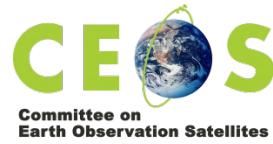




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Biennial report for Permanent Supersite/Natural Laboratory

Nicaragua Supersite

History	<i>https://geo-gsnl.org/supersites/permanent-supersites/nicaragua-supersite/</i>
Supersite Coordinator	<i>Iris Valeria Cruz Martinez, Instituto Nicaragüense de Estudios Territoriales-INETER, Ave. Xolotlán, Managua, Nicaragua</i>

1. Abstract

Nicaragua is part of the Ring of Fire (also referred to as the Circum-Pacific Belt), which is a path along the Pacific Ocean characterized by active volcanoes and frequent earthquakes, and in turn, is part of the Central America Volcanic Arc (CAVA), which is the result of the subduction of the Cocos Plate beneath the Caribbean Plate. This subduction zone creates the conditions necessary for volcanic and seismic activity. In Nicaragua, the active volcanic arc is located within the new geological terrane of the Nicaragua Depression in the country's western side, where around 70% of the population is located mainly due to the fertile soils. Phreatic explosions are the most common type of volcanic activity in the last decades, but Strombolian eruptions also occurs from time to time. Numerous lahars are generated during heavy rain at steep volcanoes, and is this type of events that are caused the largest number of fatalities related to volcanoes in Nicaragua. An eventual major eruption from any of the Nicaraguan volcanoes will comprise the lives of several thousand inhabitants, and caused a huge impact in the national economy due to the potential destruction of cultivation fields and infrastructure. Thus, the better we know about the volcanic processes, the better we can be aware of the possible erupting scenarios, and the better we can prepare by mapping out action plans against volcanic activity. The radar satellite data provided by the Supersite project is an ideal complement to foster our volcano and seismic monitoring and research programs we already have in place. Although at the start of this project we do not have the capacity to produce scientific results right away from the use of these data sets, we are building this capacity along the way. So, in the next biennial report we are going to present our first scientific results from the use of radar satellite data, which can be applied to better assess both volcano and seismic activity, since in Nicaragua there is a strong correlation between volcanic and seismic phenomena, radar data can shed new light on how volcanic systems interact with geologic faults, and the derived hazards. It is quite common in Nicaragua to have volcanic systems erupted along fault systems, and volcanic activity concurrent with seismic activity and vice-versa. Thus, we will use radar satellite data to study the surface deformation due volcanic and seismic activity in our active volcanic systems, and then we are going to model the deformation source (or sources) and correlated with the other data sets obtained from our monitoring and research programs. So, at this stage of the project, we are in the process of downloading and archiving the data from the Italian's COSMO-SkyMed and Germn's TerraSAR-X satellites, both part of the European Space Agency (ESA). We are glad to be part to this Supersite initiative.

2. Scientists/science teams

<In the table below please list all scientists/science teams who used/received data >

<p>Researcher/team 1</p>	<p><i>José Armando Saballos, Instituto Nicaragüense de Estudios Territoriales-INETER, Ave. Xolotlán, Managua, Nicaragua, j.a.saballos@gmail.com, https://webserver2.ineter.gob.ni/</i></p> <p><i>Eveling Patricia Espinoza, Instituto Nicaragüense de Estudios Territoriales-INETER, Ave. Xolotlán, Managua, Nicaragua, eveling.espinoza@ineter.gob.ni</i></p>
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Researcher/team 2

Christelle Wauthier, The Pennsylvania State University, 311 Deike Building, University Park, PA, USA, +1-814-863-6649, <https://www.geosc.psu.edu/directory/christelle-wauthier>

Scientists/science teams issues

Since this is the beginning of this project, and we lack of funding to hire new personnel to work specifically for this project, we are going somewhat slow in terms of getting people involved for the data downloading and processing, but once we have a significant amount of data to work on, we will have more people involved in the activities related to this very important Supersite project, and pretty soon this is going to be part of our routine activities.

We are also coordinating with the Nicaragua Autonomous National University, and some others universities from abroad, so that we can get some under graduate and graduate students to undertake their thesis program working with the Supersite data sets, which means that we are going to get products from the scientific applications of the radar satellite data.

1. In situ data

<In the table below please list all in situ data types available for the Supersite>

Type of data	Data provider	How to access	Type of access
Seismic waveforms	INETER	Open access to GSNL scientists upon request and authorization from the INETER Senior Directorate	...
Geodetic data from 14 GPS/GNSS	INETER	Open access to GSNL scientists upon request and authorization from the INETER Senior Directorate	...
Fixed mini-DOAS volcanic gas data	INETER	Open access to GSNL scientists upon request and authorization from the INETER Senior Directorate	...
Volcano webcam data	INETER	Open access to GSNL scientists upon request and authorization from the INETER Senior Directorate	...

In situ data issues

The data request is usually easy to do, but depending on the data type requested, it may take some time to get the data. Some data may have gaps due to different technical issues.

2. Satellite data

Type of data	Data provider	How to access	Type of access
TerraSAR X	<i>DLR</i>	<i>https://eoweb.dlr.de/egp/</i>	<i>Limited to GSNL scientist</i>
COSMO-SkyMed, Radarsat 2, ALOS-1/2, etc.	<i>ASI</i>	<i>https://geohazards-tep.eu/</i>	<i>Limited to GSNL scientist</i>

Satellite data issues

Sometimes the data download from the satellite data repository is no that fast, albeit we use a good internet broadband connection to download the data. We are still in the process to fulfill the quota assigned to us, which we are very close to accomplish.

3. Research results

We are in the data downloading and archiving stage. We will have results pretty soon that will be included in the next report.

Publications

We do not have publications yet.

Peer reviewed journal articles
...
...
...
Conference presentations/proceedings
...
...
...

Research products

We do not have results yet.

Type of product	Product provider	How to access	Type of access
<i>e.g. ground deformation time series, source model, etc.</i>	<i>Name of scientist(s)</i>	<i>Link to publication, research product repository or description of procedure for access</i>	<i>E.g. public, registered, limited to GSNL scientists, etc.</i>
...

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...

...

...

Research product issues

4. Dissemination and outreach

Since we still have no results, we are not making public our findings in the use of the Supersite's data. But once we have results we are going to begin to disseminate our results, and get people involved in the use of the data, mainly from students and staff at the universities in Nicaragua.

5. Funding

So far, we only have funds from our own institution to maintain the project. But we are contacting external collaborators to get funds to boost our capabilities in data processing and analysis of results.

6. Stakeholders interaction and societal benefits

The interested parties are also the civil society who live under volcanic hazard zones (hundreds of thousands of people), and also the decision makers who work in the prevention and mitigation of volcanic phenomena, land management and the educational part. All involved personnel will benefit from the results that we will share with them through outreach campaigns.

7. Conclusive remarks and suggestions for improvement

So far we have only being downloading the radar satellite data and archiving them. We are not going as fast as we can. But pretty soon we will speed up our activities concerning the Supersite data processing and analysis.

8. Dissemination material for CEOS (discretionary)

In the next report we will provide dissemination material to the CEOS community.