

GAGE

National Science Foundation's
Geodetic Facility for the
Advancement of Geoscience

GAGE Facility GNSS Data Archives and Products

Kelly Enloe (enloe@unavco.org), David Phillips, Charles Meertens, Dan Reiner, David Maggert,
Christine Puskas, Michael Rost, Michael Marquez, Susana Gross



Abstract

The GAGE Facility GNSS Data Center, operated by UNAVCO Geodetic Data Services (GDS), manages a complex set of data, metadata and data flow operations from sensor to users, providing a wide range of geodetic/geophysical observations to the scientific and educational communities. This include data operations (managing metadata, data downloading, ingestion, and preprocessing); data products and services (generating processed results, and QA/QC); data management and archiving (distribution, curation and attribution-DOIs); and associated cyberinfrastructure.

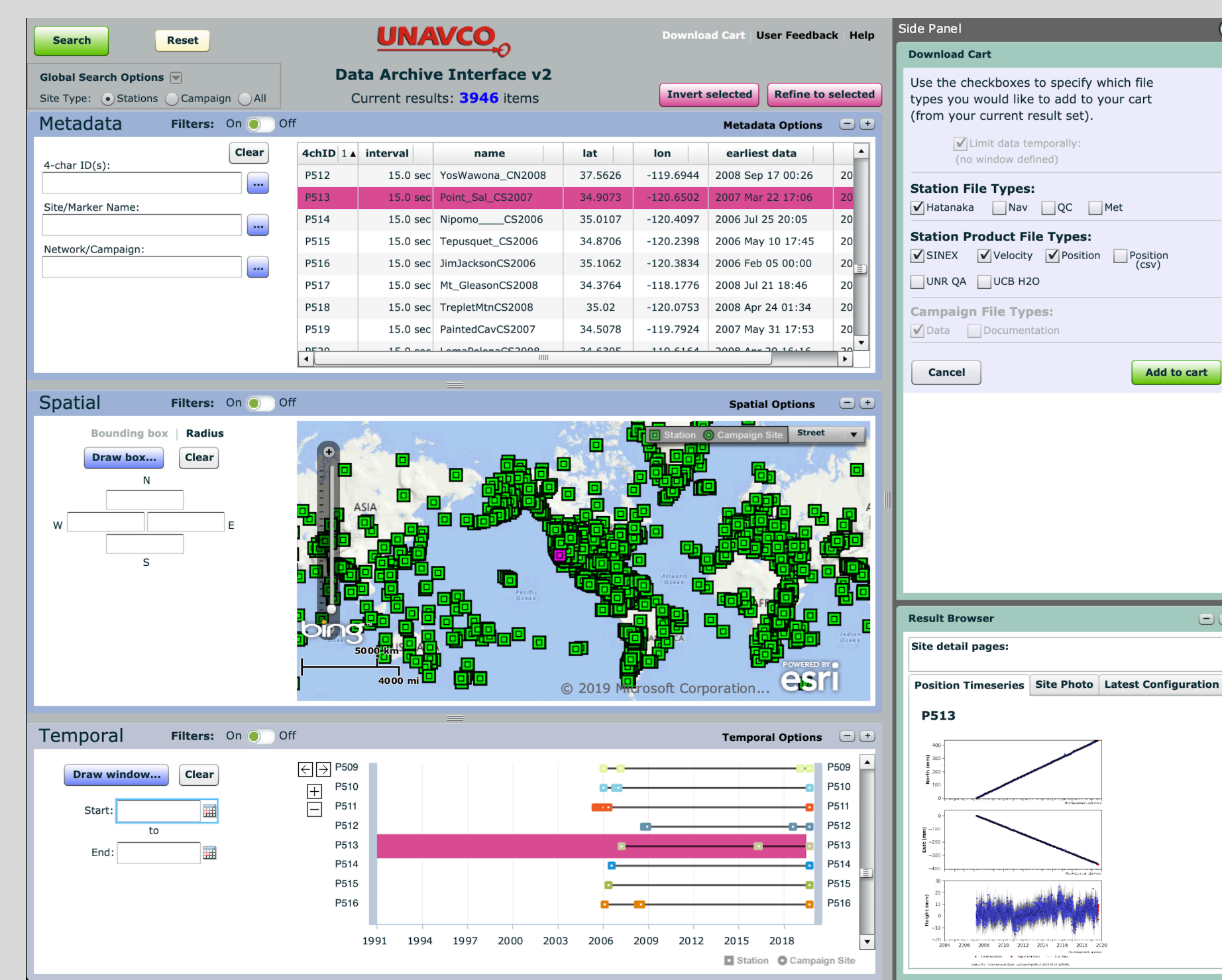
GAGE Facility GNSS data products include raw receiver files (Level 0), pre-processed GNSS observation data (Level 1, e.g., RINEX files), and post-processed derived solutions (e.g., position solution time series, velocity solutions, tropospheric parameters). GNSS data are acquired from thousands of continuously operating sites from the Network of the Americas (NOTA), operated by UNAVCO, as well as PI networks and episodic "campaign" surveys conducted by the community. NOTA consists of ~1,278 selected stations from pre-existing NSF funded networks including the Plate Boundary Observatory (PBO), Caribbean COCONet network, and Mexican TLALOC network. GDS provides data services for another 1,600+ contributed continuously operating sites from PI and related GNSS networks from around the globe.

