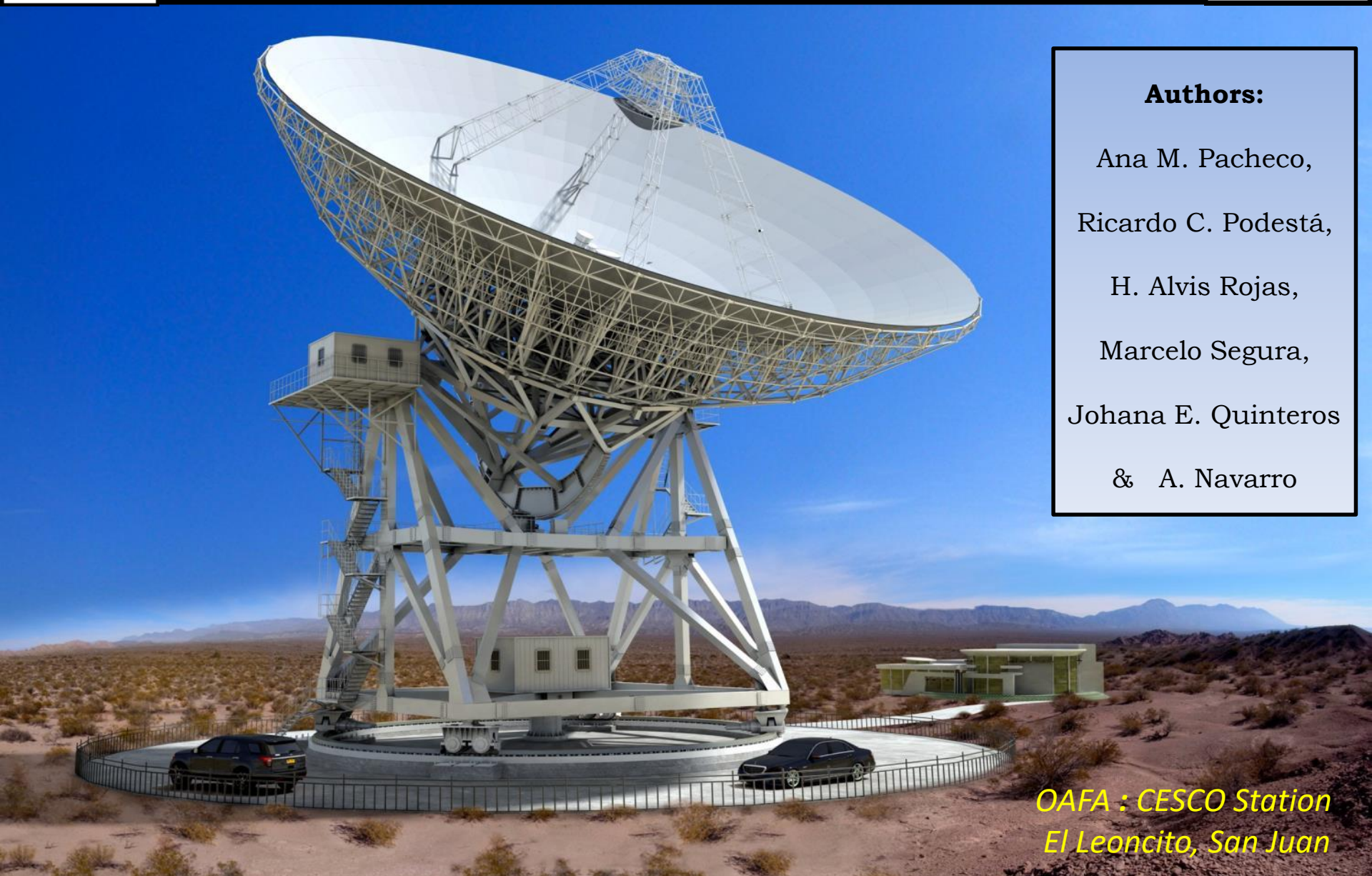
Microgeodesic Auscultation at the CART (Chinese Argentine Radio-Telescope) Site



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China's First International agreement with a foreign country

Robotic Photoelectric Astrolabe 2 in OAFA

According to an agreement between the UNSJ and the Chinese Academy of Sciences signed in 1992, a PHOTOELECTRIC ASTROLABE (PA2) arrived at OAFA. It worked for more than 15 years and produced three catalogs with 30 thousand stars from the southern hemisphere

Second Agreement Argentina–China

First SLR Station in Argentina

International Laser Ranging Service N° 7406

- International agreement between UNSJ and NAOC of the Chinese Academy of Sciences (CAS)

Officially started on February 2006, as one of the most productive in the world

Satellite Laser Ranging (SLR)

GPS Permanent Station

The GPS Permanent Station (PS) was incorporated into the RAMSAC - IGN network. The next step is the installation of a new triple frequency PS (including BeiDou constellation).

