

## Investigating potential icequakes at Llaima volcano, Chile

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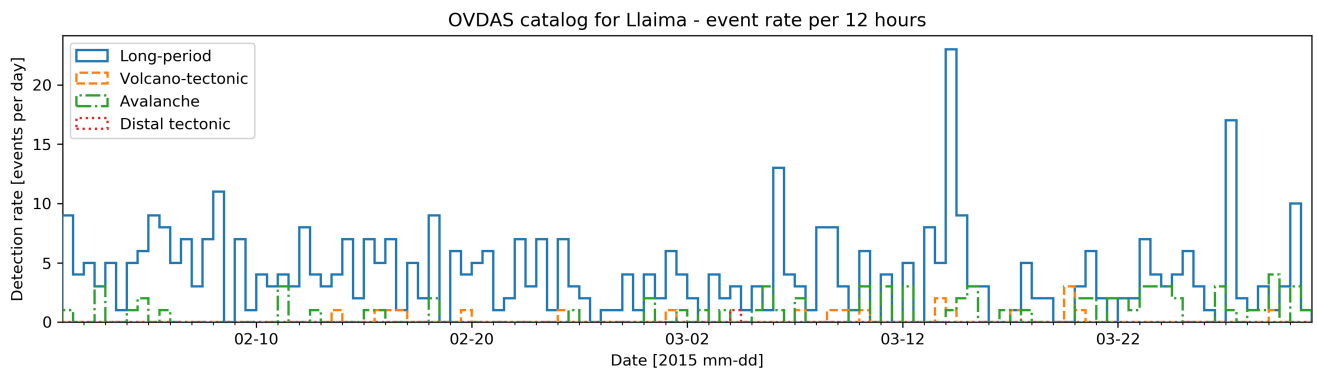


Figure S1: Rates of events manually cataloged by OVDAS from seismic data collected at Llaima volcano from 1 February to 31 March 2015, in 12-hour bins. No icequakes were officially detected by OVDAS during this period.

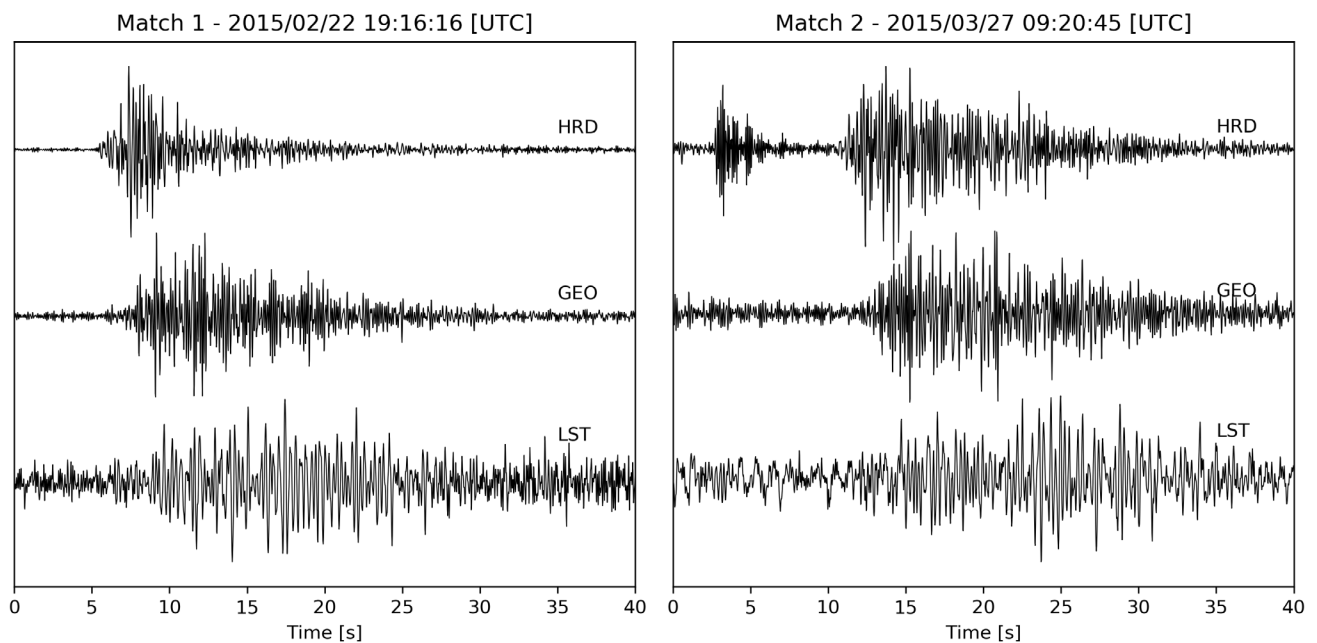


Figure S2: Waveforms of two earthquakes cataloged by OVDAS as volcanic long-period events that were also matched with repeating events detected during this study. Waveforms are plotted from three stations across the 2015 deployment, as indicated by their labels on the right.

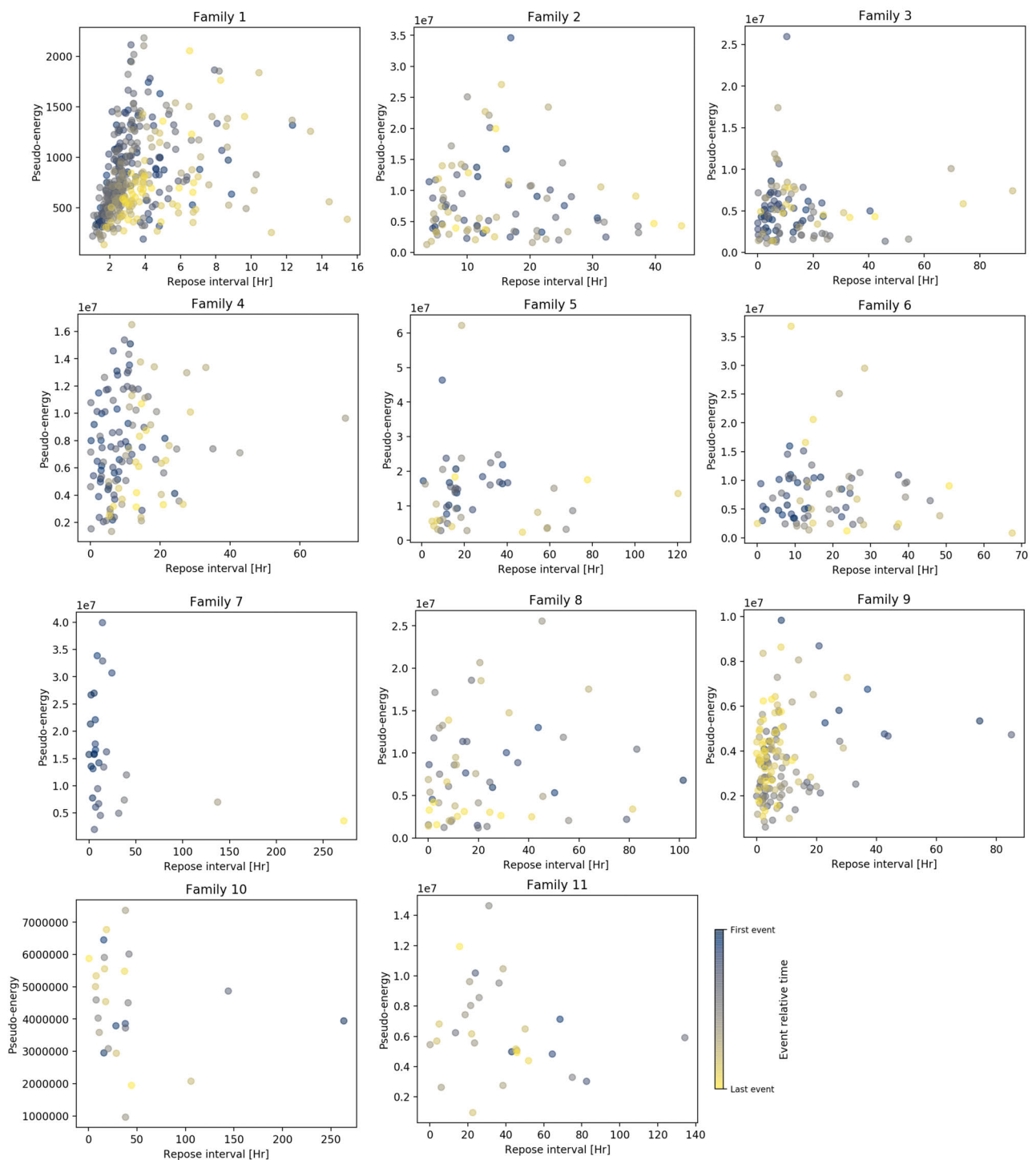


Figure S3: Repose intervals versus pseudo-energy for each event in each family, colored by their relative age within the family duration, using waveforms recorded at station GEO.