GAGE also provides a number of tools and services for discovering and accessing these GNSS data and metadata. A primary priority for GAGE is to provide openly-accessible high quality and trusted data services to the community. UNAVCO is a signatory to the Findable Accessible Interoperable and Reusable (FAIR) initiative. We support the GAGE community's commitment to proper data use ethics and we facilitate the broader use of data Digital Object Identifiers and access through Google and EarthCube. The UNAVCO community was at the forefront of the discussion on the ethical use of data in the publication "Pritchard, M., S. Owen, S. Anandkrishnan, W. Holt, R. Bennett, P. LaFemina, P. Jansma, I. MacGregor, C. Raymond, S. Schwartz, S. Stein, and M. Miller, 2012, Open access to geophysical data sets requires community responsibility, Eos Trans. AGU, 93(26), 243, <https://doi.org/10.1029/2012EO260006>."

UNAVCO is a regular member of the World Data System (WDS) and we share their objectives to 1) enable universal and equitable access to quality-assured scientific data, data services, products and information (all community data are openly available unless granted an explicit exemption from NSF), 2) ensure long term data stewardship, and 3) and foster compliance to agreed-upon data standards and conventions.

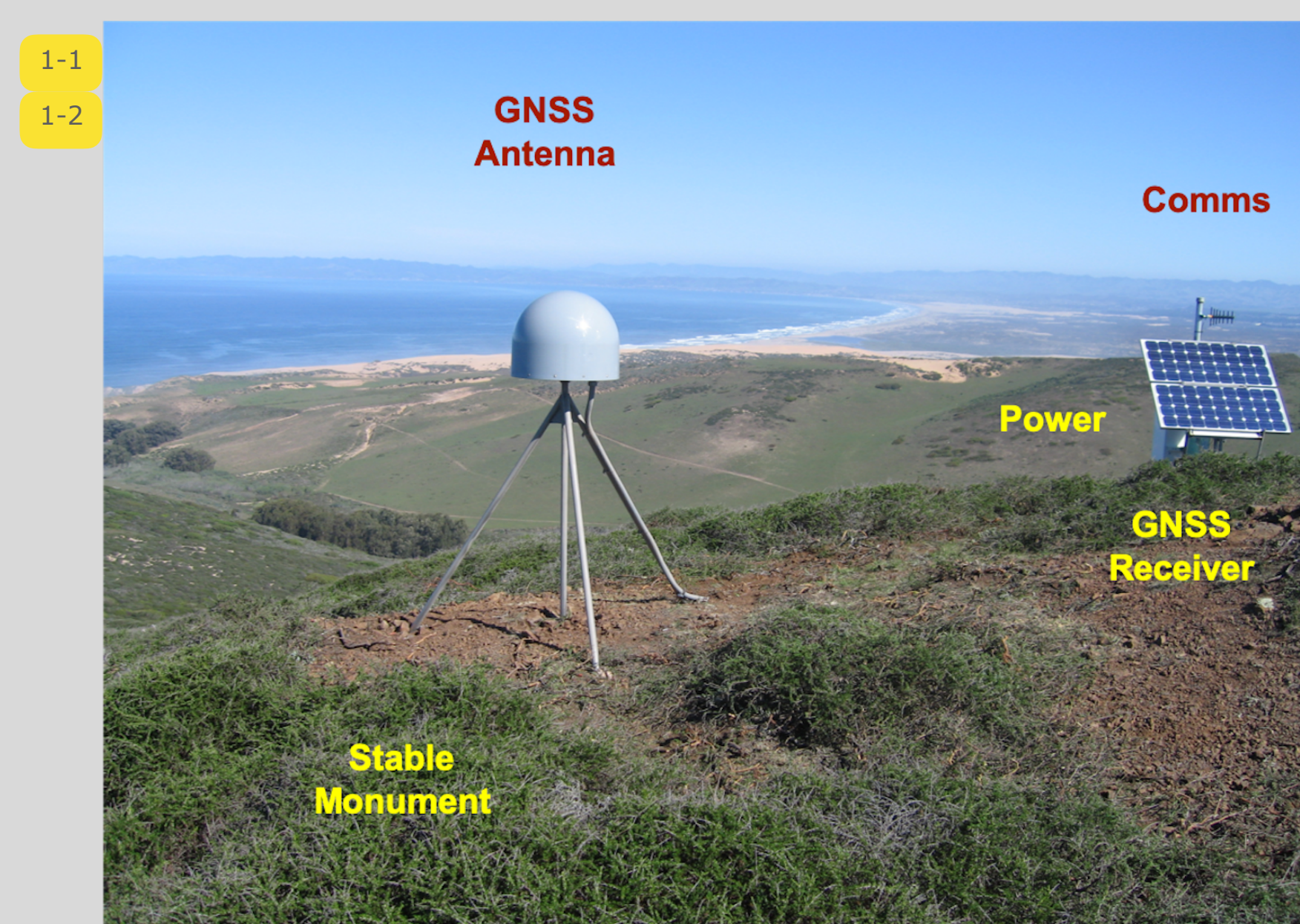
This presentation includes an overview of the data, operations and community resources available from the GAGE Facility GNSS Data Center.

