Supplementary information for "Blind magmatism abets nonvolcanic continental rifting."

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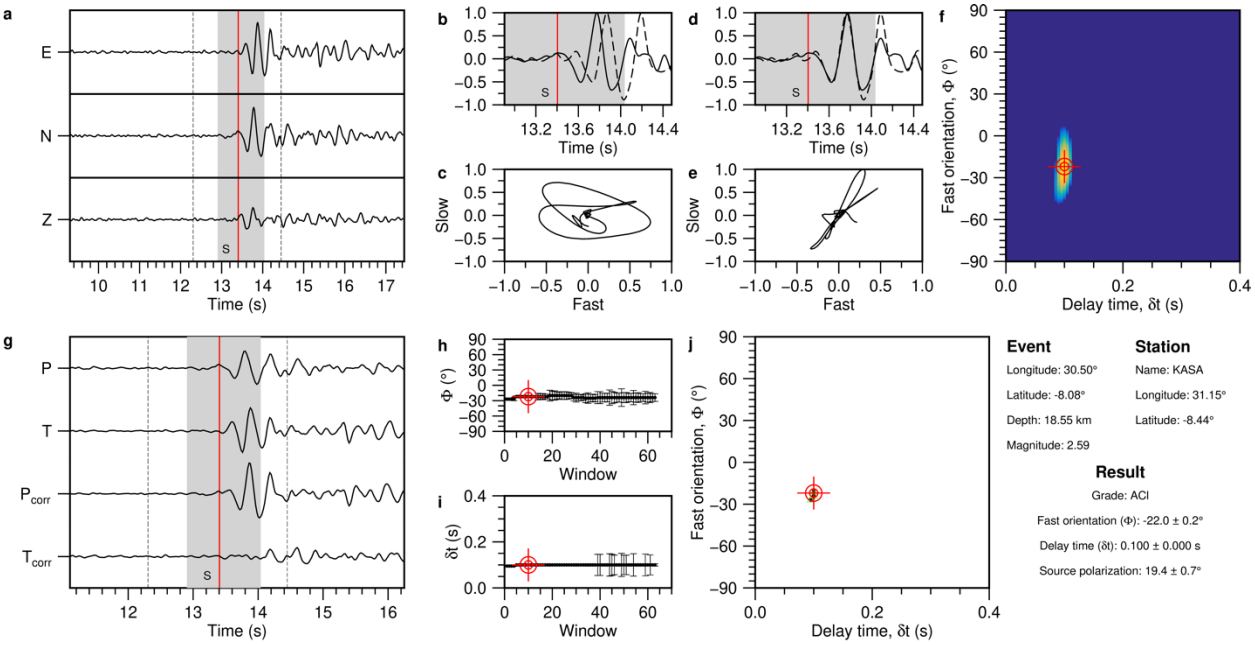
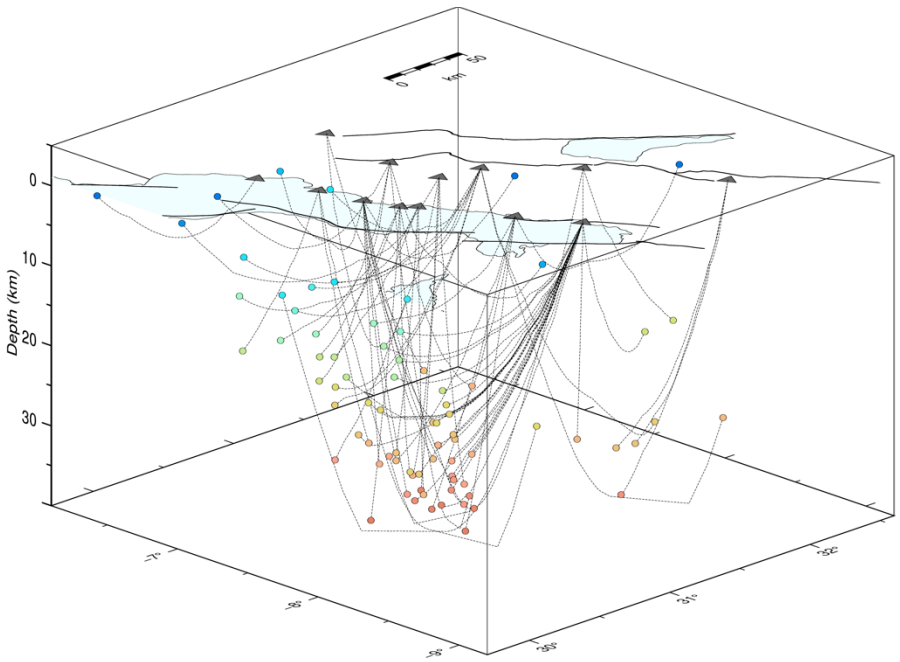
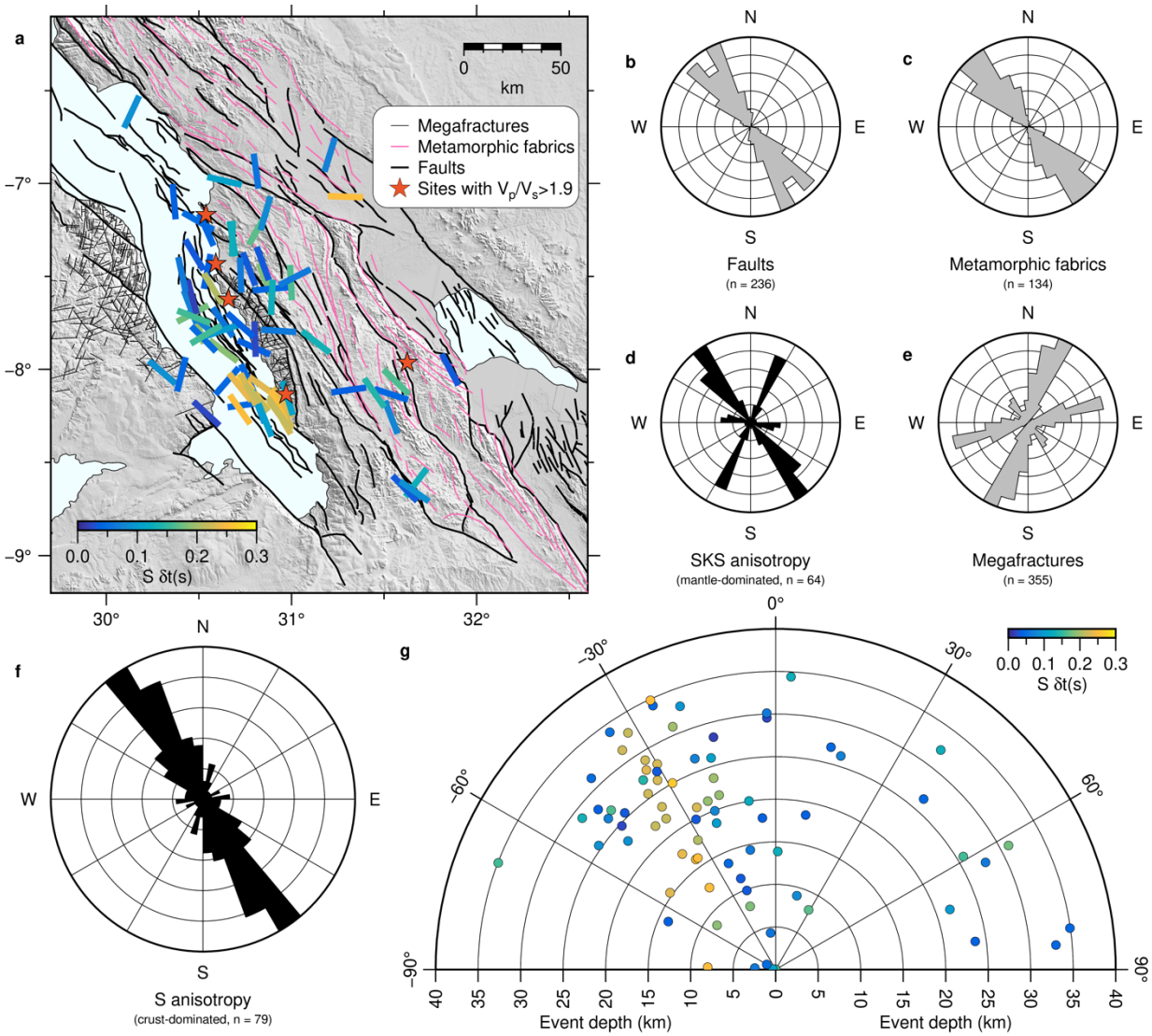


