Supplementary Materials:

Weeks-long and years-long slow slip and tectonic tremor episodes on the south-central Alaska megathrust

Baptiste Rousset[1], Yuning Fu[2], Noel Bartlow[1] and Roland Bürgmann[1]

[1] Department of Earth and Planetary Science, University of California, Berkeley, Berkeley, CA 94720, USA.

[2] School of Earth, Environment and Society, Bowling Green State University, Bowling Green, OH 43403, USA.

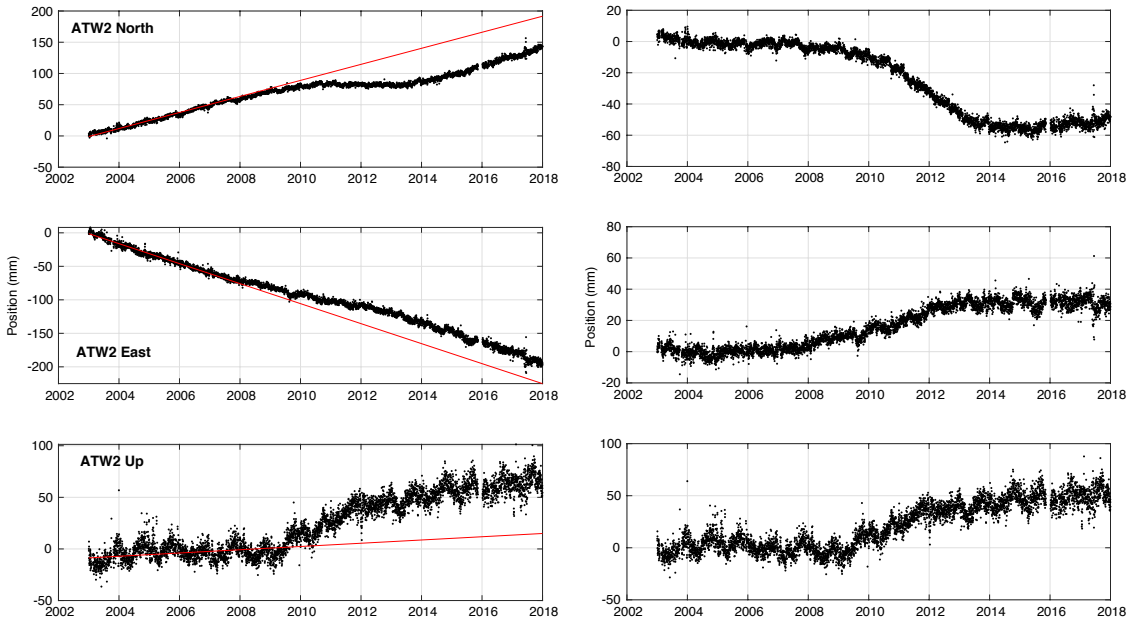

Figure S1: GPS position time series at site ATW2. Left: times series relative to stable North America plate. Red lines are showing best linear fit for inter-SSE periods. Right: Residual time series after subtracting the linear term.