Data Access Interface V2



UNAVCO's primary interactive data access point. NOTE: the DAIV2 requires Flash to be installed and working in your browser.

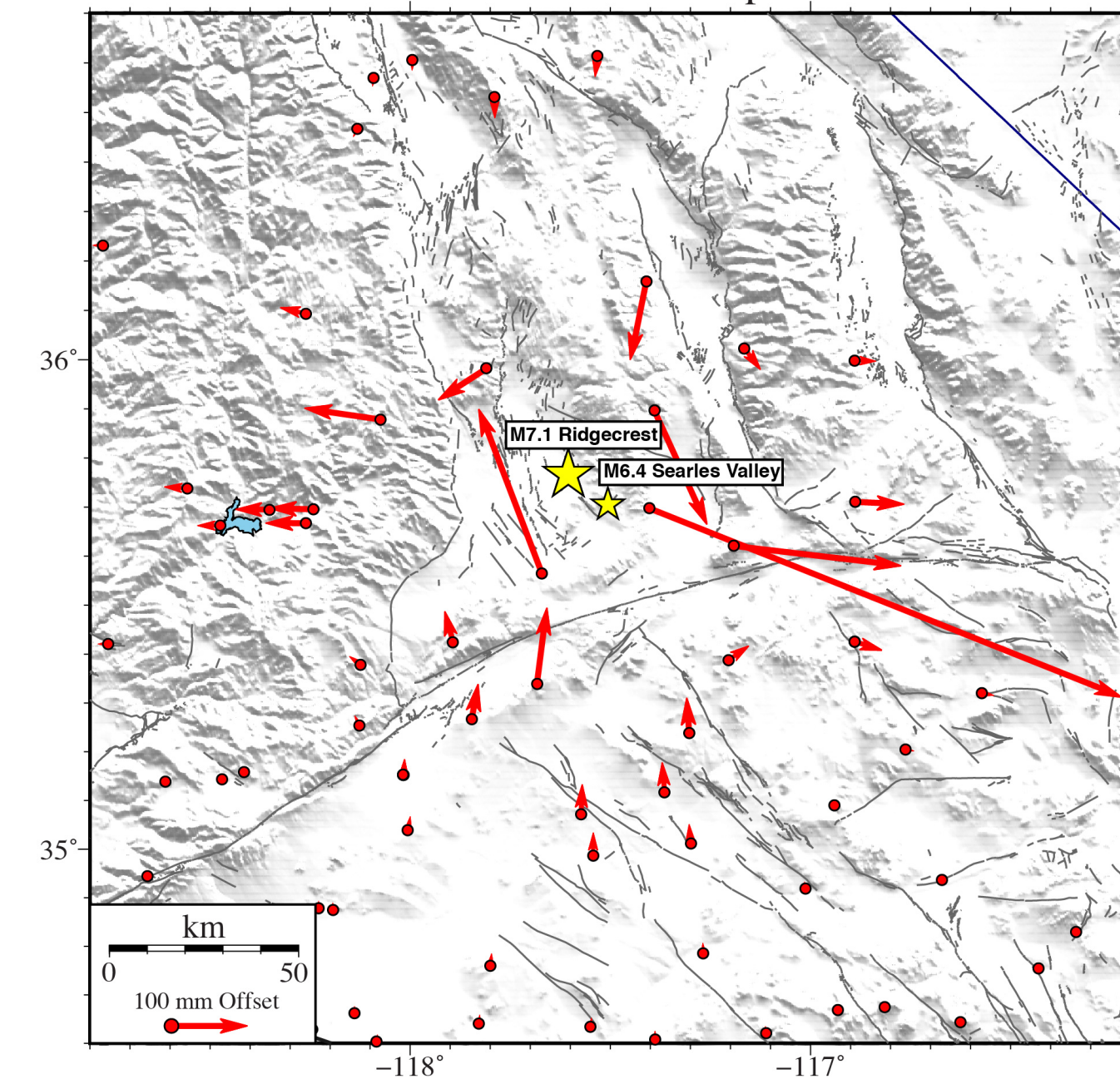
