The June 24, 2026 M5.6 Redwood Valley, CA earthquake and creep on the Maacama fault

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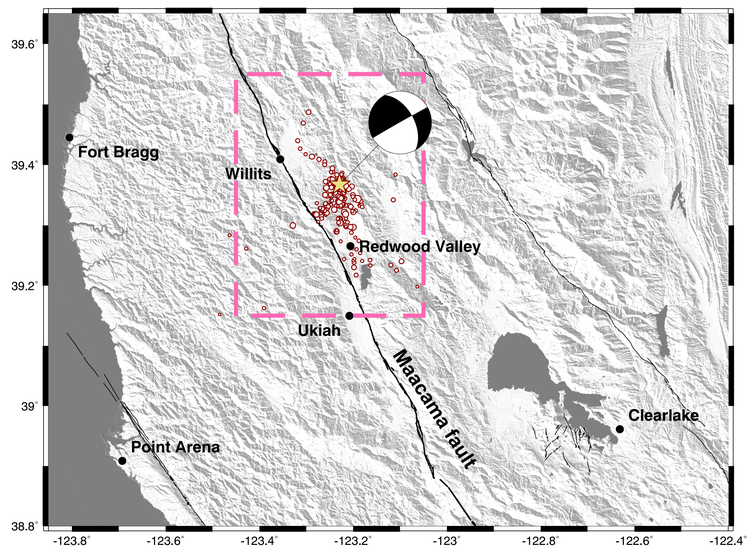
Context and motivation

- Mainshock: 8:10 am local time, June 24, 2026
- M_w 5.6, minor damage, power outages locally
- Epicenter: 7 km NE of the Maacama fault
- Moment tensor solution: right-lateral strike-slip on NW-trending fault, with 54° dip
- Maacama fault creeps at the surface locally

How does the earthquake relate to the Maacama fault and its creep?



Data sources

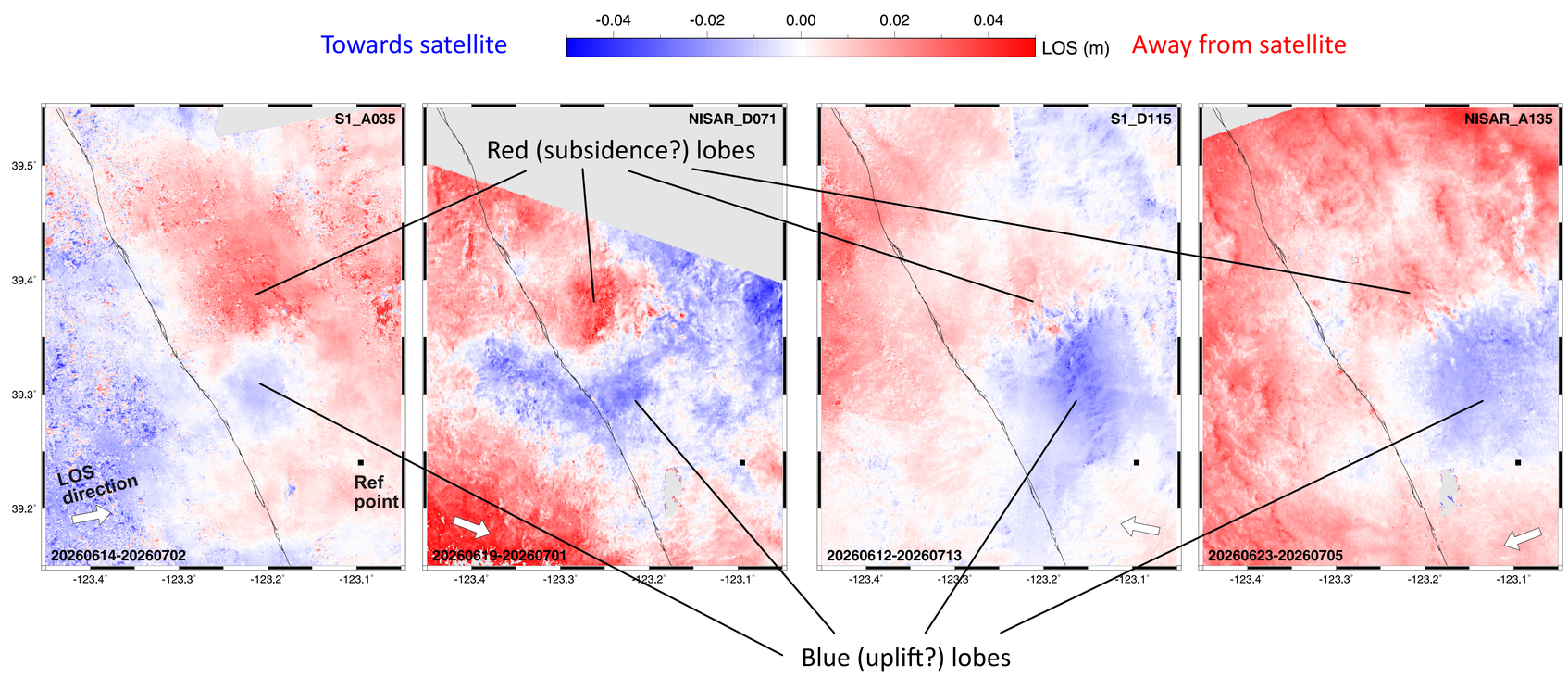
- Seismicity: NCAeqDDRT catalog
- Moment tensor: NCEDC
- Coseismic InSAR data: Copernicus (Sentinel-1) and NASA (NISAR) via ASF
- InSAR velocities: Sangha et al. (2026)*

