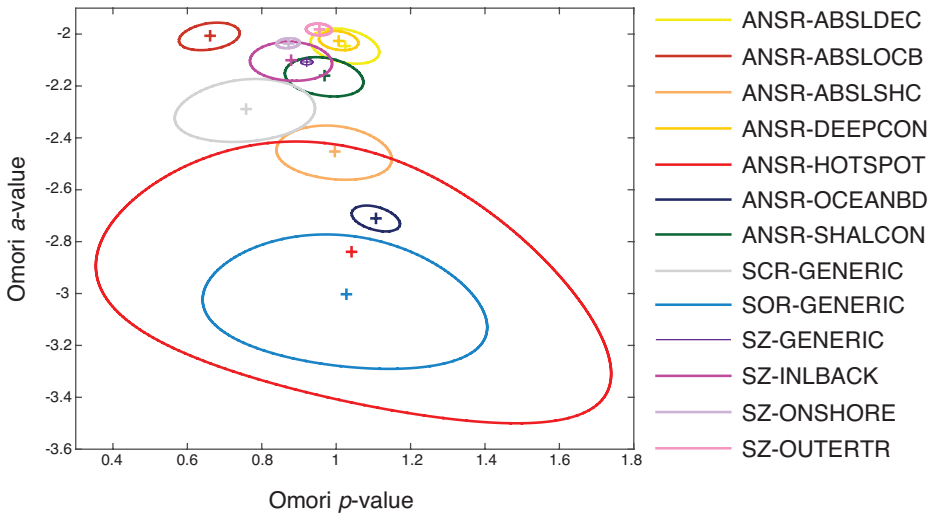

Figure S1: Omori parameter 95% confidence limits for sequences within the García et al. (2012) tectonic regions (Figure 3). Maximum likelihood solutions (see Figure 5 for fits) are shown by the '+' symbols.

