0.713984	0.000021	0.512294	0.000007	-6.71

Table A4: *Sm, Nd, Rb and Sr contents, $^{87}Sr/^{86}Sr$ and $^{143}Nd/^{144}Nd$ ratios from thirteen samples of the Pondaung and Yaw formations. For four samples results for both fine (<2µm) and coarse (>63 µm) fractions are shown. For the remaining samples, only bulk analyses were performed.*