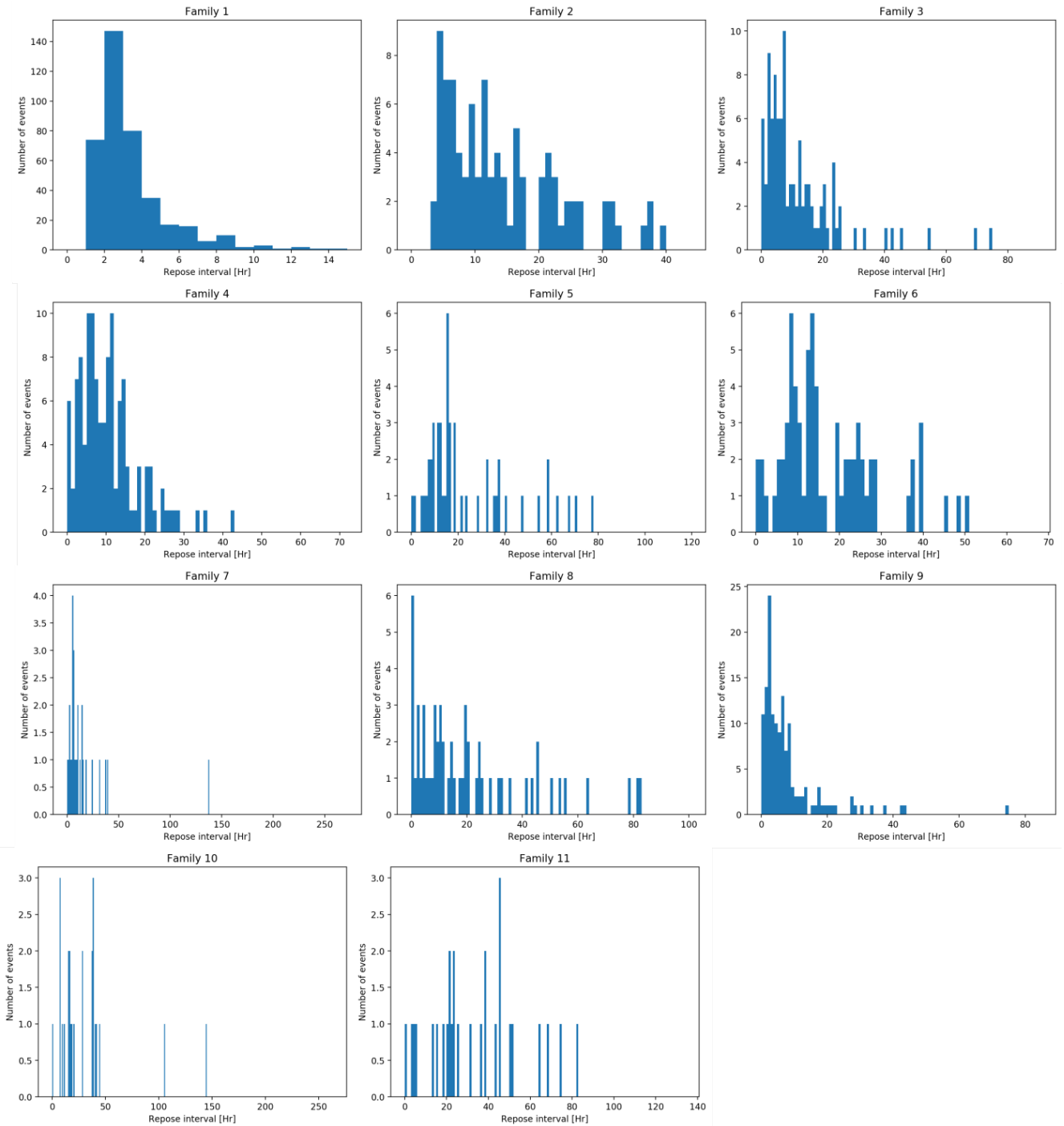


Figure S4: Frequency distributions for repose intervals for all events within each family.

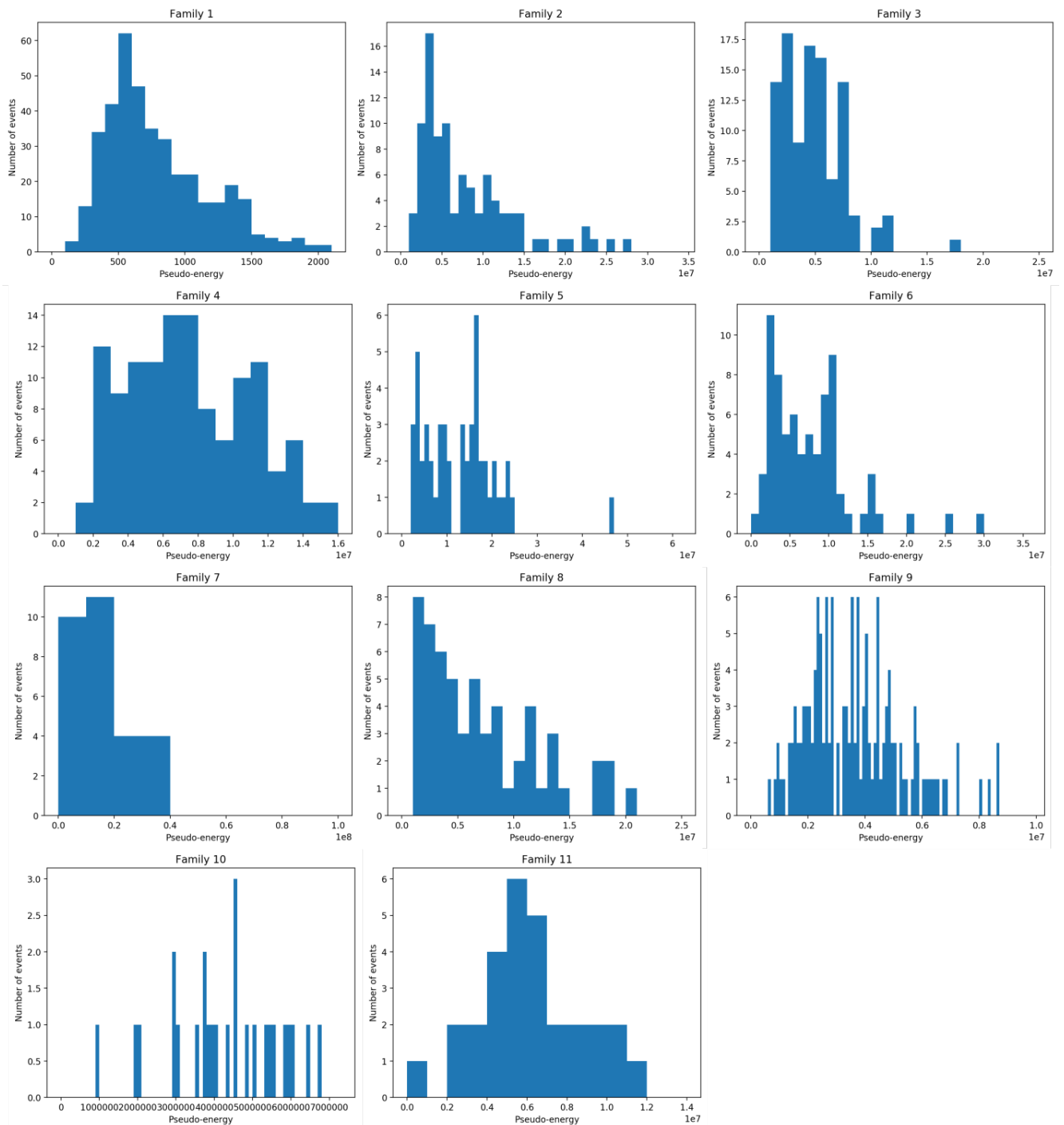


Figure S5: Frequency distributions for calculated pseudo-energies of each event within each family, using waveforms recorded at station GEO.