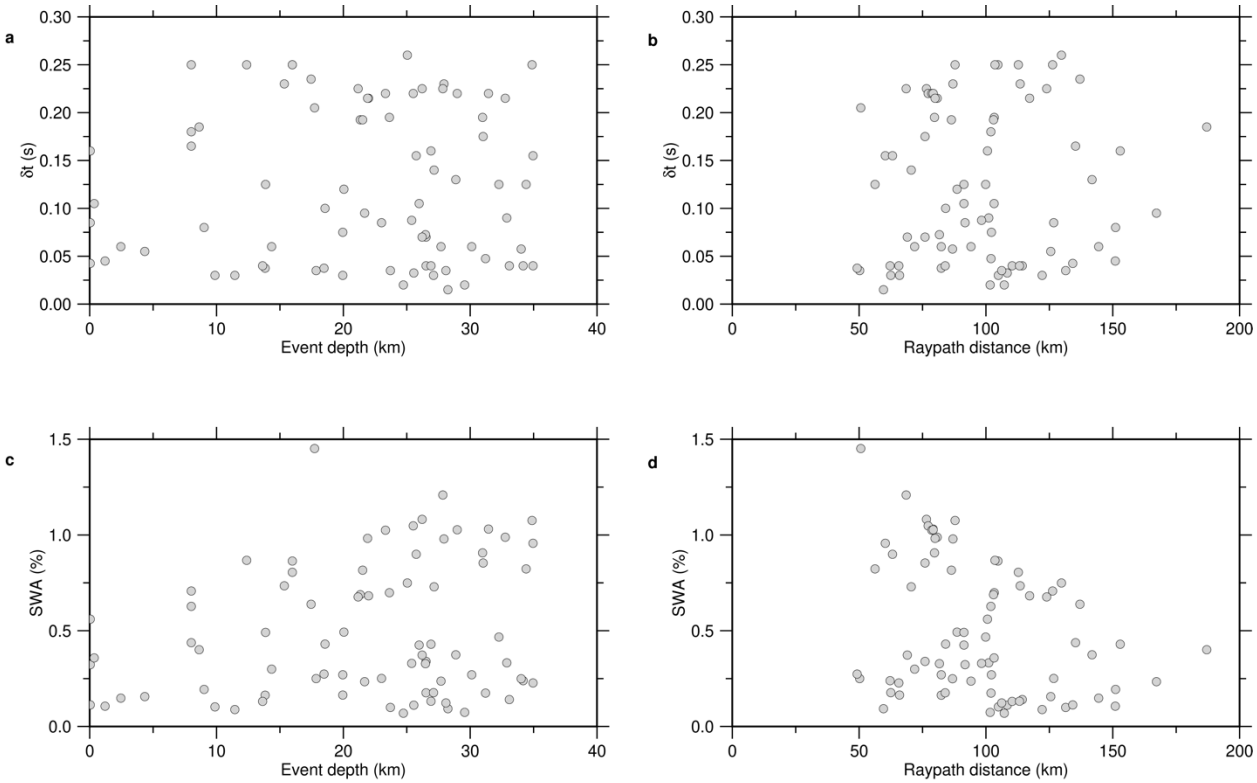
Supplementary Fig. 1 | Example of a reliable shear wave splitting result. (a) Filtered (0.2–3 Hz) three-component seismograms. Red line indicates the S wave onset. Dashed lines indicate the minimum and maximum times for defining shear wave windows during the analysis. Gray region indicates the best shear wave window from the analysis. **(b)** and **(d)** show the fast and slow (dashed) waveforms before and after splitting correction, respectively. **(c)** and **(e)** are the corresponding particle motion plot for the fast and slow waveforms before and after correction. **(f)** Grid search space for the optimal splitting parameters indicated by the bullseye. **(g)** Radial (P) and transverse (T) components before and after correction. Note the energy minimization on the corrected transverse component. **(h – j)** Cluster analysis result for several shear wave windows. Bottom right text shows event and station information and a summary of the results.