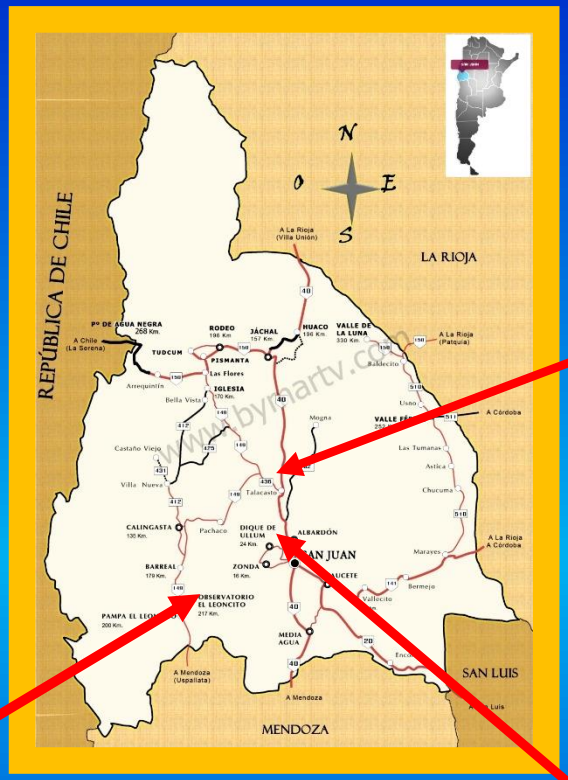
Third Agreement Argentina-China

China Argentina Radio Telescope (CART)

40m diameter radio telescope – Frequency range: 1 - 45Ghz

Site Search: During the years 2009–2011, topographic survey campaigns in many areas of San Juan were studied, to find the best CART place. Finally, in 2013, the CART site was selected at the EACUC (Carlos U. Cesco Astronomical Station), in the zone El Leoncito.

Site : EL LEONCITO
Located at 30 km. South of the Barreal city (Calingasta)



Site : TALACASTO
Located at 60 km. north of San Juan city

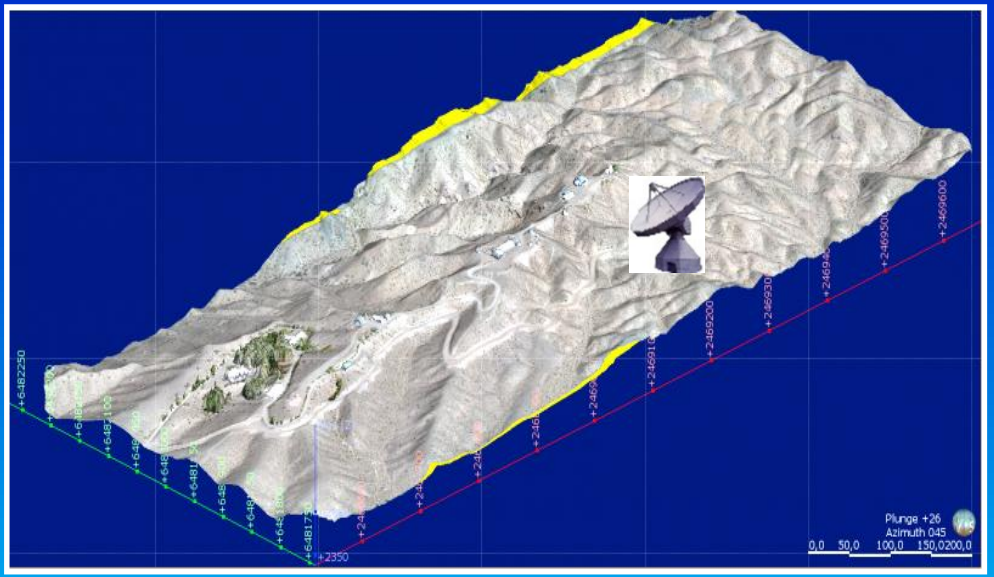
Site : ULLÚM
Located 20 km. west of San Juan city

Station: CARLOS U. CESCO

EL LEONCITO: Latitude: -31º 47´, Longitude: 69º 17´, height: 2500 m s.n.m.