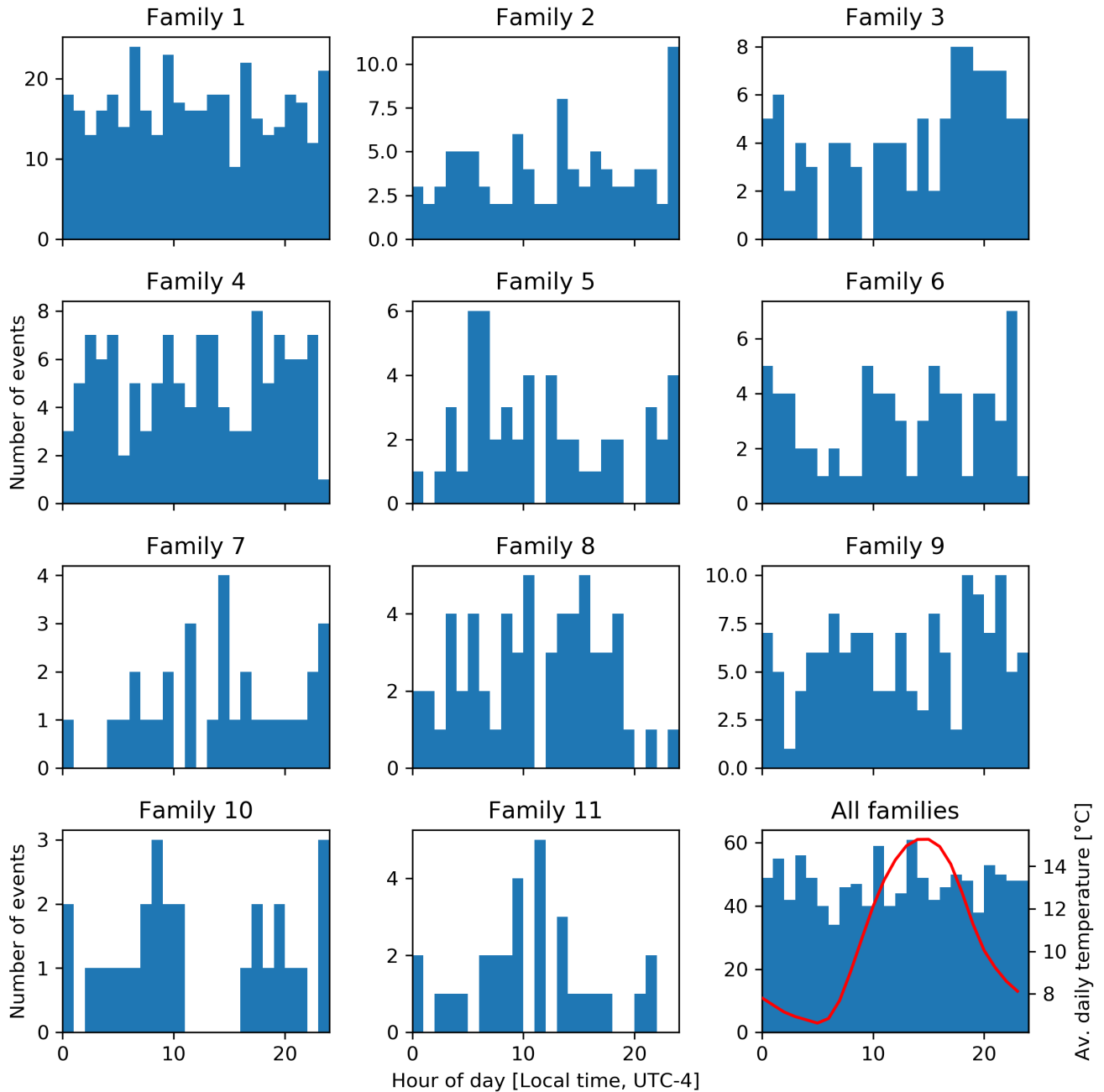


Figure S6: Histograms for each family where events are binned by time-of-day occurrence (in local time, UTC-4). Also included is the histogram for all families, plotted with the average daily temperature fluctuations as measured during our period of study (bottom right plot).