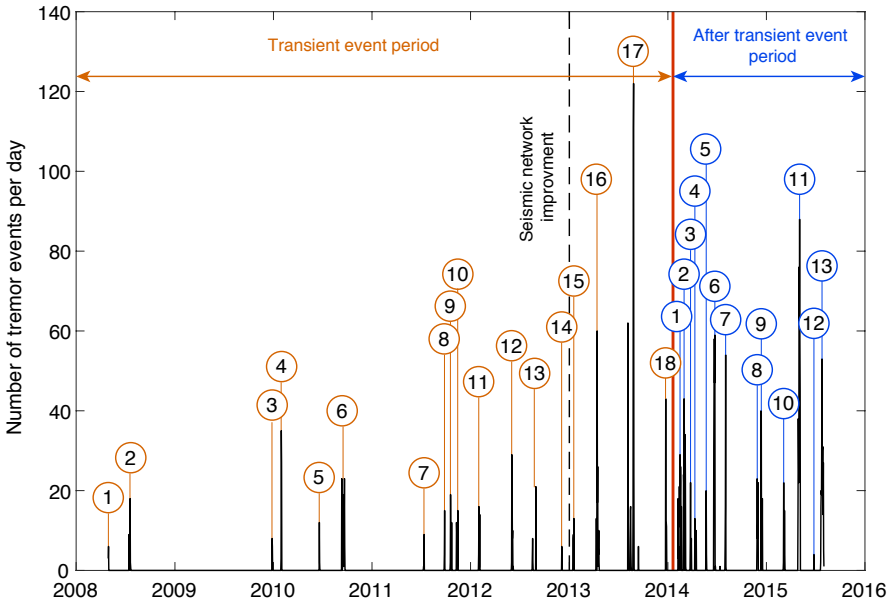

Figure S2: Tremor clusters used to decompose the GPS time series. The black line represents the daily count of tremors. Orange and blue numbers show the clusters of tremors used to decompose the GPS time series respectively during and after the 5-year transient event.

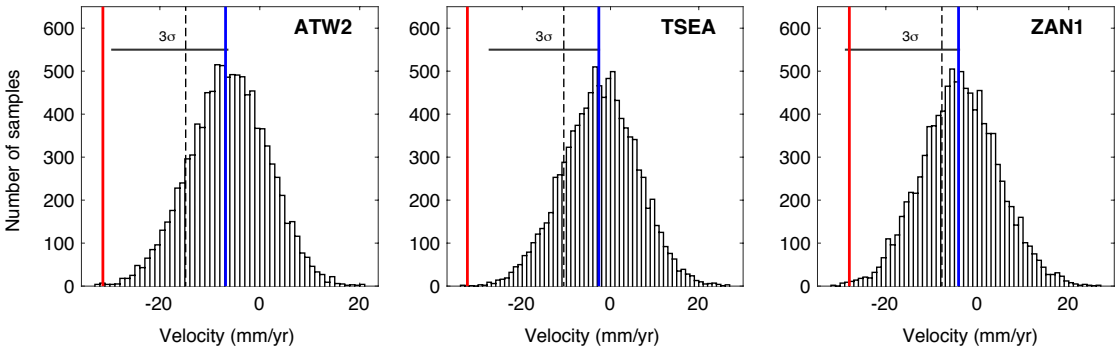

Figure S3: Velocities obtained by random decompositions during the 5-year transient event. The velocities shown on the histogram are obtained from time series with tremor periods removed, for which we have randomly selected 18 periods that correspond to the number and duration of the actual tremor clusters to perform the decomposition and estimate a velocities. 3-sigma of the distributions are indicated. The blue and red lines indicate the velocities obtained respectively for the tremor and inter-tremor periods. The black dashed line indicates the constant displacement rate as a reference.

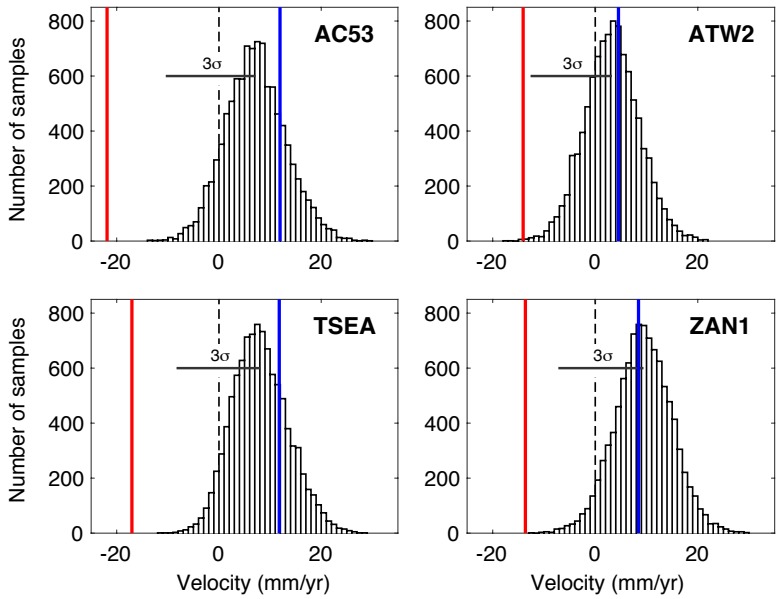

Figure S4: Same as figure S3 but for the period 2014 - 2016, after the 5-year transient event.