GAGE Facility GNSS Site



Network Of The Americas (NOTA) GNSS site P513 at Point Sal, CA. DOI: <https://doi.org/10.7283/T5WH2N0P>

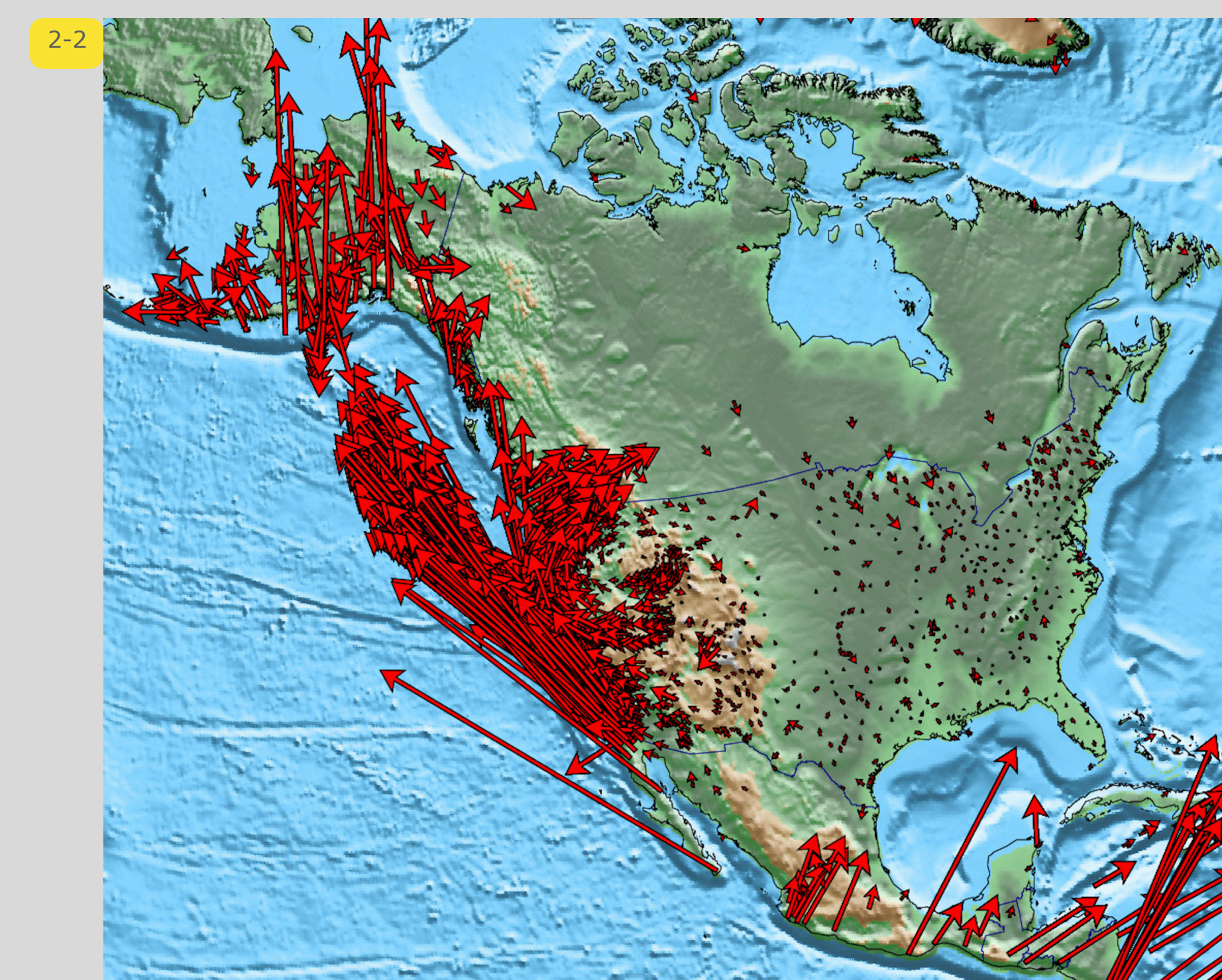
GAGE Facility Coseismic Offset Estimates