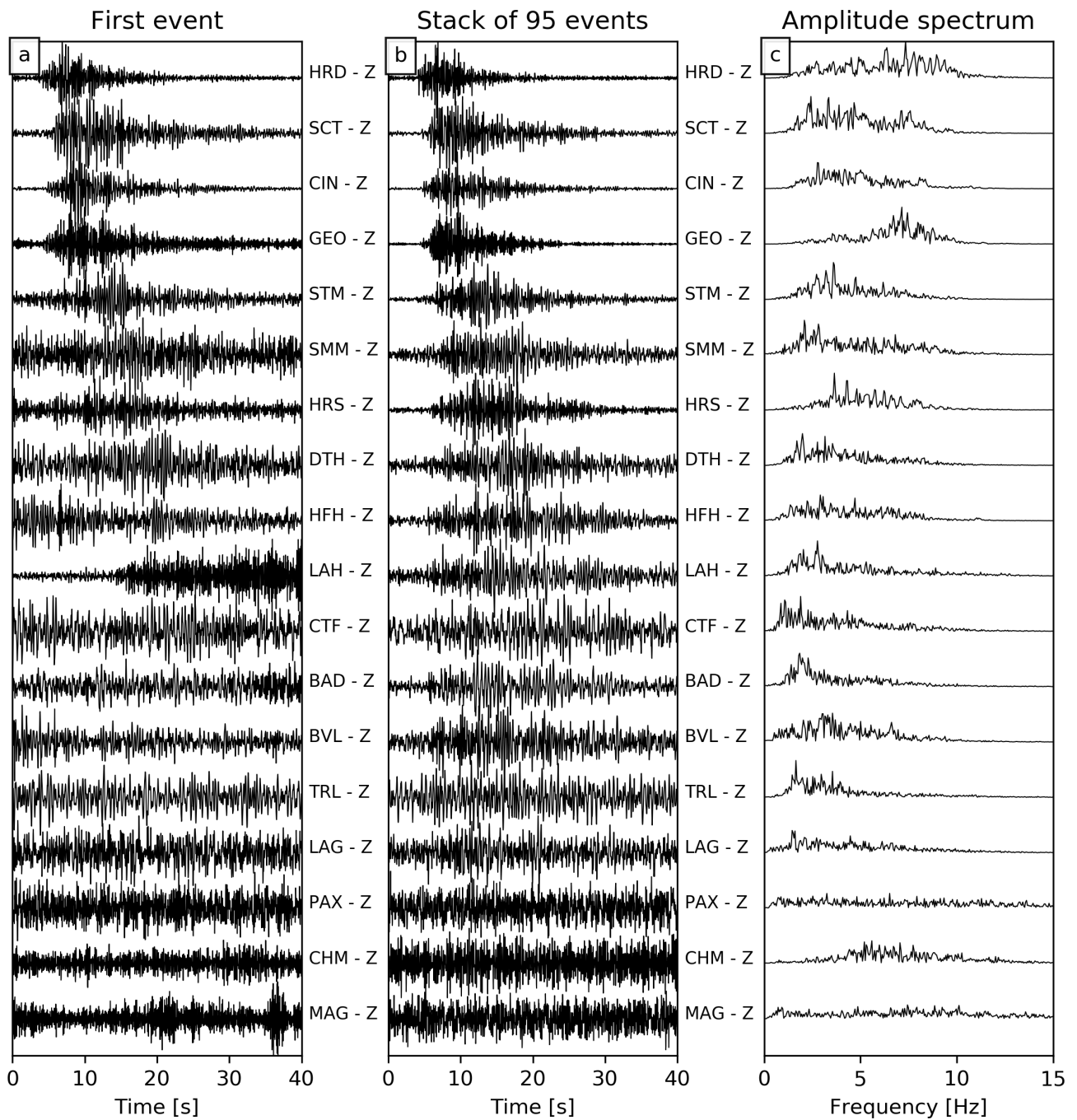


Figure S7: [a] The waveform of the first detected event in Family 2 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 95 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b].

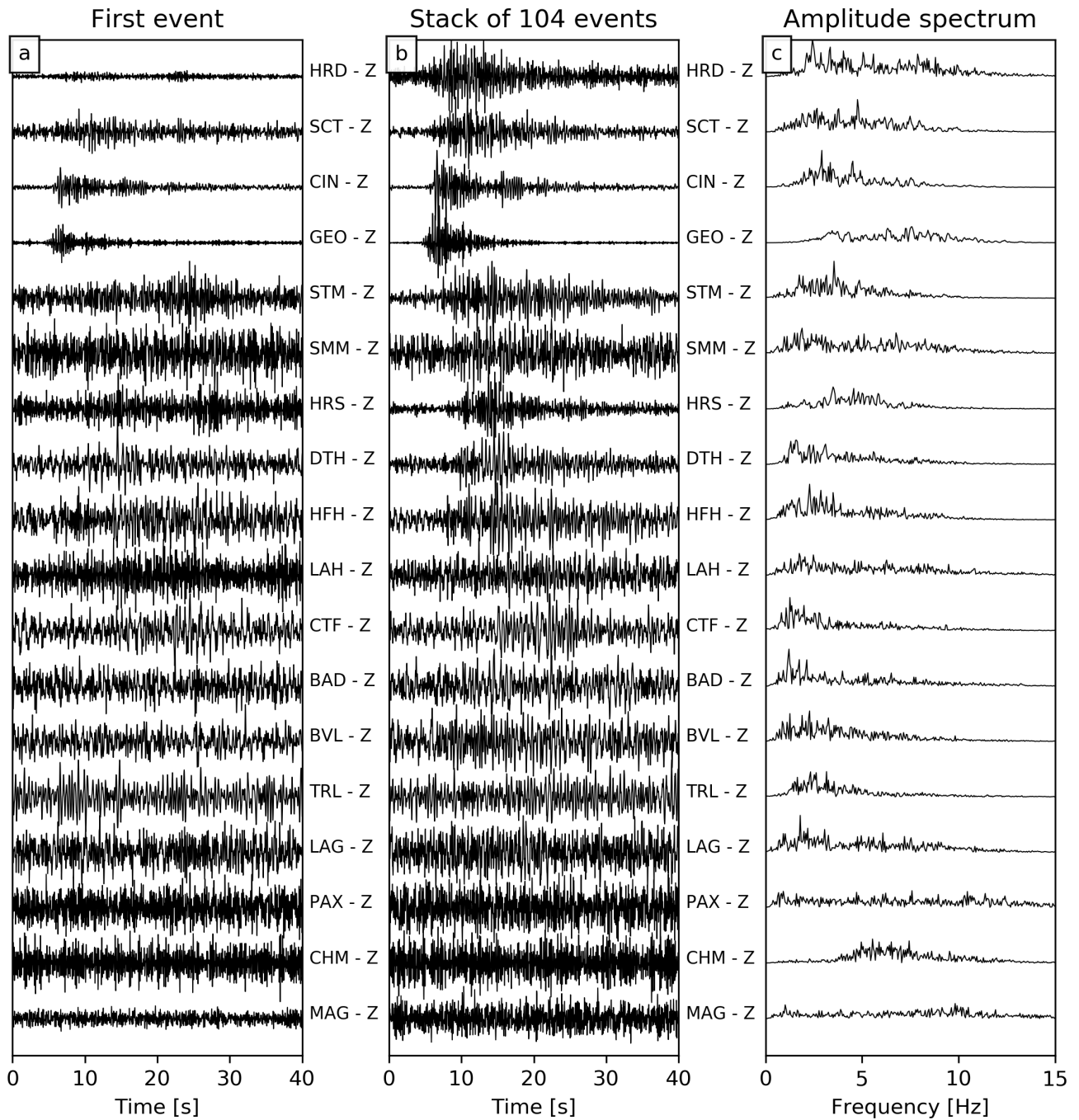


Figure S8: [a] The waveform of the first detected event in Family 3 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 104 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b].