Left: Mainshock (gold star) and aftershocks (white circles) are located NE of the Maacama fault trace, indicating moderate NE-ward dip. Pink box indicates location of InSAR data subset used (below).

InSAR data of the earthquake

- Sentinel-1 data processed using ISCE2; daisy chain stacks used to mitigate bad troposphere
- NISAR GUNW interferograms with ionosphere and troposphere corrections applied
- Collocated paired lobes of range increase (red) and decrease (blue) are present in all four interferograms, east of the fault

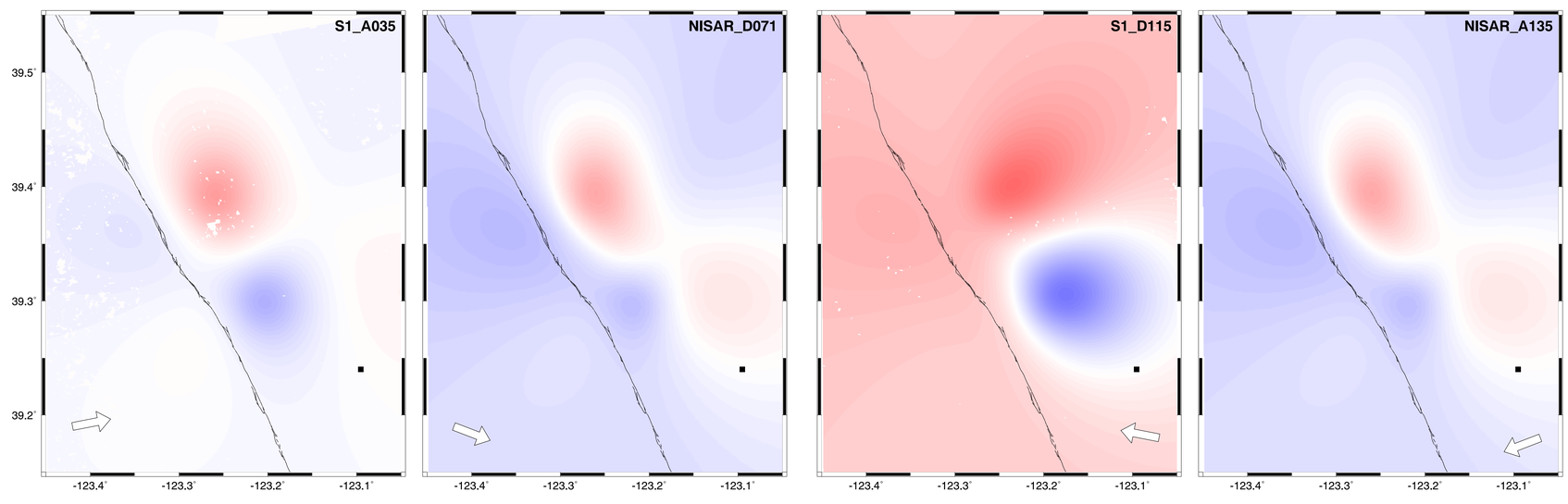
Is the signal real? It is seen in the same place in multiple interferograms from different dates and viewing geometries. Noise is unlikely to be spatially persistent like this!