2019-07-06 M7.1 Ridgecrest + 2019-07-04 M6.4 Searles Valley Horizontal Coseismic Displacement



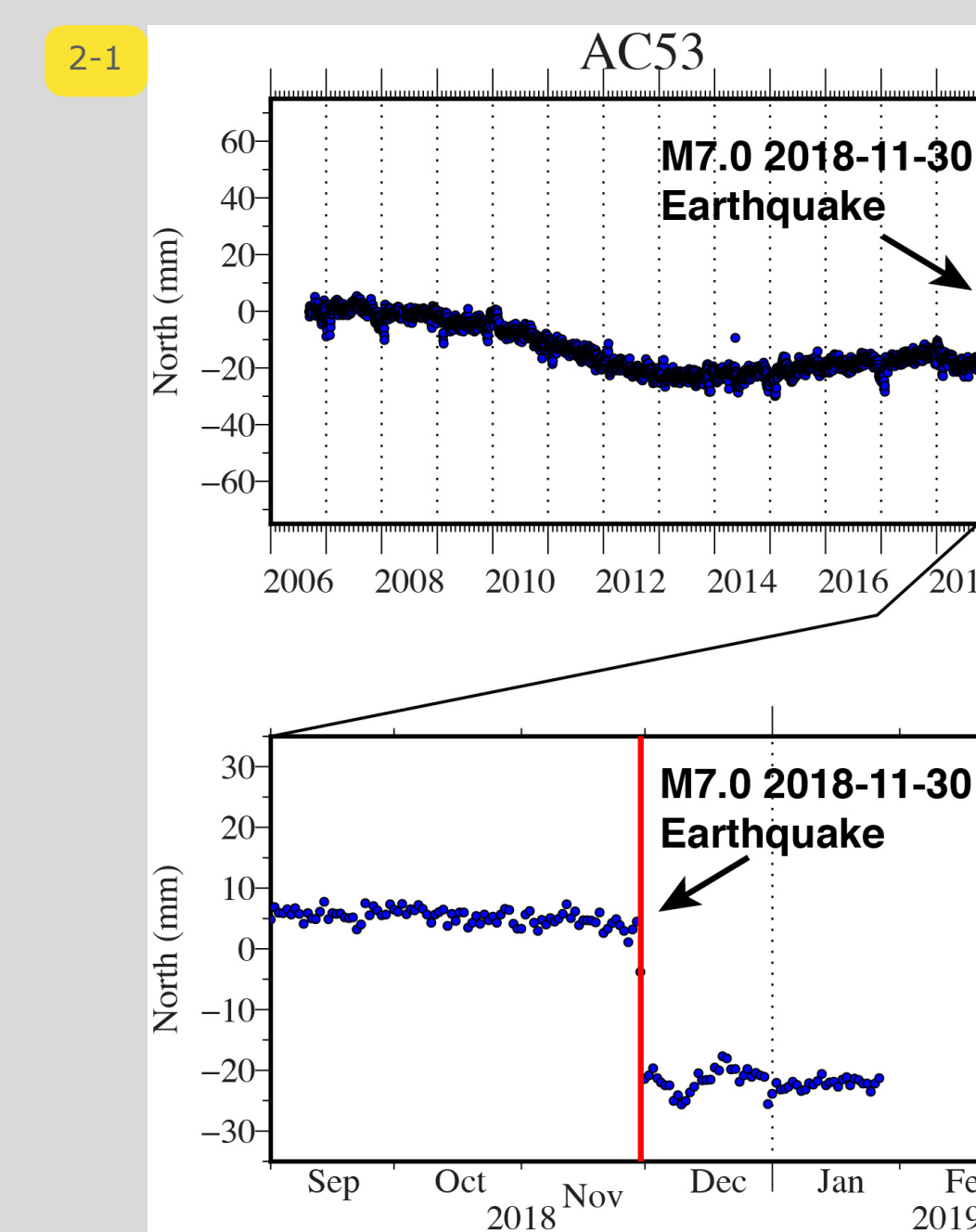
GAGE Facility GNSS Analysis Center co-seismic horizontal offsets of the 2019-07-06 M7.1 Ridgecrest and 2019-07-04 M6.4 Searles Valley earthquakes. These offset estimates are available from the UNAVCO ftp site as an event (EVT) file. DOI coming soon.