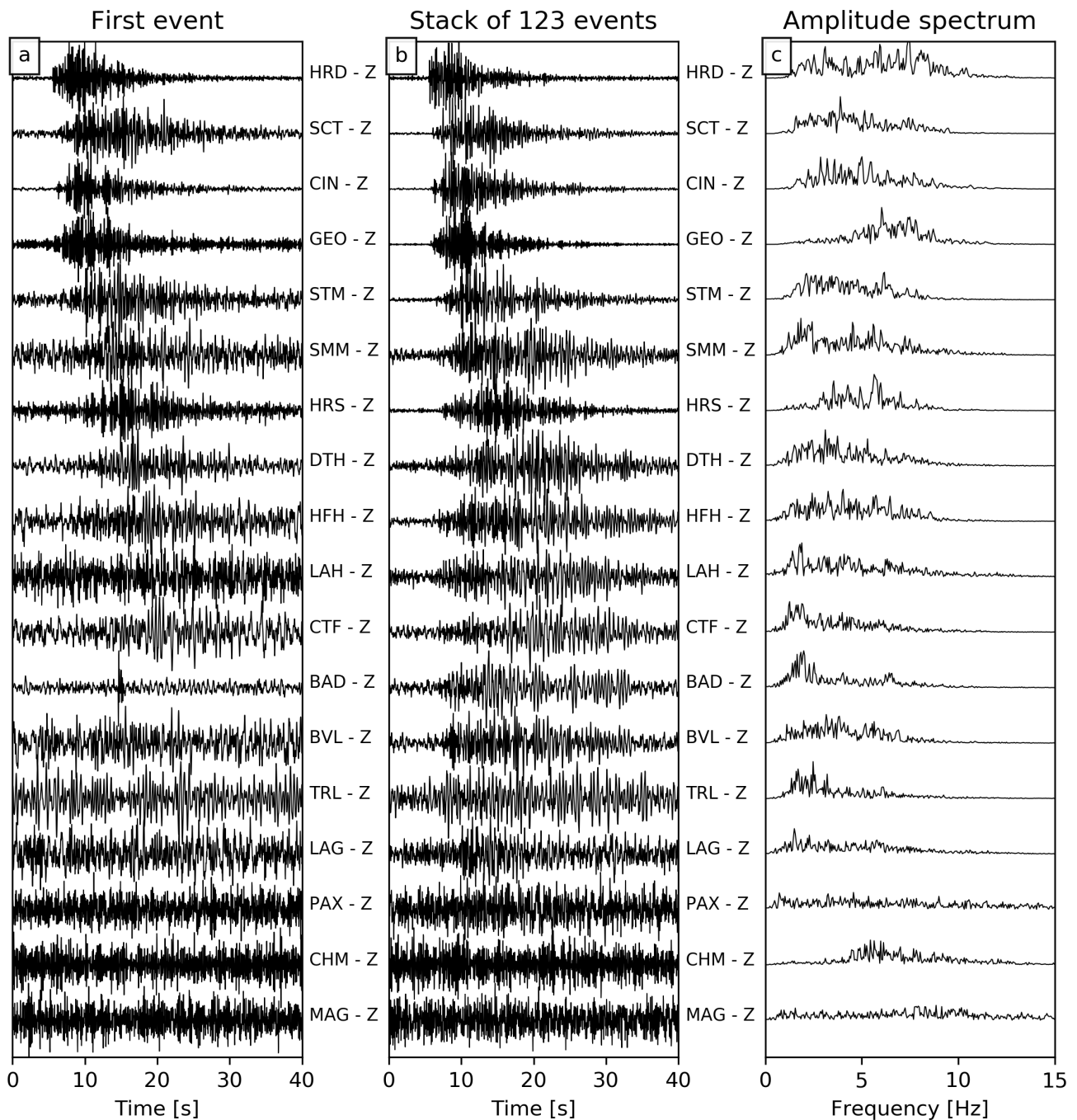


Figure S9: [a] The waveform of the first detected event in Family 4 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 123 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b].

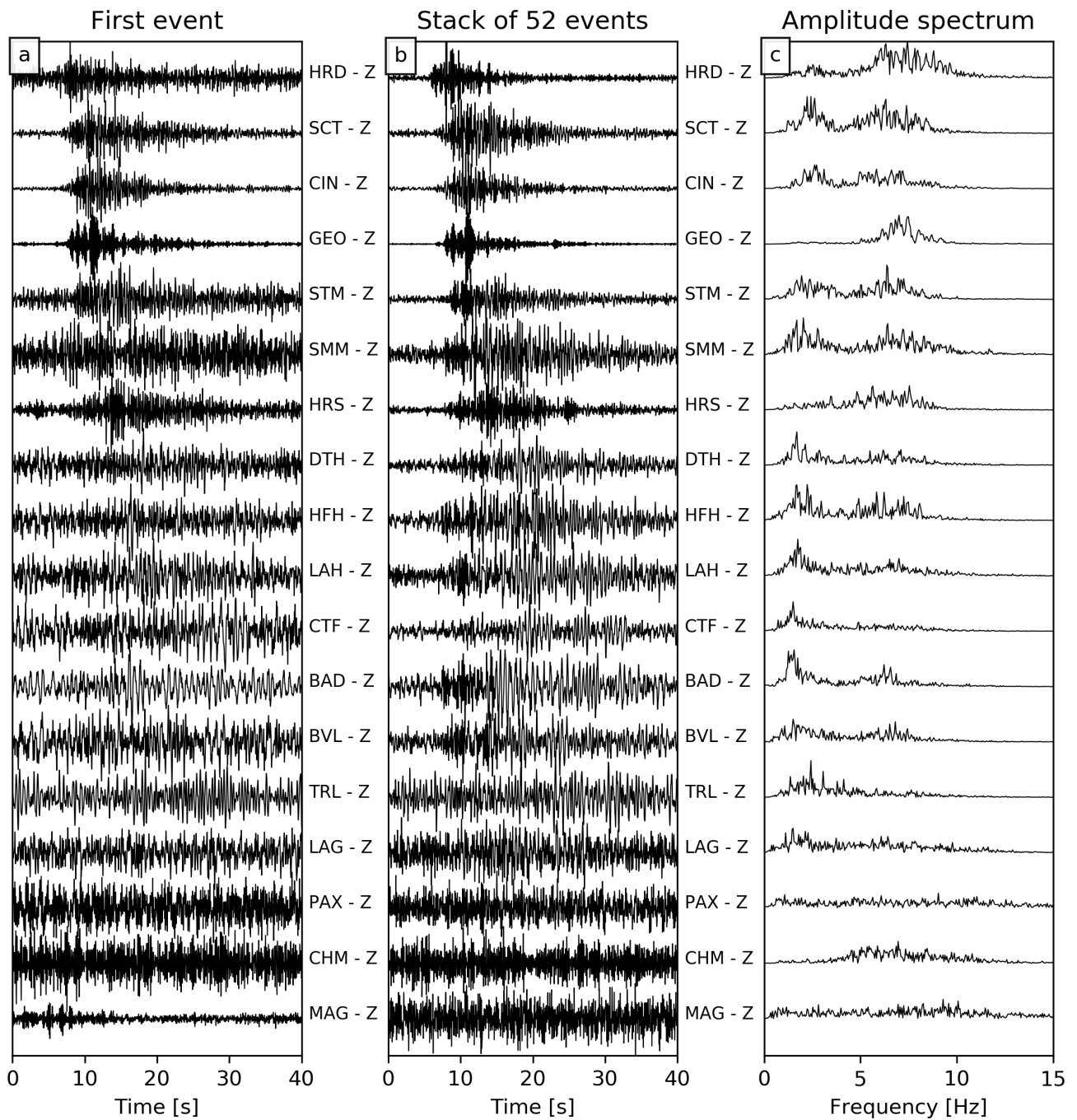


Figure S10: [a] The waveform of the first detected event in Family 5 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 52 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b].

