TLALOCNet: A continuous GPS-Met array in Mexico for seismotectonic, atmospheric and climatic research.

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Abstract:
TLALOCNet is a combined tectonic and atmospheric cGPS-Met network in Mexico for the interrogation of the earthquake cycle, and tectonic processes, climate, and atmospheric processes. When completed, TLALOCNet will span all of Mexico and will link existing GPS infrastructure in the rest of North America and the Caribbean to create a continuous, federated network of networks spanning from Alaska to South America. The National Science Foundation (NSF) and the Universidad Nacional Autónoma de México (UNAM) are jointly funding the construction and operation of TLALOCNet. This 40+-station network operates to the high standard of the EarthScope Plate Boundary Observatory (PBO) and the Continuously Operating Caribbean GPS Observational Network (COCONet).

In the solid Earth disciplines, TLALOCNet will sustain and enhance continued detailed studies of the earthquake cycle, with potential downstream applications for earthquake forecasting. The Mexico subduction zone is a nearly ideal laboratory for detailed GPS studies of the subduction earthquake cycle, including coseismic rupture, postseismic fault afterslip and viscoelastic rebound, episodic tremor and slip, and interseismic elastic strain. Accordingly, TLALOCNet will provide a wealth of observations on the subduction earthquake cycle. In particular, episodic tremor and slip is now being studied intensively in

Mexico to better ascertain the temporal and physical relationship, if any, with the genesis of shallow-thrust earthquakes in the Mexican Subduction Zone.

Research stimulated by TLALOCNet promises fundamental improvements in climate research and weather forecasts in large areas of Mexico and the United States, with broad implications for both societies. For example, over decadal time scales, climate models predict that the currently arid parts of northern Mexico and the southwestern U.S. will become even drier, raising concerns about the sustainability of agricultural production and exports critical to the regional populations and economies of both countries. Rising global temperatures are expected to intensify drought and heavy rainfall events across Mexico and adjacent areas of the U.S., with serious local and regional consequences.

Most of these applications, however hinge on the timely distribution of real-time GPS-Met observables with high availability and low-latency requirements and openly available and querable data repositories. A major outcome of this project is the development of the TLALOCNet data center. The TLALOCNet data center works as part of UNAVCO's federated GSAC archives for discovery, sharing, and access to data, and also serves as a continuously growing collection and distribution center for academic cGPS-Met sites throughout Mexico. The TLALOCNet data center is hosted at Universidad de Guadalajara (http://tlalocnet.udg.mx). It currently holds data from 50+ cGPS stations, some of them extending up to the late 1990's. By year's end, we expect to be actively and routinely archiving data from ~100 GPS stations. Once, The TLALOCNet data center meets all relevant specific policies and guidelines for the mexican national and institutional repositories as published by CONACyT.

The TLALOCNet data center operates under an open and freely accessible data policy and is the first of it kind within the Mexican Earth Science community. This data center is based on *Dataworks for GNSS*, a UNAVCO developed, open-source software subsystem and integration of the GSAC software (https://www.unavco.org/software/data-management/gsac/gsac.html) for GNSS data and metadata management. It allows the operation of a repository of holdings, a metadata database, and mechanisms to present geodetic and meteorological data and metadata holdings to users via both fully querable GUI and command-line interfaces.

Even though the outlined research derived from the TLALOCNet observational platform is still dependent on data mining efforts from geodetic and meteorological data sets available at repositories such as this, any applications for operational forecasts, early

warning or rapid response systems is also fully dependent on high availability and low latency data transmission from observational instruments to data archiving and or rebroadcast facilities and data processing centers, usually at academic institutions and federal government agencies. In this presentation we will share our current experiences and challenges to meet these requirements.