Surface displacements and megathrust slip of the M8.8 2025 Kamchatka earthquake from Sentinel-1 InSAR

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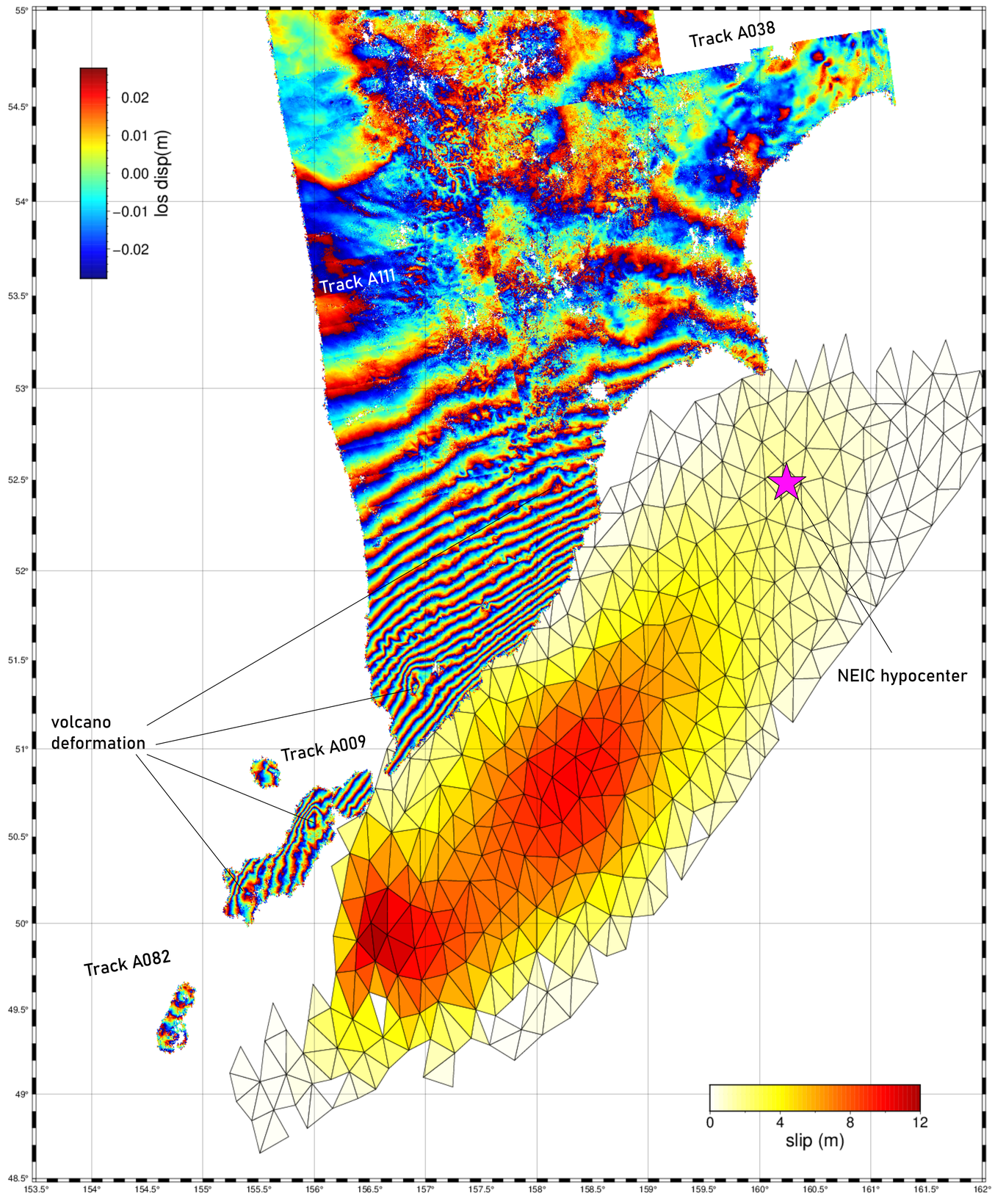
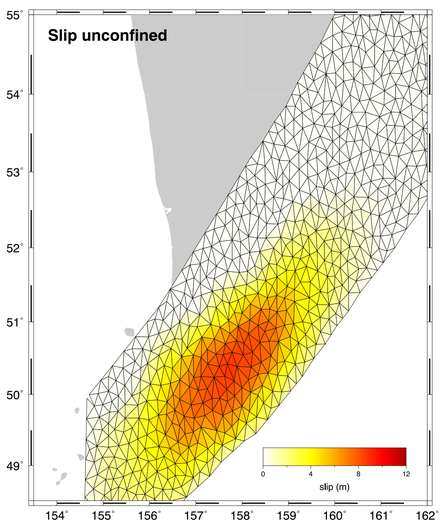
Data