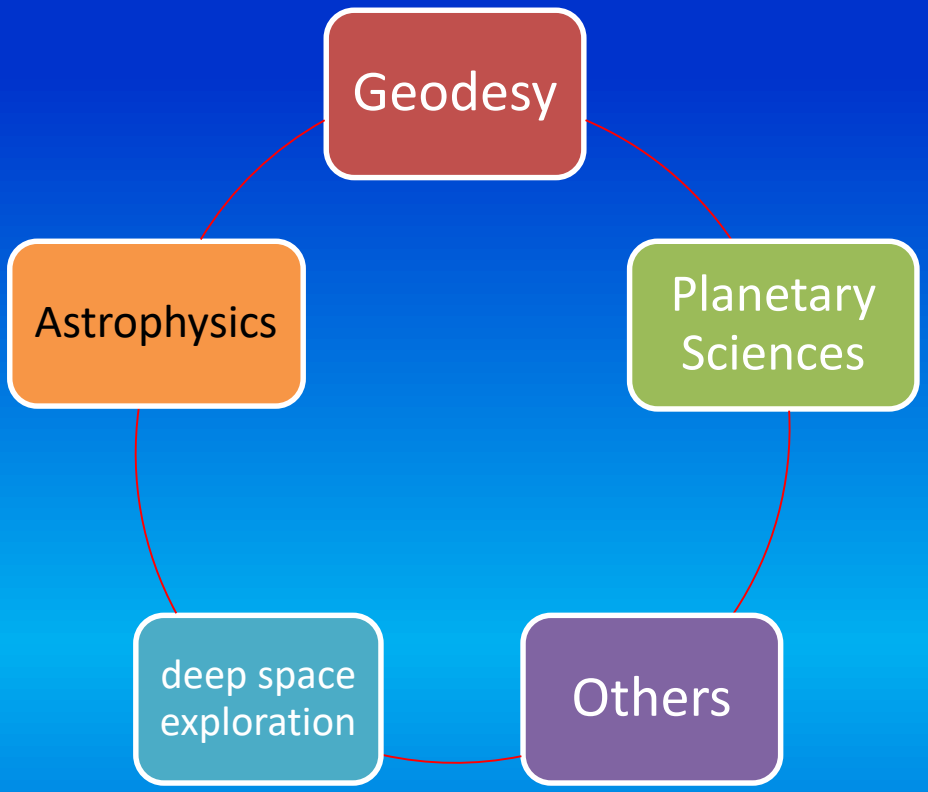
Precision Geodesy at the CART site

The general objective of this project consists of designing and executing superior geodesy tasks, for the installation of the CART antenna and the planning of the construction of a fundamental geodetic observatory.



The first tasks were to enable access to the CART site and the materialization of a network points in the area for plani-altimetric control of the base and future co-location with other geodetic techniques. During the years 2015-2017, the geodesy group placed stakeouts of the new access road to the CART site, and a topographical survey from the access to the Cesco Station to the entrance to El Leoncito park.

Potential Scientific Objectives of the CART



- Establishment and Maintenance of ICRF, ITRF and SIRGAS.
- To link between the frameworks of radio and frameworks established in other wavelengths
- Determination of EOPs.
- Geodynamic studies of the crust of the Earth. Tectonics Movements.
- Study of radio and variations of structure
- Investigating the redshift of AGN.
- Observations of X-ray binaries, supernovae and novae wrap.
- To study activities of solar objects, eg. planets and asteroids

- To study the feedback of expanding HII regions
- To investigate the circumstellar medium around evolved stars.
- Timing observations of pulsars
- Investigations of interstellar masers
- Polarization of galaxy clusters
- Contribute to space exploration, participating chinese Lunar exploration program

Microgeodesic auscultation

The primary objective of the Microgeodesic auscultation works is the continuous monitoring of the structure of the CART base, in addition to the three-dimensional movement control of the site, considering that CART is located in an area of high seismic activity.