GAGE Facility GPS Velocity Field



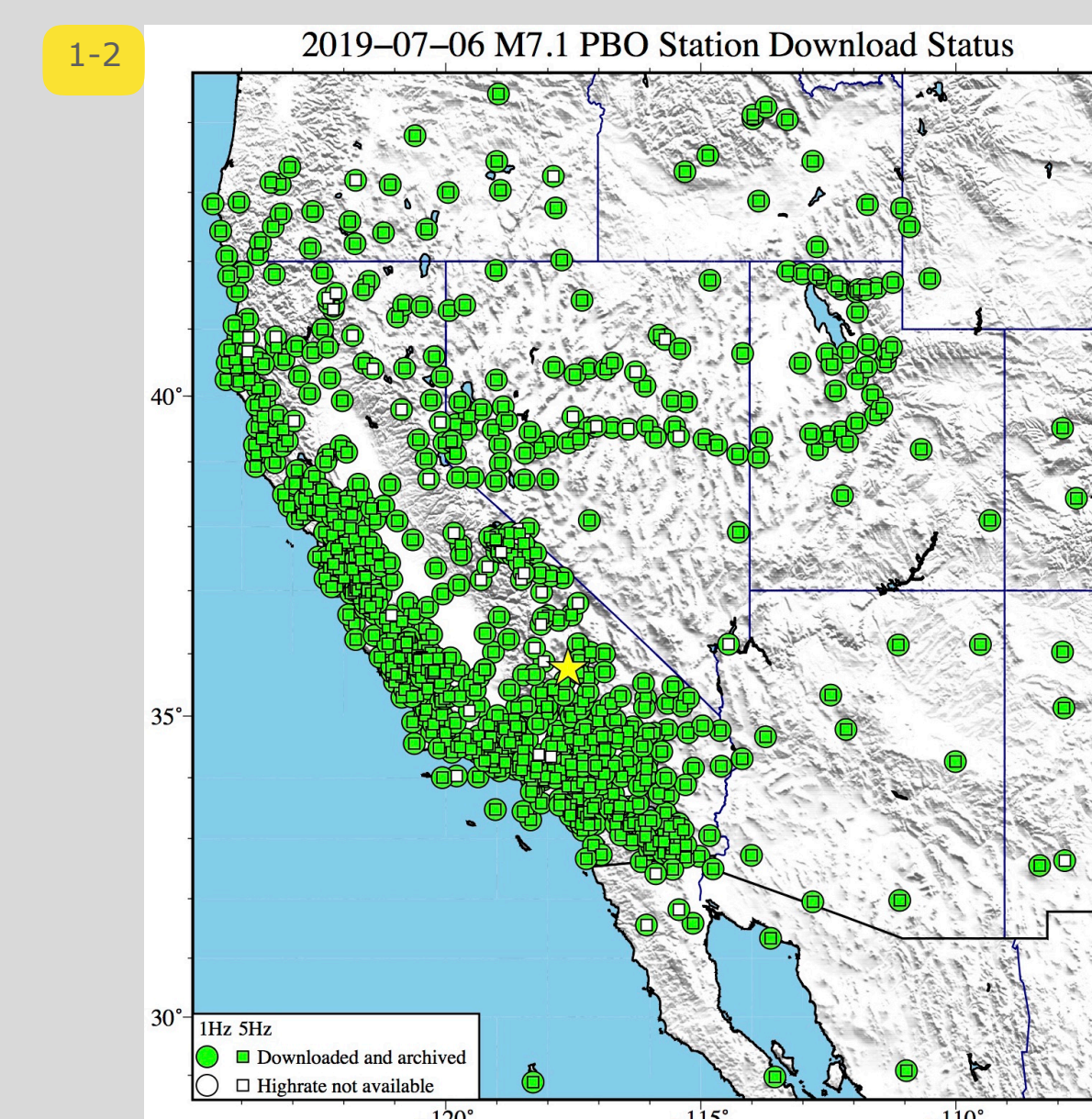
GAGE Facility Analysis Center Coordinator GPS velocity solutions from the September 2019 final product release (cwu.final_nam14.vel) in a North American fixed reference frame (NAM14). DOI coming soon.