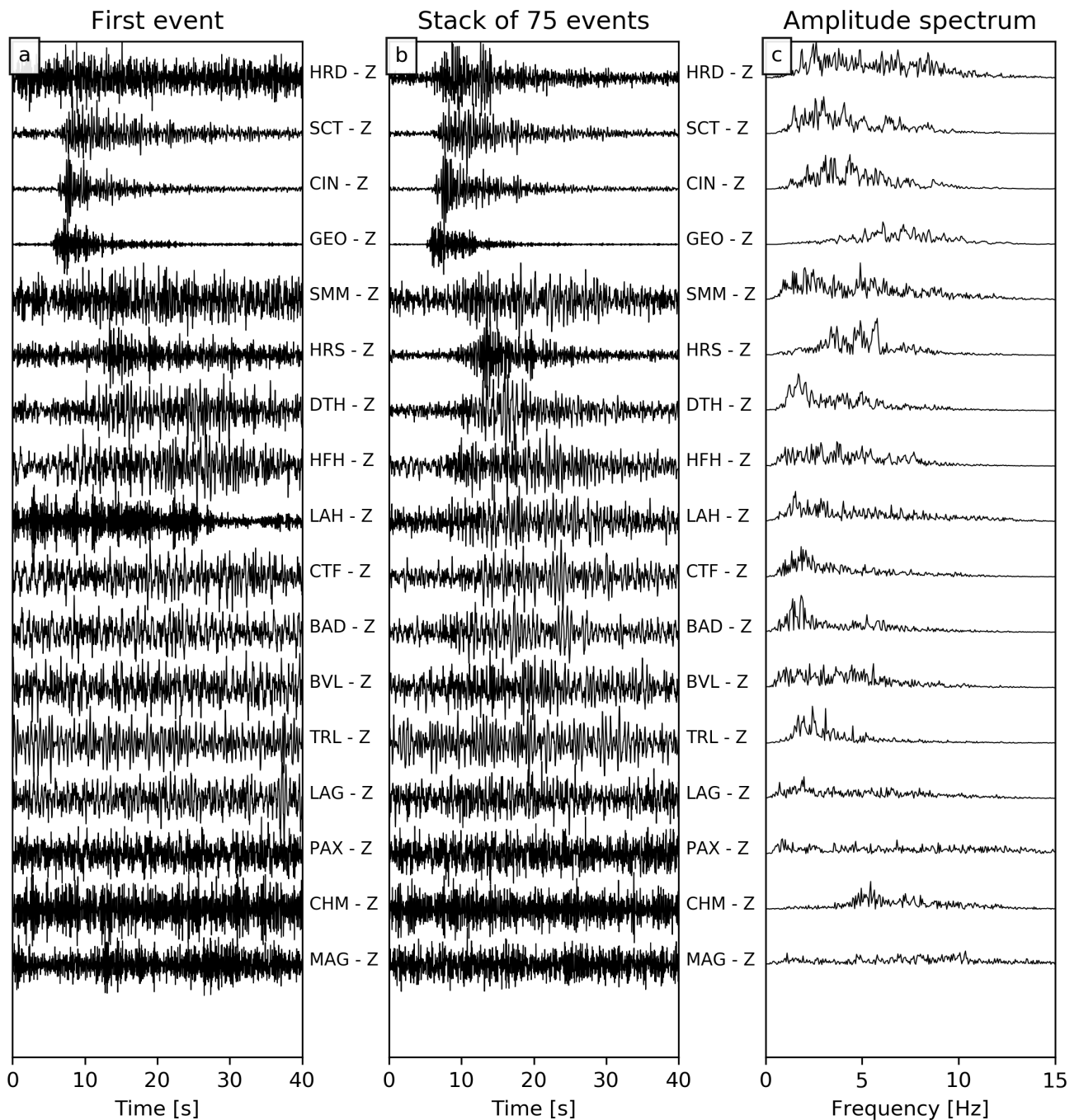


Figure S11: [a] The waveform of the first detected event in Family 6 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 75 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b]. Note: Due to issues with the data, waves for station STM could not be plotted for this family.

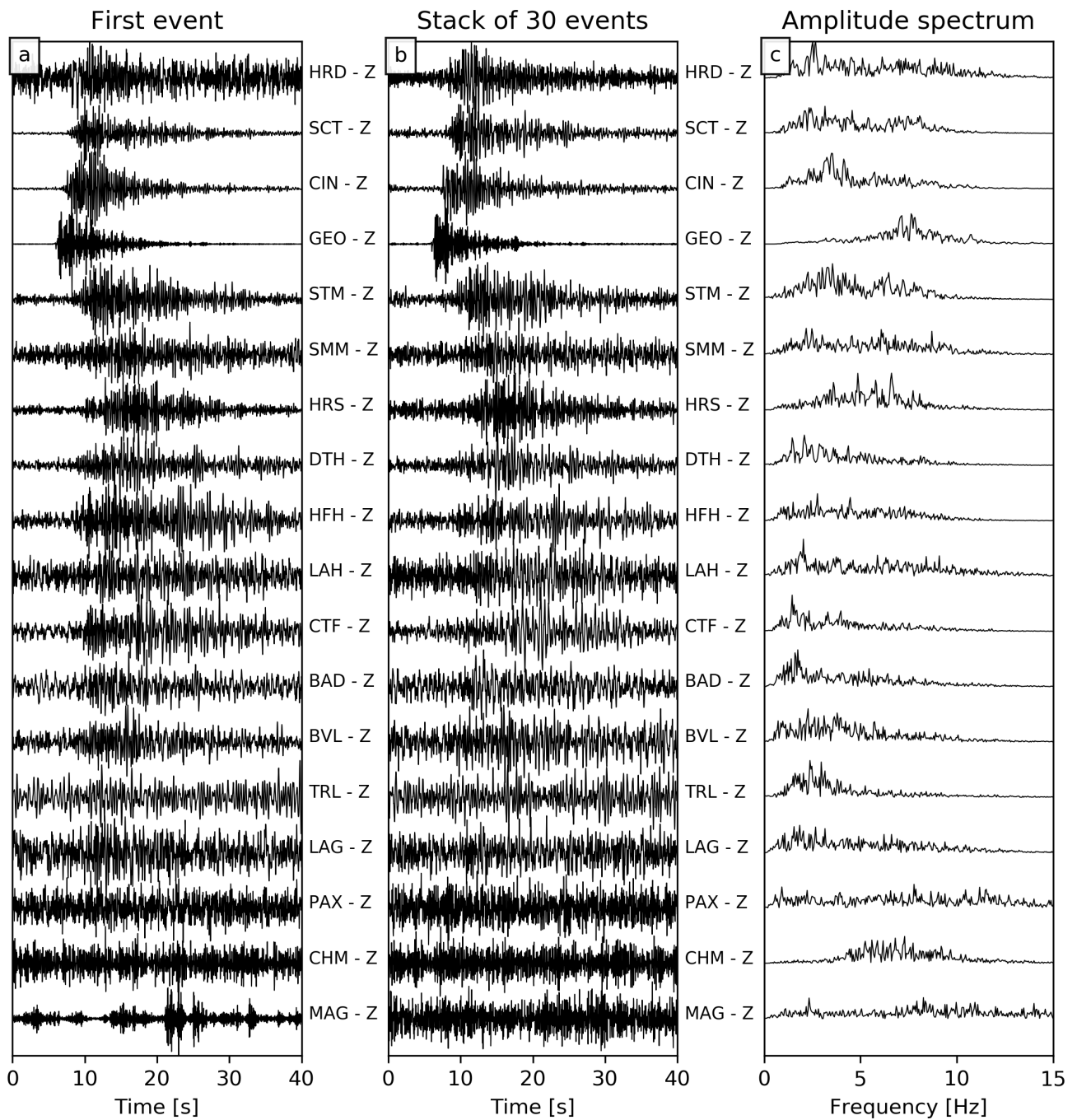


Figure S12: [a] The waveform of the first detected event in Family 7 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 30 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b].