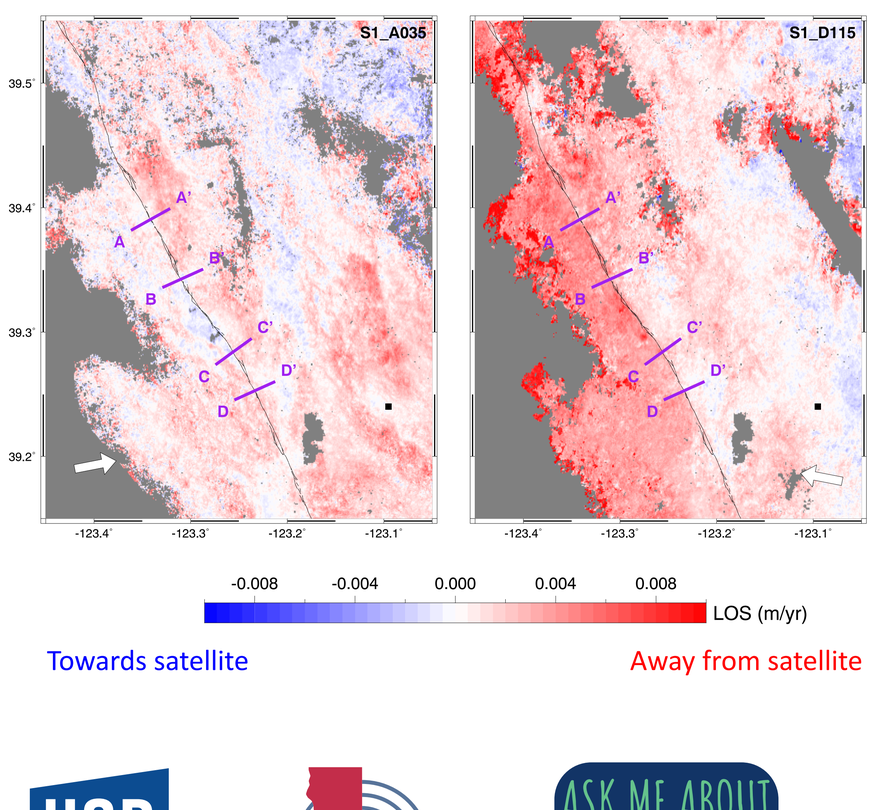


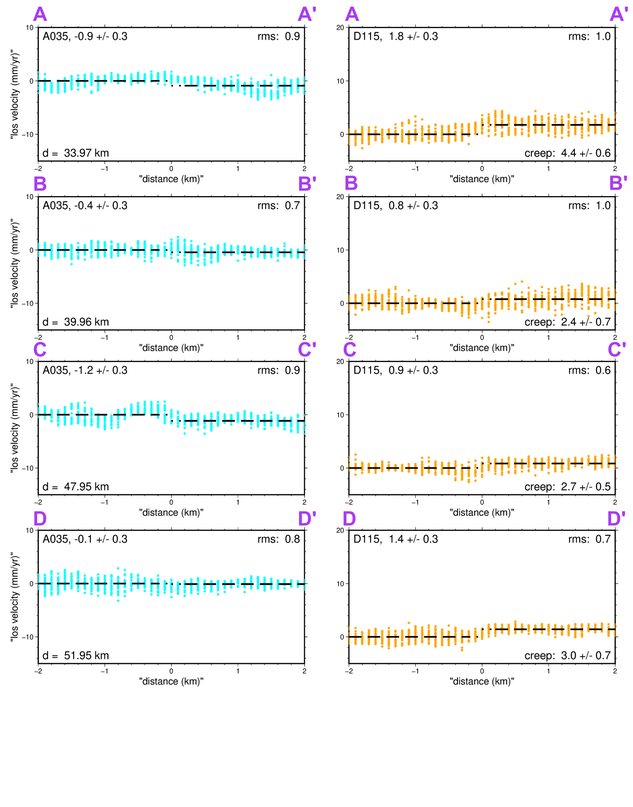
Preliminary model of the earthquake

- Forward model based on NCEDC moment tensor (dip 54°, rake 180°) and scale of deformation pattern (depth 4-9 km, length 11 km)
- Without any optimization, I can reproduce the approximate pattern of deformation lobes for three out of four interferograms
- Some of the discrepancy could be due to the remaining tropospheric noise in the data, but both the model and the data need refinement

Maybe the signal really is the earthquake!







Comparison with creep; discussion

- Sentinel-1 InSAR velocities (far left) constrain surface creep rates along the Maacama fault
- Cross-fault velocity profile offsets are inverted (near left) for creep and vertical offset rates
- I estimate surface creep in the vicinity of Willits (A-A') at 4.4 ± 0.6 mm/yr; in the vicinity of the earthquake, estimates are 2.4–3.0 mm/yr

Is the presence of a (previously) locked asperity on the fault slowing the creep rate near Redwood Valley? Could we have used this feature to identify it earlier?

Is the 'coseismic' signal (M5.8 in my model) really a combination of the earthquake (M5.6 estimated seismically) and postseismic creep?

*Sangha, S., G. Funning, D. Bekaert and M. Govorcin, Earth and Space Science, Earth and Space Science, 13, e2026EA005214. https://doi.org/10.1029/2026EA005214 – out this week!

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