Supplementary Fig. 2 | 3D traced raypaths for the 79 reliable shear wave splitting measurements.



Supplementary Fig. 3 | Similar to Fig. 2, but the shear wave anisotropy results in **a** and **g** are colored using the delay time between the fast and slow shear waves.



Supplementary Fig. 4 | Cross-plots of splitting parameters. (a) Delay time versus event depth. **(b)** Delay time versus raypath distance. **(c)** Shear wave anisotropy versus event depth. **(d)** Shear wave anisotropy versus raypath distance.

Supplementary Table 1 | Thermo-mechanical numerical modeling parameters.

Material/Parameter	Felsic crust	Mafic crust	Lithospheric mantle	Asthenospheric mantle
Density (kg m-3)	2800	2900(solid), 2600 (molten)	3280	3300
Flow law	Wet quartz	Wet anorthite	Dry olivine	Wet olivine
Reference	Rutter & Brodie, 2004[1]	Rybacki & Dresen, 2000[2]	Hirth & Kohlstedt, 2003[3]	Hirth & Kohlstedt, 2003[3]
Pre-exponential constant (M pa^{-n} s^{-1} μm^{m})	$10^{-0.4}$	$10^{1.7}$	$10^{9.2}$	$10^{7.4}$
Grain size (µm)	1000	300	400	100
Grain size exponent	2	3	3	3
Activation energy (J mol-1)	220e3	170e3	375e3	375e3
Activation volume (J Pa-1)	0	0	10e-6	20e-6
Thickness (km)	20	20	Variable	Variable
Thermal conductivity (W m-1 K-1)	2.5	2.5	3.3	3.3
Volumetric heat production (µW m-3)	Variable	0.45	0.02	0.02

Supplementary References

1 Rutter, E. H. & Brodie, K., H. Experimental grain size-sensitive flow of hot-pressed Brazilian quartz aggregates. *Journal of Structural Geology* **26**, 2011-2023 (2004).

2 Rybacki, E. & Dresen, G. Dislocation and diffusion creep of synthetic anorthite aggregates. *Journal of Geophysical Research* **105**, 26017-26036 (2000).

3 Hirth, G. & Kohlstedt, D. L. in *Inside the subduction factory American Geophyscial Union Monograph* (ed J. Eiler) 83-105 (2003).