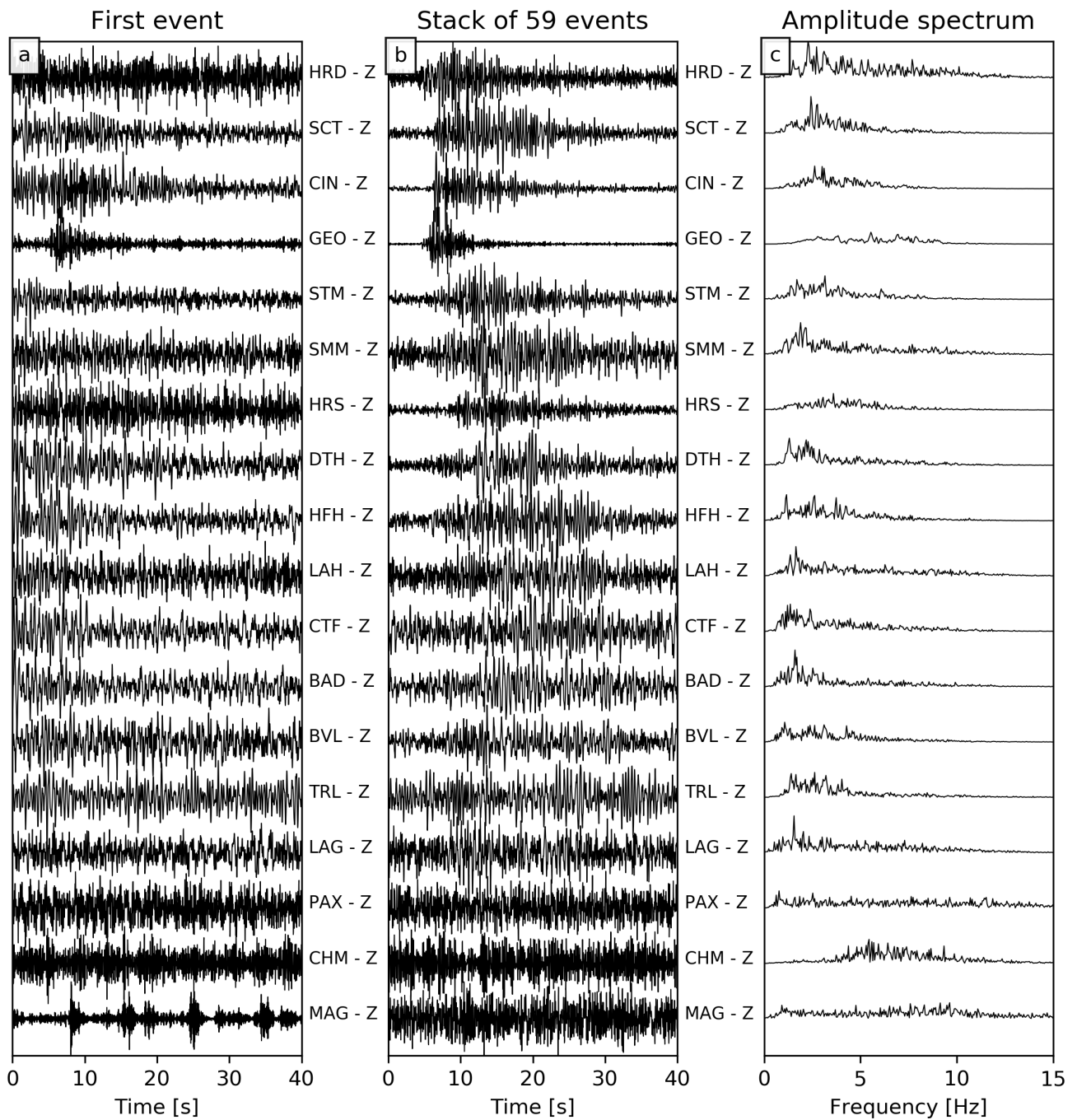


Figure S13: [a] The waveform of the first detected event in Family 8 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 59 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b].

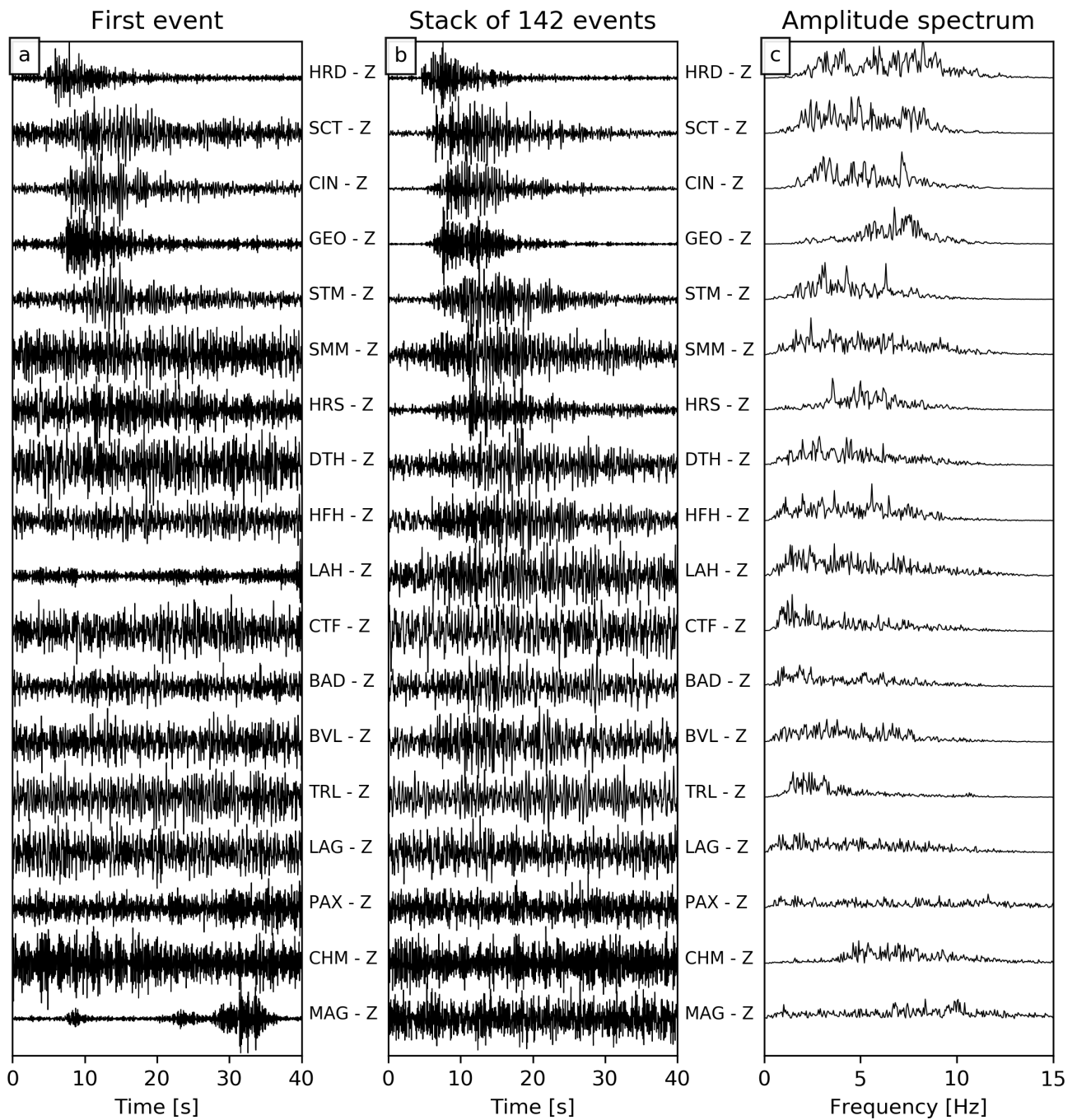


Figure S14: [a] The waveform of the first detected event in Family 9 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 142 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b].