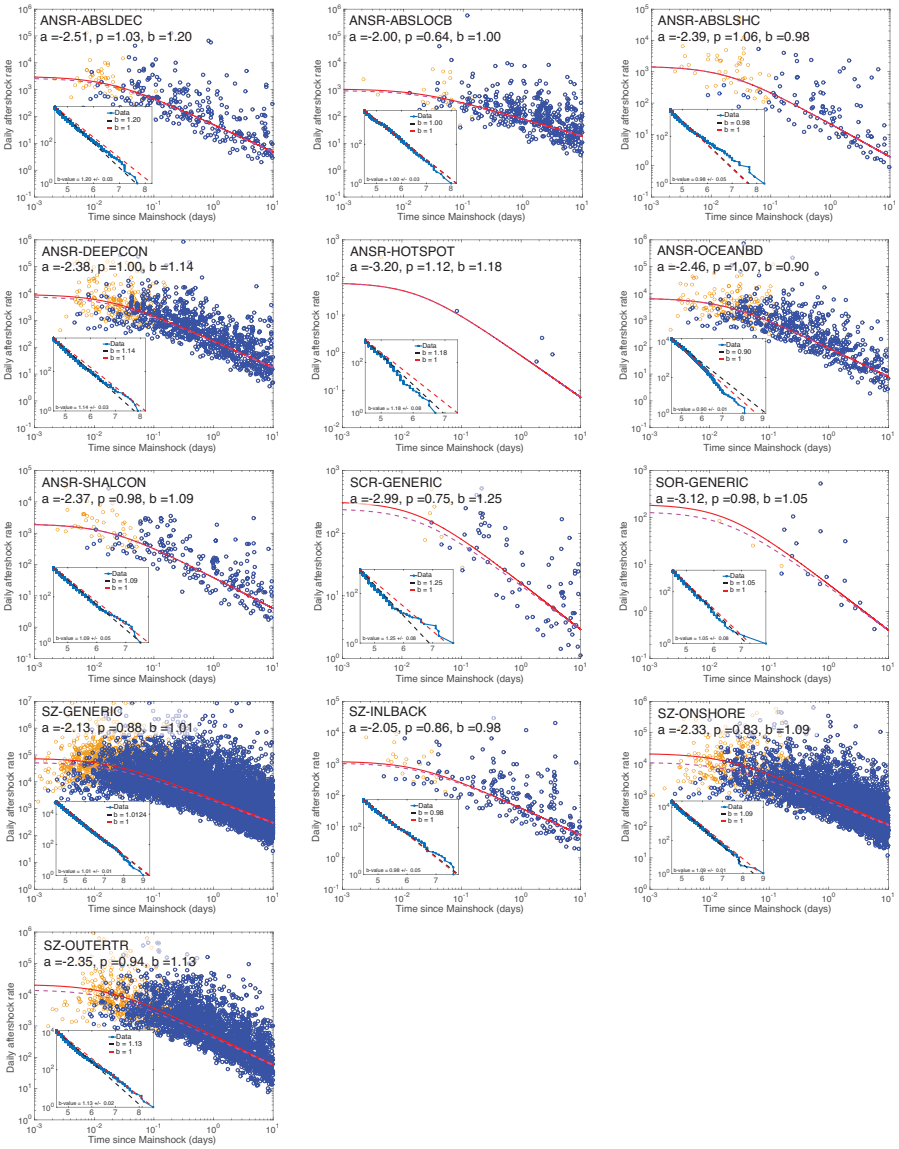

Figure S2: Stacked Omori fits for aftershock sequences within the García *et al.* (2012) tectonic regions (Figure 3) in the format of Figure 5, using maximum-likelihood b-values fit to all earthquakes in the catalog (NEIC, 1990-2015) within each region. Insets: Magnitude-frequency distributions for earthquakes in each region, with maximum-likelihood b-value fits and $b = 1$, for comparison.

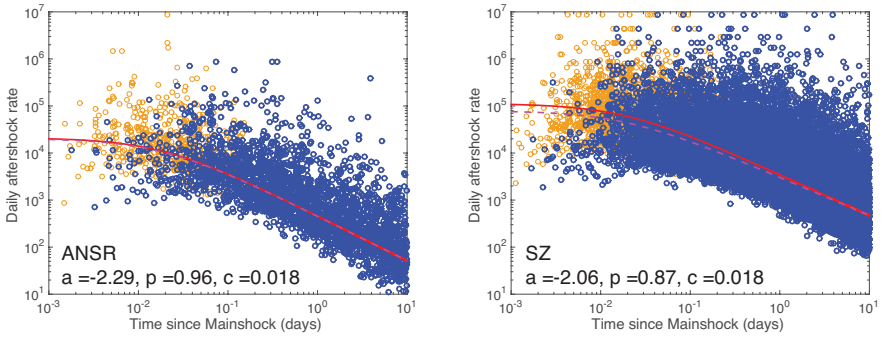

Figure S3: Stacked Omori fits for aftershock sequences within the all ANSR and SZ García *et al.* (2012) tectonic regions (Figure 3) in the format of Figure 5.

