Table S1. Rock properties used in paper and their relationship to seismic velocity.

Typical rock type	Sediment	Greywacke	Schist	Basalt	Peridotite	Eclogite
Density kgm^{-3}	≤2500	2640±100	2730±115	2770±160	3090±225	3550±50
Calculated or measured *Vp* (1) *km/sec*	≤4.3	5.5	6	6.1	7.1	8.4
Calculated Vs (2) *km/sec*	≤2.6	3.3	3.6	3.7	4.3	5.0
Calculated shear modulus (3) *GPa*	≤17	29	35	38	57	90
Assumed friction coefficient	0.75	0.75	0.75	0.75	0.75	0.75
Ductile creep parameters based on(4)	Quartz	Quartz	Feldspar	Gabbro	Olivine	Olivine

The top row lists density ranges of sediment, greywacke, schist, basalt and peridotite from Tenzer et al. (2011) and for mafic eclogite (Christensen 1996). Calculated *Vp (1)* use the relationship in Hill (1978) for *Vp* <5.5 km/sec and in Gardner et al. (1974) for *Vp* > 5.5 km/s (Eberhart-Phillips et al. 2010). *(2)* The table assumes a constant *Vp/Vs* ratio of 1.65 (typical for most regions, however see Eberhart-Phillips et al. 2010). *(3)* Shear modulus = ρV_s^2. *(4)* Quartz dislocation creep (Paterson & Luan1990) up to density 2750 kg m^{-3}; feldspar (wet anorthite) combined diffusion and dislocation creep (Rybacki et al., 2006) up to 2900 kg m^{-3}; gabbro dislocation creep (Wilks and Carter, 1990) from 2900-3000 kg m^{-3}; wet olivine dislocation creep for all greater densities (Hirth & Kohlstedt 2003).