GAGE Facility GPS Time Series



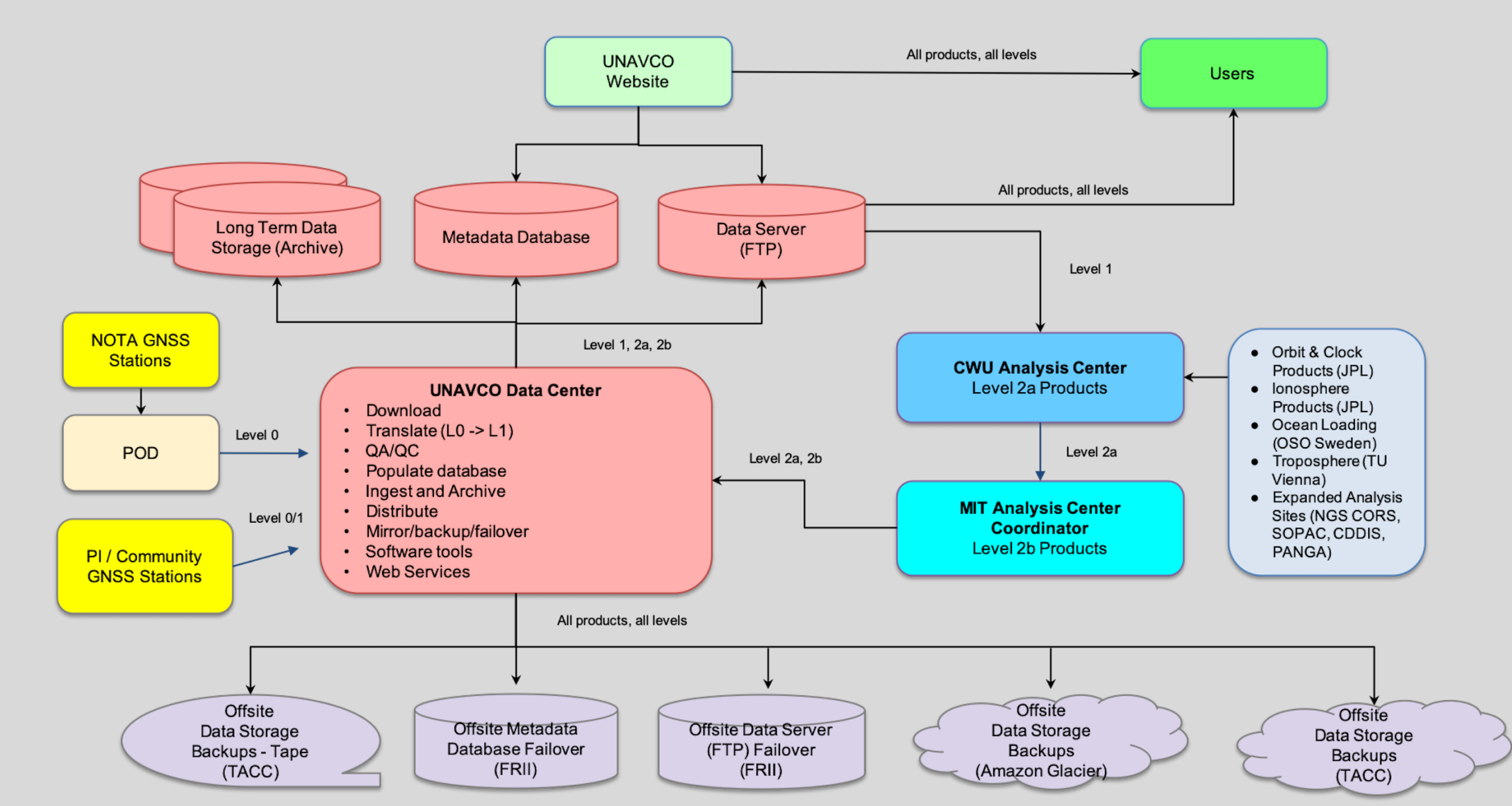
NOTA GNSS station AC53 time series. Upper plot shows full time series since 2005; a multi-year southward "bend" due to a slow slip event that began in 2009. Lower plot shows the 6-month period surrounding the 2018-11-30 earthquake including a 25 mm southward coseismic offset. DOI: <https://doi.org/10.7283/T5MG7MGM>