the ecological police

For this, it was necessary to develop the following stages:

- Design of monitoring networks
- Demarcation of network points
- Precision measurement of geodetic networks
- Calculation of geodetic networks and the temporal variations of the coordinates of the center of the base.
- Auscultation analysis of the base for different periods.
- Evaluation of the movement of the center of the base (ITRF international reference)

topographic tasks

mirror

Microgeodesic Auscultation:

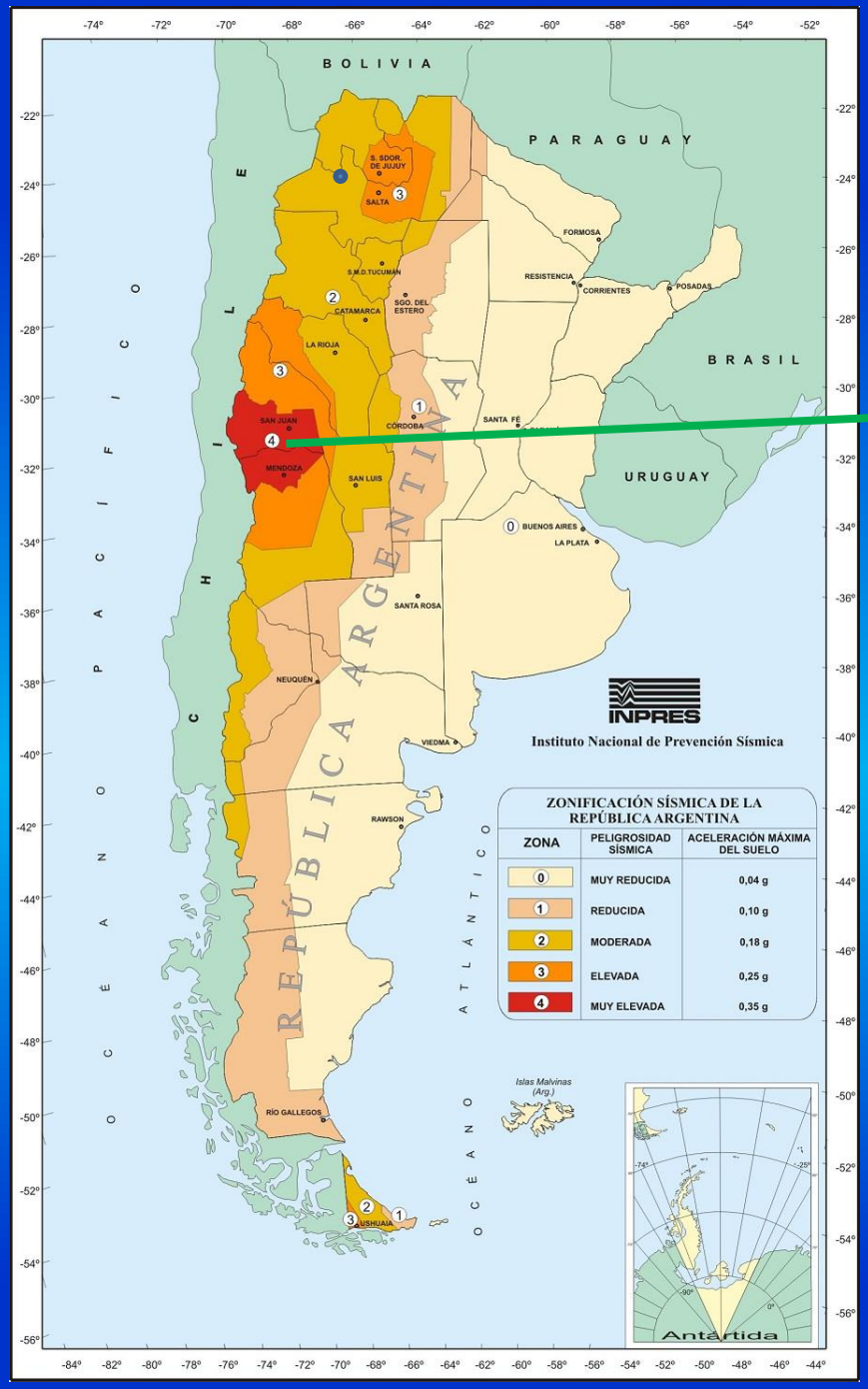
Internal network (8 points): base deformation control.

