Using GeoGateway to access NASA Earth Science data for teaching

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Locating Faults & Fault Creep Using UAVSAR Interferograms

UAVSAR interferogram data is collected using radar instruments, providing detailed images of ground deformation. *Figure 1* shows how UAVSAR interferogram data can be used to view the creeping section of the San Andreas fault (SAF), located between San Juan Bautista and Parkfield. *Figure 1(a)* shows the side-by-side view of selected interferograms, which form a linear feature between points **A** and **B**.

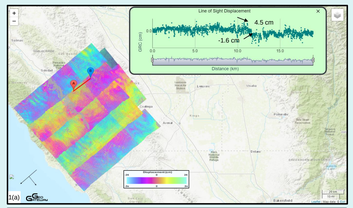


Figure 1(a): Interferogram overlayed on a creeping section of the SAF. The SAF runs through the interferogram where there is a line-of -sight (LOS) change. The LOS tool displays surface displacement for the period between flights.

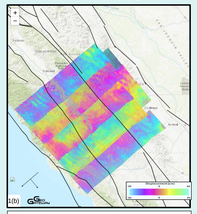


Figure 1(b): Interferogram with black lines representing UCERF3 faults.

Figure *1(b)* shows the Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) faults plotted as black lines overlaid on the UAVSAR interferograms. The relatively high slip rate SAF is the most prominent fault imaged by UAVSAR interferograms in *Figure 1.* The line-of-sight (LOS) tool shows a change in distance within the selected swath spanning the SAF. This example shows 4.5 cm of LOS slip across the fault.

To Visit GeoGateway

To obtain an overview of GeoGateway and its products, view the recent publications and User Guide located on the **Help** tab.

Abstract

NASA's airborne- and satellite-based instruments provide Earth science data for understanding natural disasters, tectonic processes and environmental change. NASA data are free and openly accessible for students and instructors but can be challenging to use. GeoGateway (https://geo-gateway.org) is a powerful yet usable analytic center framework that enables users to integrate disparate data sources for intuitive and rapid science analysis. It is suitable for both research and teaching at undergraduate through graduate levels. GeoGateway provides tools for educational and scientific discovery, field use, and disaster response using UAVSAR and GNSS integrated with earthquake fault, seismicity, and model data. **We developed a User Guide and introductory Exercises** to help students and new users become familiar with GeoGateway tools and data sets. We invite the SCEC Community of scientists and educators to submit suggestions for new Exercises to be developed and posted on GeoGateway. **Our interactive poster will link to a survey for submitting ideas or requests for Exercises to be developed and posted on GeoGateway.**

Analyzing Coseismic and Postseismic Slip Using GNSS

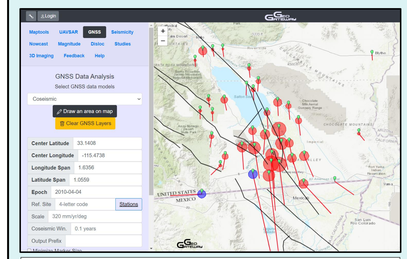


Figure 3(a): Coseismic displacement

Figure 3(a), shows (EMC) earthquake coseismic displacement. Most stations moved South and upward (red circles) and two stations moved downward (blue circles).

Figure 3(b) displays the EMC earthquake's postseismic displacement. Here stations are also moving to the South, but at shorter distances, with all stations displaying movement upward.

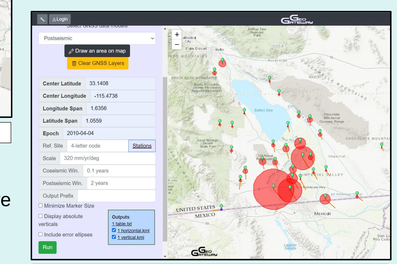


Figure (b): Postseismic displacement

El Mayor-Cucapah (EMC) Earthquake

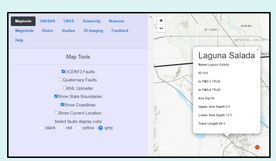


Figure 2(a): *Using Maptools tab to overlay UCERF3 faults in EMC earthquake region.*

Figure 2(b): *UAVSAR tools shows ground range change from the EMC earthquake.*

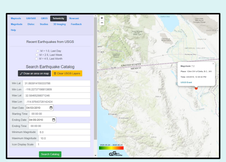


Figure 2(c): *Using the Seismicity tool to filter the EMC earthquake onto the map.*

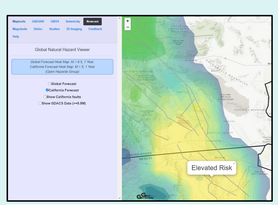


Figure 2(d): *Selecting the Nowcast tool's California Forecast option, displays elevated risk (present day) in region of EMC earthquake.*

Figure 2(e): *Magnitude tab used to calculate EMC earthquake magnitude from parameters.*

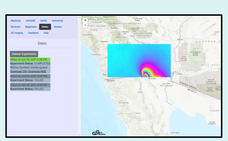


Figure 2(f): *Disloc tool used to create a dislocation model for the EMC earthquake.*

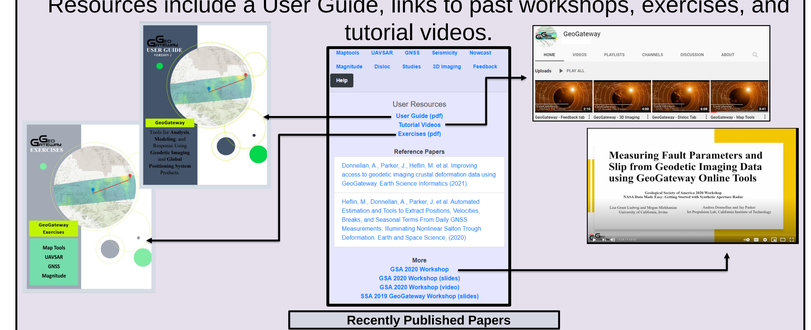
GeoGateway Outreach Survey

SCEC participants are encouraged to take the GeoGateway Outreach survey. The survey can be accessed via the link below. The team looks forward to the feedback.

GeoGateway Outreach Survey

GeoGateway Resources

The **Help** tab describes GeoGateway hosted datasets and tools. Resources include a User Guide, links to past workshops, exercises, and tutorial videos.



Recently Published Papers

Parker, J., Donnellan, A., Bilham, R., Ludwig, L. G., Wang, J., Pierce, M., et al. (2021). Buried aseismic slip and off-fault deformation on the southernmost San Andreas fault triggered by the 2010 El Mayor Cucapah earthquake revealed by UAVSAR. Earth and Space Science, 8, e2021EA001682. https://doi.org/10.1029/2021EA001682

Pulver, N., Donnellan, A., Parker, J., & LaBrecque, L. (2021). Observing southern California landslides using UAVSAR: La Conchita as a case study. Washington: American Geophysical Union. doi: http://dx.doi.org/10.1002/essoar.10506420.1