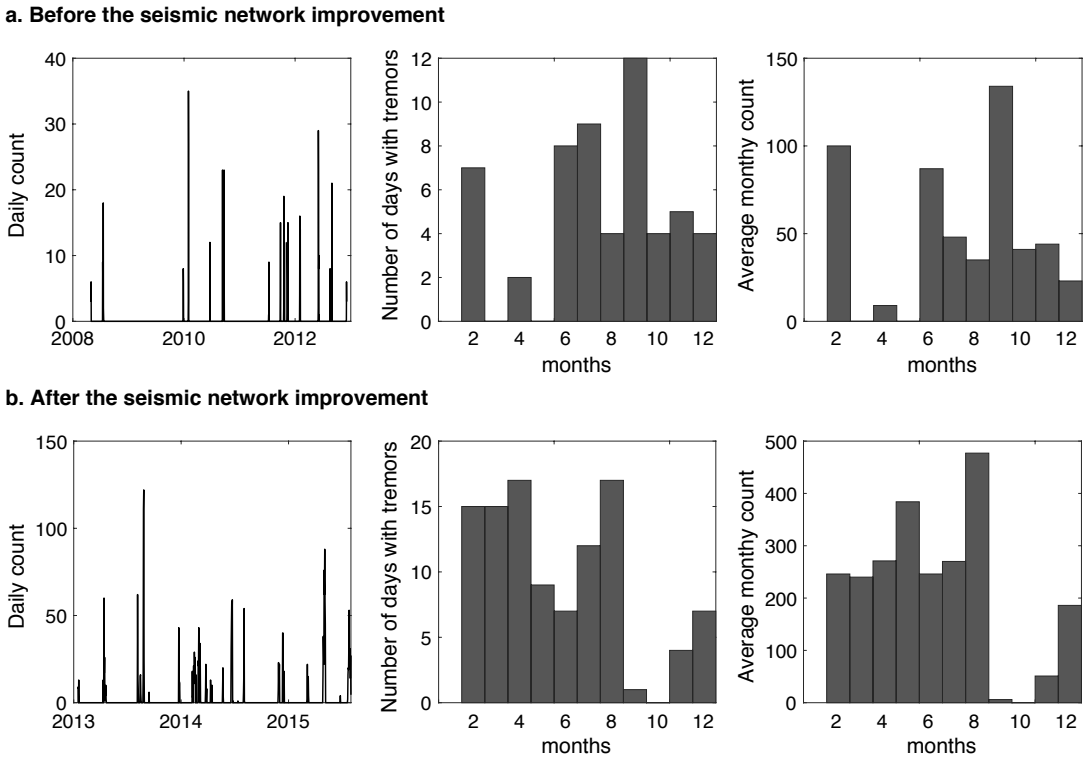

Figure S5: Distribution of catalogued tremors with time before (a) and after (b) the seismic network improvement. (left) Daily number of events. (middle) Average number of days with tremors as a function of month-of-year. (right) Average cumulative number of tremors versus month-of-year.

GPS site	Velocity difference 5-year transient (mm/yr)	Velocity difference Interseismic period (mm/yr)
ATW2	24.15 ± 1.69	18.60 ± 1.62
TSEA	29.69 ± 1.66	28.82 ± 2.10
ZAN1	23.88 ± 1.93	22.07 ± 2.84

Table S1: Difference between tremor period and inter-tremor period velocities for the 5-year 2009 - 2013 period and the 2014 - 2016 interseismic period. These velocities correspond to the the surface deformation associated with short-term transient deformation at tremor burst times.