Intermediate network: control of vertical displacements, due to possible settlements or subsidence (altimetric auscultation) and for the continuous monitoring of temporary coordinates variations of the point base center.

External network: for linking the point base center to the POSGAR 07 framework (Argentine Geodetic Positions 2007), adopted by the National Geographic Institute (IGN) as the National Geodetic Reference Framework.

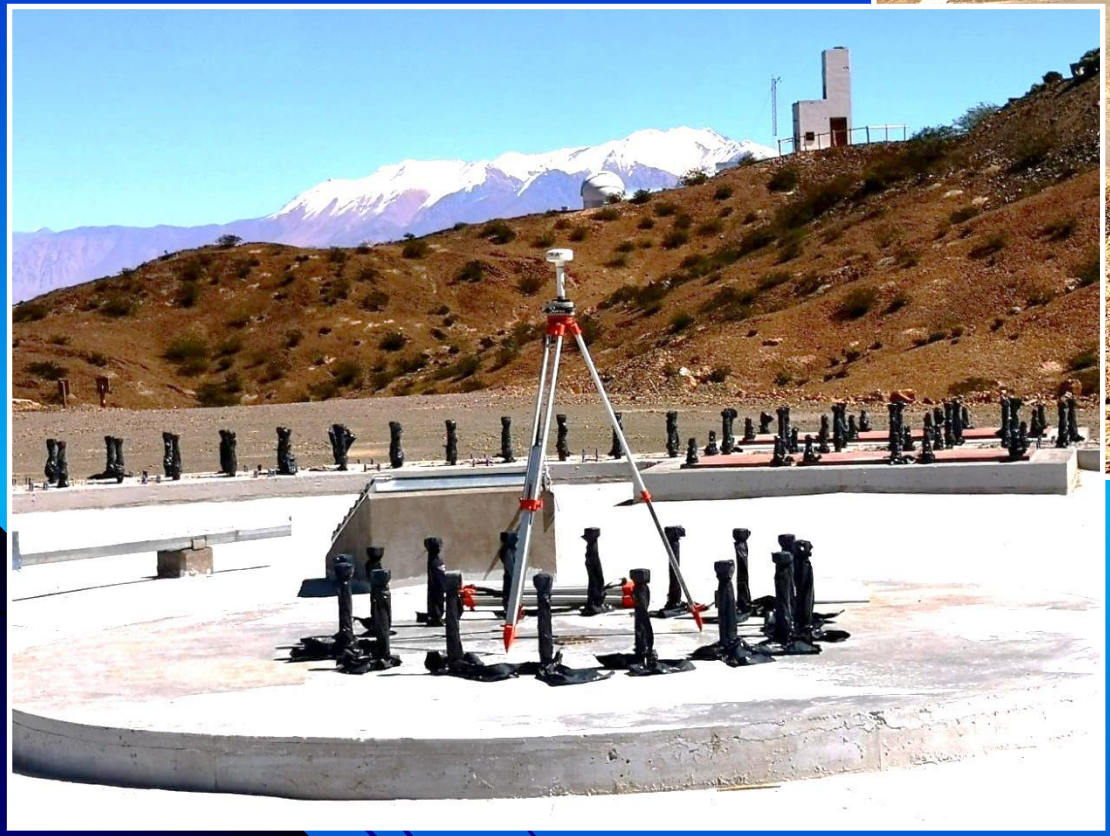
Seismic Risk in Latin America

Latin America is considered one of the most active seismic region of the world, in which the earthquake danger threatens, within large portions of the continent, all human life.



CART

MAXIMUM LEVEL
OF SEISMIC HAZARD



Microgeodesy tasks continue with monthly campaigns to measure and calculate the coordinates of the center of the base and the reference points of the geodetic networks.

Earthquake 18/01/2021 (M: 6,4) → Displacement (elastic): 7cm

OAFA is part of the current International Terrestrial Reference Framework (ITRF 2020).

The CART project will be integrated into the existing international VLBI geodetic networks.

The global network of radio telescopes are used for astrometric and geodetic purposes has some forty operational instruments, most of which are concentrated in the northern hemisphere.

The installation of CART in Argentina will not only contribute to improving the global coverage of this network, also in the determination of astro-geodetic parameters in the southern region of our planet.

First Workshop and CART school

October 2019 - OAFA

Muchas Gracias