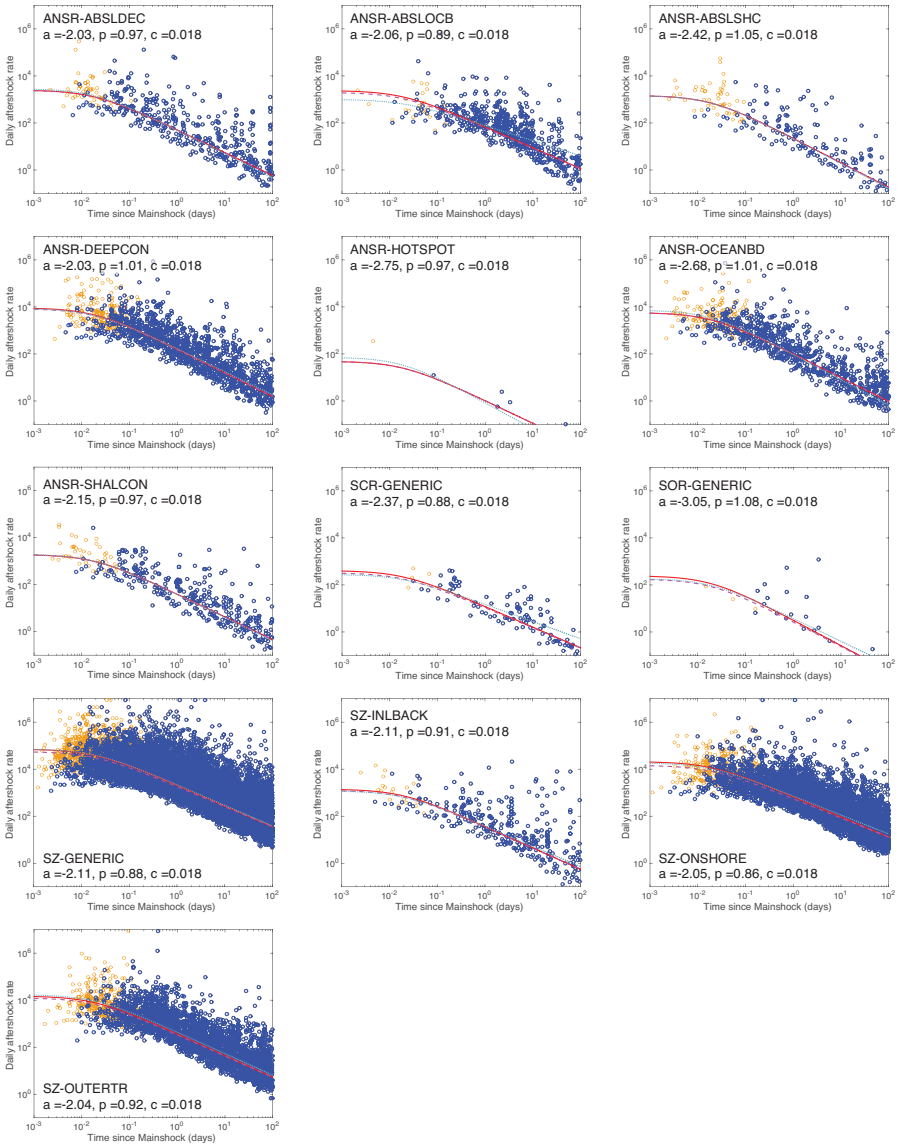

Figure S4: 100-day fits for aftershock sequences within the all García *et al.* (2012) tectonic regions (Figure 3) in the format of Figure 5. Light blue dotted lines show 10-day fits (Figure 5) for comparison.

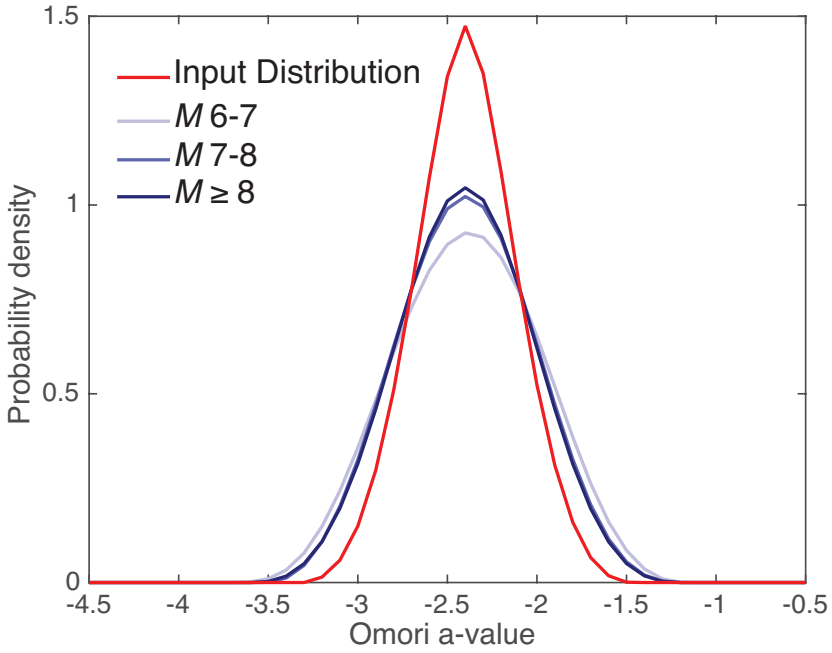

Figure S5: Synthetic Test Results. We generate 10-day synthetic aftershock sequences for all mainshocks in the global dataset, assuming the mean global p-value and the distribution of a-values shown. Recovered a-value distributions for different mainshock magnitude bins show that the inversion recovers a slightly wider a-value distribution with the correct mean.