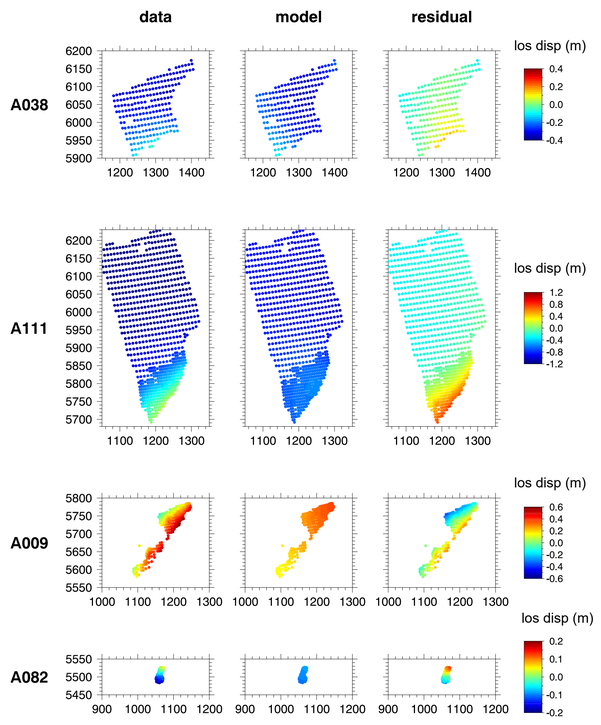
- 12-day coseismic interferograms from four ascending Sentinel-1 tracks, processed using ISCE2 (below)
- GACOS atmosphere corrections applied to mitigate noise
- Phase offsets between islands verified by inspection



Model 1: unconstrained

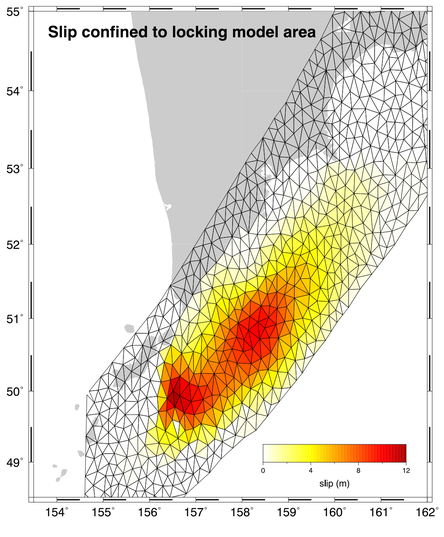
- Invert for slip based on whole mesh (Slab2.0)
- Peak slip 8.5 m, ~4 m slip inferred at the surface
- M_0 = 1.98 × 10²² Nm (M_w 8.83), total squared misfit = 1.09 m²

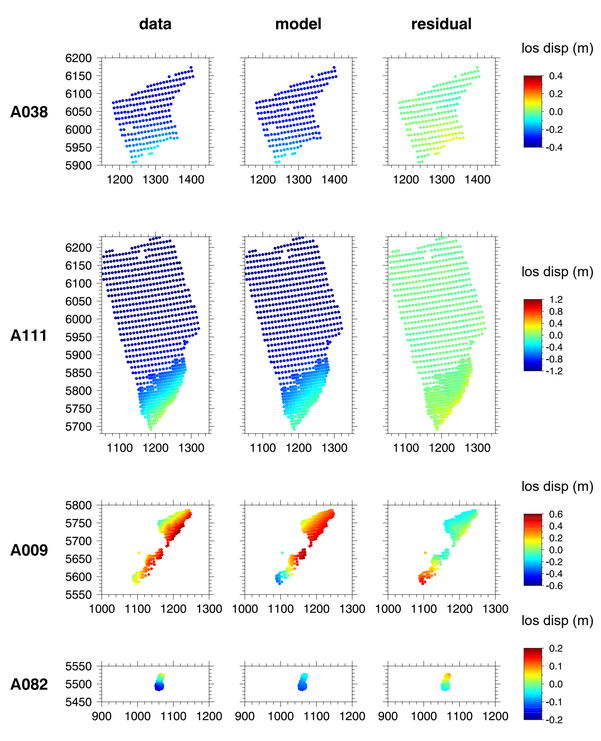




Model 2: confined to locked region

- We use our interseismic locking model (see poster 171) to restrict the area allowed to slip
- Slip focused in two deeper asperities, south of the southern tip of the Kamachatka Peninsula, negligible surface slip
- M_0 = 1.66 × 10²² Nm (M_w 8.79), total squared misfit = 1.67 m²





Discussion

- Given the limited tsunami observed for this event, we prefer model 2 with its deeper slip, over model 1 with its significant surface slip
- The difference in root mean squared misfit is small (2.6 cm for model 1 vs 3.2 cm for model 2)
- Multiple volcano deformation signals can be identified in the InSAR data, suggesting that the earthquake stimulated magmatic activity

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