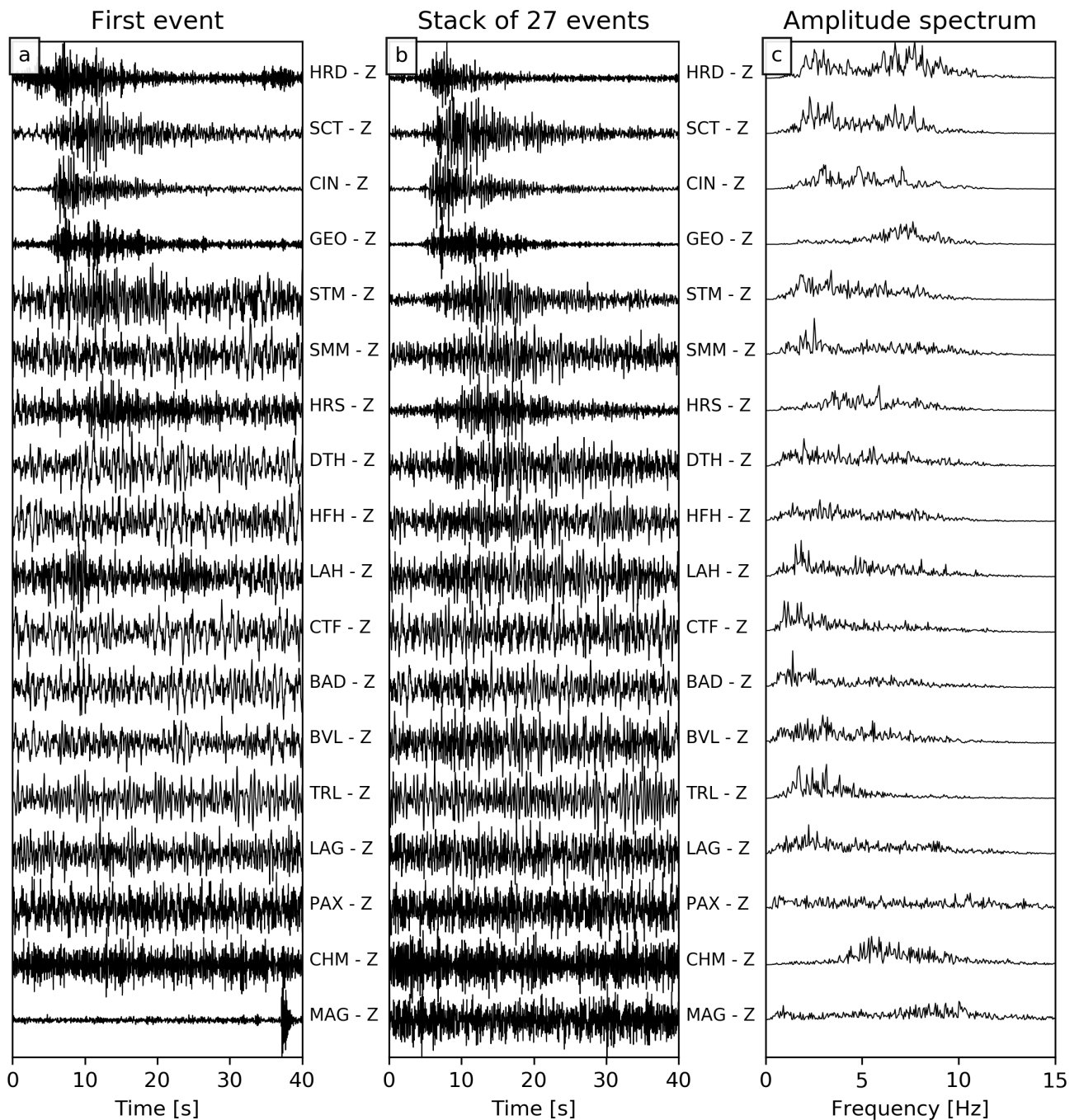


Figure S15: [a] The waveform of the first detected event in Family 10 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 27 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b].

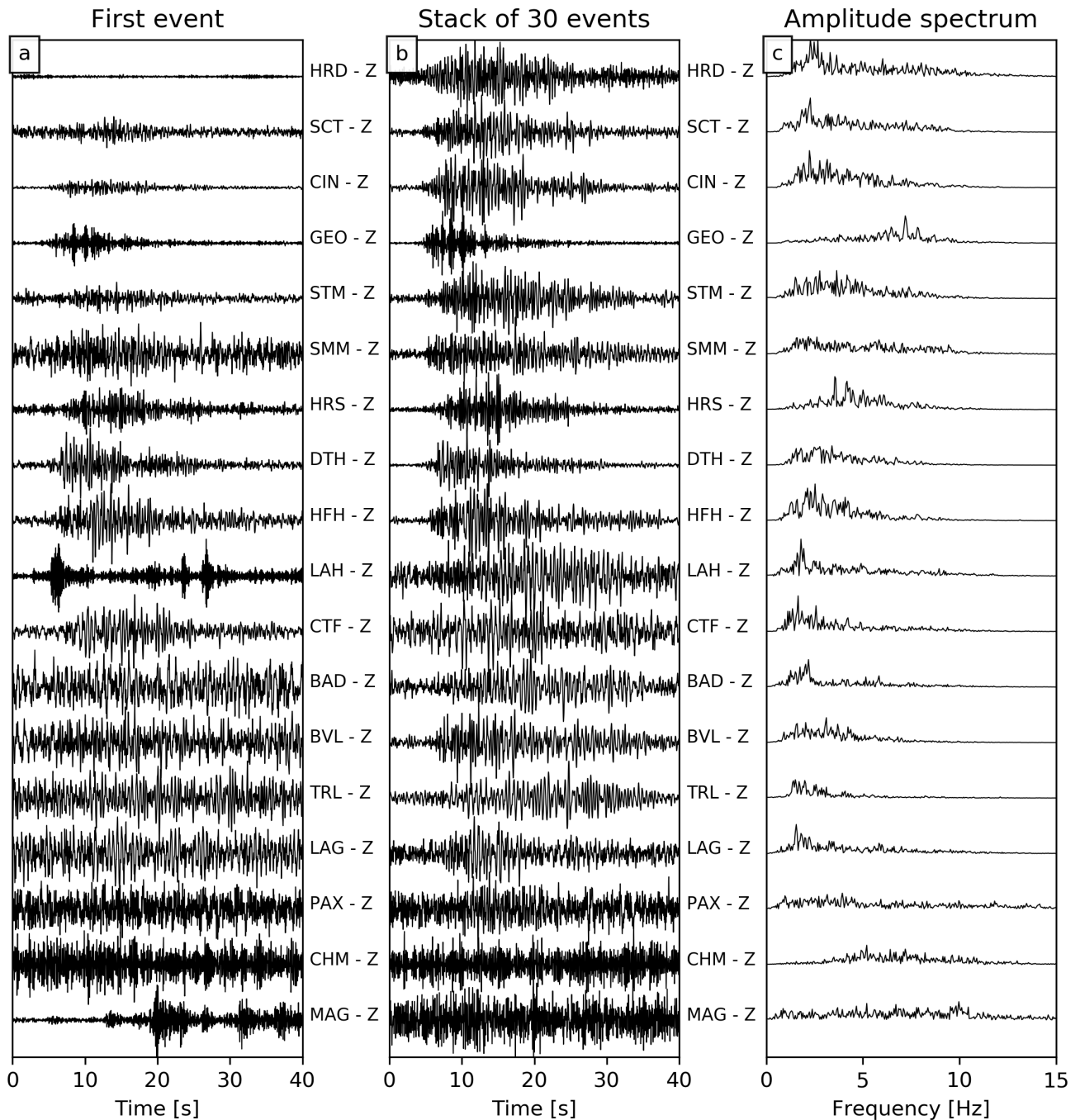


Figure S16: [a] The waveform of the first detected event in Family 11 as recorded at stations within the 2015 deployment, ordered by distance from the summit. [b] Stacked waveforms generated from the 30 events detected in family 1 at each station. [c] Frequency-amplitude spectra of the stack waveforms presented in panel [b].

Table S1 – Details of the stations deployed around Llaima volcano in early 2015. All stations marked with an asterisk were used in the multi-station detection step.

Name	Longitude	Latitude	Altitude (m)	DAS Type	Sensor Type
WAT	-71.65767	-38.7243	1027	Centaur	Trillium 120PA
MIC	-71.7123	-38.6565	1411	REFTEK 130	Guralp 40T
TRL	-71.6455836	-38.754478	882	Guralp	Guralp 3T
LAH	-71.72533	-38.63643	1183	Guralp	Guralp 3T
BAD	-71.782943	-38.644051	1245	Guralp	Guralp 3T
SMM	-71.79142	-38.69038	1711	Guralp	Guralp 3T
PAX	-71.742971	-38.820343	712	Guralp	Guralp 3T
LAG	-71.598033	-38.69351	998	Guralp	Guralp 3T
CHM	-71.5855	-38.765	840	Taurus	Trillium 120PA
RAB	-71.7367	-38.8949	732	Taurus	Trillium 120PA
SCT*	-71.72349	-38.67293	1934	REFTEK 130	Guralp 40T
CIN*	-71.7029	-38.6844	1934	REFTEK 130	Trillium 120PA
MAG	-71.8941	-38.8551	501	Taurus	Trillium 120PA
ROD	-71.82444	-38.93478	821	Centaur	Trillium 120PA
MDV	-71.8741	-38.8996	490	REFTEK 130	Trillium 120PA
GEO*	-71.69817	-38.70291	1933	REFTEK 130	Trillium 120PA
STM*	-71.765127	-38.687911	1970	Centaur	Trillium 120PA
RLW*	-71.7639	-38.7059	1975	REFTEK 130	Trillium 120PA
POW	-71.79934	-38.8094	777	REFTEK 130	Guralp 3T
HRD*	-71.73027	-38.69548	3080	Meridian	Meridian
CTF	-71.72169	-38.76369	1473	Meridian	Meridian
DTH*	-71.72274	-38.74567	1720	Meridian	Meridian
HFH	-71.76026	-38.75104	1621	Meridian	Meridian
BVL	-71.7925	-38.75609	1478	Meridian	Meridian
HRS	-71.77995	-38.72586	1810	Meridian	Meridian
LST*	-71.68367	-38.72921	1486	Meridian	Meridian

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