GAGE Facility Event Response Datasets



Map showing GNSS stations from which UNAVCO has downloaded high-rate (1-sps and 5-sps) data following the July 6, 2019 M7.1 event. These data are available as RINEX files for post processing from the UNAVCO high-rate data ftp site. DOI coming soon.

GAGE Facility GNSS Data Flow



Data Citation and DOIs

The UNAVCO GAGE Facility archives datasets and derived data products that have been collected by many community investigators funded by a variety of sources. The data user bears sole responsibility for recognizing the role of the data provider through co-authorship, citation, sponsor acknowledgement, and/or other attribution, as appropriate and consistent with professional standards and sponsor requirements.

To facilitate data citation, we provide Digital Object Identifier (DOI) assignments for all suitably-archived, publishable datasets. A citation using a dataset's DOI in a publication's reference list provides appropriate attribution. We believe that the ability to cite datasets using DOIs will encourage ethical use of free and open data. In addition to fostering data citation, DOIs are useful for accessing specific datasets or versions of datasets, and for tracking provenance. If you are using a particular dataset that does not yet have a DOI, please contact us to see if DOI minting can be expedited. If needed, multiple DOIs can be aggregated into a single (new) DOI for ease of citation when many datasets are being referenced; contact data@unavco.org to arrange aggregate DOIs.

Community contributors of datasets in the UNAVCO Archive and others can view the DOI information for published datasets through our GPS/GNSS Dataset DOI Search as well as Google Dataset Search (beta).

Gage Facility GNSS Data Access Methods

GPS/GNSS Data Products		Access Method / Product Format				
Data Product Level	Description	Generation Frequency	Creator	FTP	Web Graphical Interface	Web Service
Level 1	1-1 Standard rate data (15-sec)	Daily, varies	UNAVCO	RINEX	RINEX	n/a
	1-2 High rate data (1-, 2-, 5-sps)	Varies	UNAVCO	RINEX	RINEX	n/a
	Survey-mode (campaign) data	Daily, varies	UNAVCO	n/a	RINEX	n/a
Level 2	2-1 Position solution time series	Daily	MIT	ASCII_CSV	ASCII_CSV	ASCII_CSV
	2-2 Velocity solutions	Monthly	MIT	ASCII	ASCII	ASCII_CSV
	2-3 Position offsets (e.g. coseismic)	Varies	MIT	ASCII	n/a	n/a
	Tropospheric parameter estimates	Daily	CWU	ASCII	n/a	n/a
	Position solution QA parameters	Daily, varies	UNR	ASCII	ASCII	n/a
	Position solutions (loose)	Daily	CWU	SINEX	SINEX	n/a
	Position solutions (constrained)	Daily	MIT	SINEX	SINEX	n/a

Product levels distinguish between raw data (Level 0), pre-processed data (Level 1), and post-processed/derived (Level 2) data products.