Developing a GeoGateway User Community

SCEC 2020 Annual Meeting

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GeoGateway

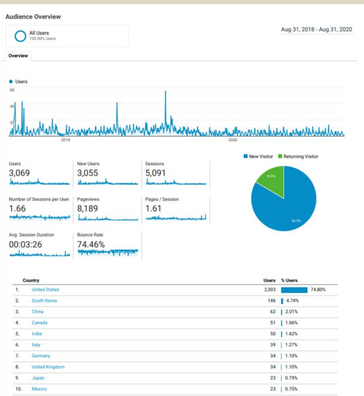
Abstract

Science gateways allow research communities to access shared data, software and services. GeoGateway (http://geo-gateway.org) is a science gateway that provides online tools for analysis, and modeling of crustal deformation using geodetic imaging data. GeoGateway bridges the gap between production and end-use of data products by simplifying the discovery of geodetic imaging products including UAVSAR, InSAR, GNSS, seismicity and fault data thereby enabling users to explore and integrate data products, and allowing researchers to easily share, publish and collaborate. We developed multiple methods for expanding the GeoGateway science user community. Initial efforts focused on showcasing GeoGateway in scientific talks, posters and papers. Discussions with users revealed technical challenges for adoption by novice users. To make GeoGateway accessible to a broad audience, we developed tutorial exercises and a GeoGateway User Guide. The tutorial exercises were tested in an undergraduate class at CalPoly Pomona in 2018, and the User Guide was rolled out during a workshop at the 2019 SSA Meeting. The classroom exercises and SSA workshop generated the largest single day user counts (41-42) to that date. Subsequently the 2019 Ridgecrest CA earthquake sequence generated the largest daily user count (55), suggesting that user training and development of a guide were effective in making GeoGateway more accessible to users following an earthquake. Since 2015 there were >11,000 GeoGateway sessions and >600 repeat users. In the past year there were >340 repeat users and >2,700 sessions. We are currently developing a new user interface along side, creating video tutorials to enhance the GeoGateway website, and offering webinars for remote training.

GeoGateway

GeoGateway is a data product search and analysis gateway for scientific discovery, field use, and disaster response. To be effective, users require data overlay and visualization, interactive analysis features, and data product download. The data products of focus in this project are NASA's UAVSAR and spaceborne interferometric radar, (InSAR), geologic earthquake faults, Global Positioning System (GPS) position time series, moment magnitude calculator, elastic dislocation models, and seismicity.

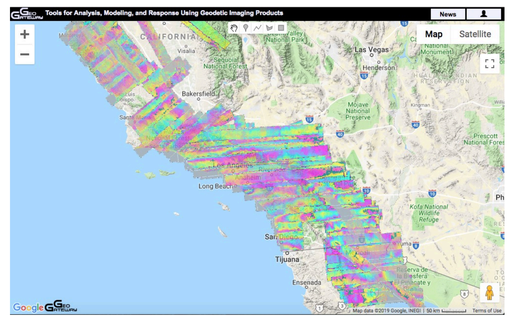
GeoGateway User Community



As shown in the analytics graph, GeoGateway is used primarily by English speakers in the USA, with <20 users per day, and peak periods of >40 users per day. A downloadable User Guide was developed to increase the GeoGateway user community by providing a resource for novice users. The ongoing development of tutorial videos will also provide guidance for novice users. User analytics will be monitored to see if there is an increase in users.

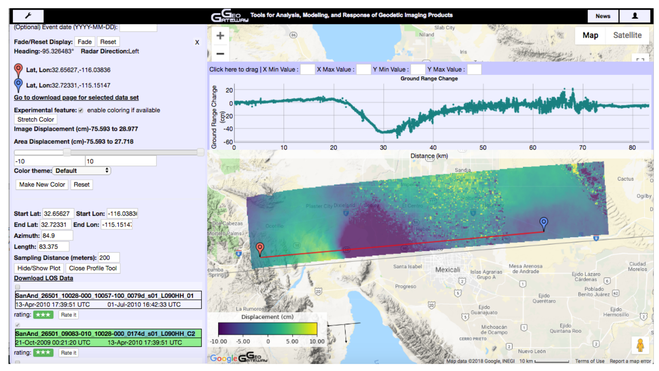
UAVSAR/InSAR Interferograms

GeoGateway allows users to efficiently find and use NASA geodetic imaging data products. Here we see available UAVSAR interferograms spanning California. Users can zoom in and select relevant interferograms.



Line-Of-Sight (LOS) Tool

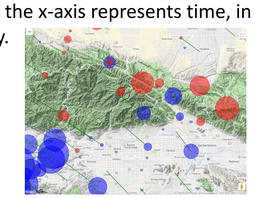
- GeoGateway's Line-of-Sight (LOS) tool allows easy selection and plotting of interferograms from pairs of UAVSAR flights.
- The interferogram images allow change detection for recognition of tectonic deformation.
- The LOS tool measures and displays surface elevation changes during the time period between flights.
- This is helpful for detecting creep, interpreting results of paleoseismic studies, and recognizing interseismic or coseismic deformation.

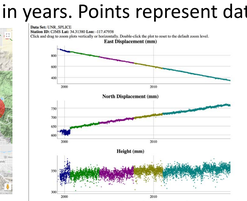


Using the LOS tool to measure surface change over the UAVSAR strip as shown in the figure above, reveals deformation associated with the 4 April 2010 Mw7.2 El Mayor-Cucapah (EMC) earthquake, in high resolution graphical format.

Global Navigation Satellite System (GNSS) Tool

GeoGateway's Global Navigation Satellite System (GNSS) tool allows for measuring plate motion and indications of strain accumulation across faults. The data is gathered when the GPS station receives signals from satellites. Movement is displayed as vectors on a map (below left) or with three graphs (below right). The horizontal trend of displacement on the map is indicated by green arrows, while upward motions are shown by red dots, downward by blue. The y-axis on the three-line plots represent position change to the east, north, and up in a standard global reference frame, and the x-axis represents time, in years. Points represent data points, recorded almost daily.



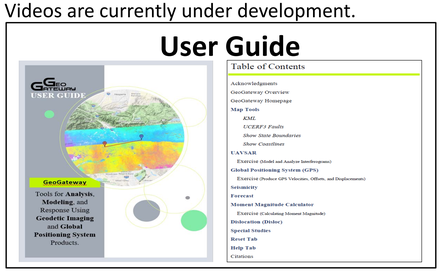


Using the GNSS tool, the graphs display the movement of the GPS station selected. The graphs show that the GPS station (CJMS) is moving Northwest and has a slight upward motion. On the top graph on right, the dots display Westward movement, and in the middle graph, the dots show Northward movement. The different line colors are a segmentation of the local three-dimensional time series data according to a hidden Markov model, providing an automatic way to focus attention on the most interesting parts of the time series.

GeoGateway User Guide & Tutorial Videos

GeoGateway's User Guide and tutorial videos present and describe the hosted datasets and models accessible on GeoGateway. The User Guide allows for users to gain hands on experience through the inclusion of sample exercises to complete. GeoGateway's Tutorial Videos are currently under development.

User Guide



Sample Screenshot View of Tutorial Video

GeoGateway's New Interface

GeoGateway is undergoing an update that will provide users with a modern interface based on web tools that will allow for increased scalability. There will be minor changes to existing tools along with some additions to streamline their use. It is currently in the beta stage and soon will be available for public use.