



PERÚ

Ministerio  
del Ambiente

Instituto  
Geofísico del Perú - IGP

Dirección  
Científica

Radio Observatorio  
de Jicamarca



# Jicamarca Radio Observatory status during COVID-19

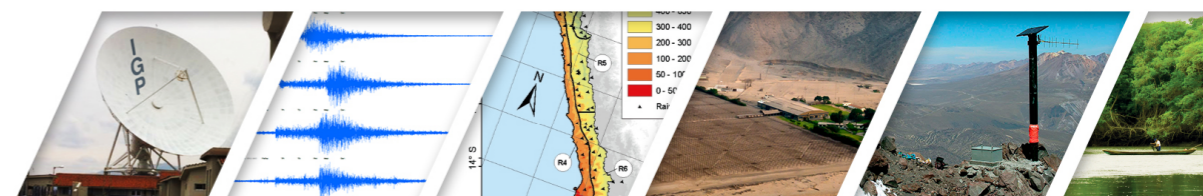
Marco A. Milla, Karim Kuyeng, Juan C. Espinoza, and Cesar De la Jara  
Radio Observatorio de Jicamarca  
Instituto Geofísico del Perú

2020 CEDAR Virtual Meeting  
June 25, 2020

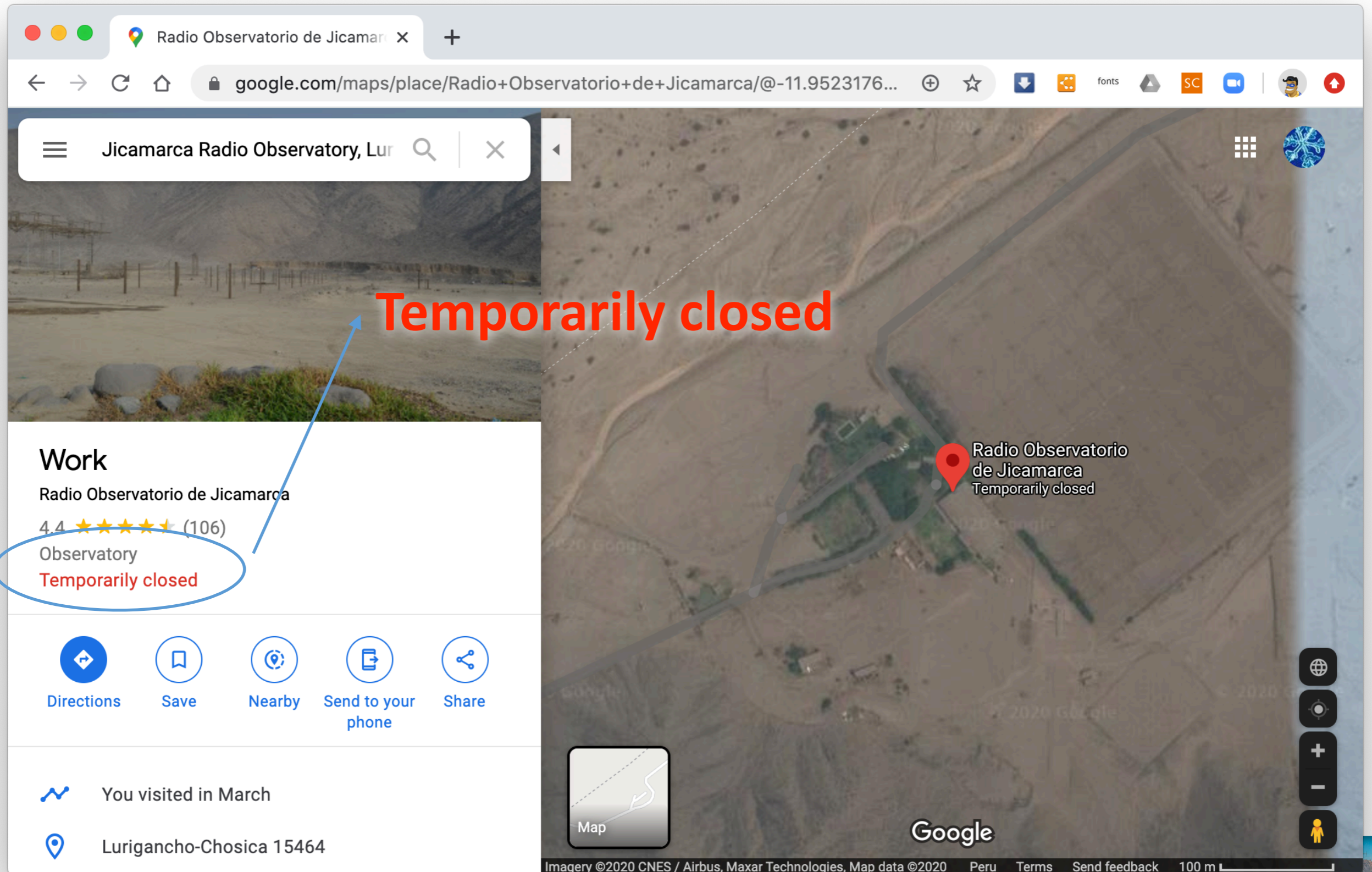
Session: Discovery Science near the magnetic equator



CEDAR Virtual Meeting  
June 22-26



# Jicamarca Radio Observatory status



The screenshot shows a Google Maps interface for the Jicamarca Radio Observatory. The search bar at the top left contains the text "Jicamarca Radio Observatory, Lur". The main map area displays an aerial view of the site with a red location pin and a label that reads "Radio Observatorio de Jicamarca Temporarily closed". A large red text overlay "Temporarily closed" is positioned over the map, with a blue arrow pointing from it to the "Temporarily closed" text in the information panel. The information panel on the left shows the following details:

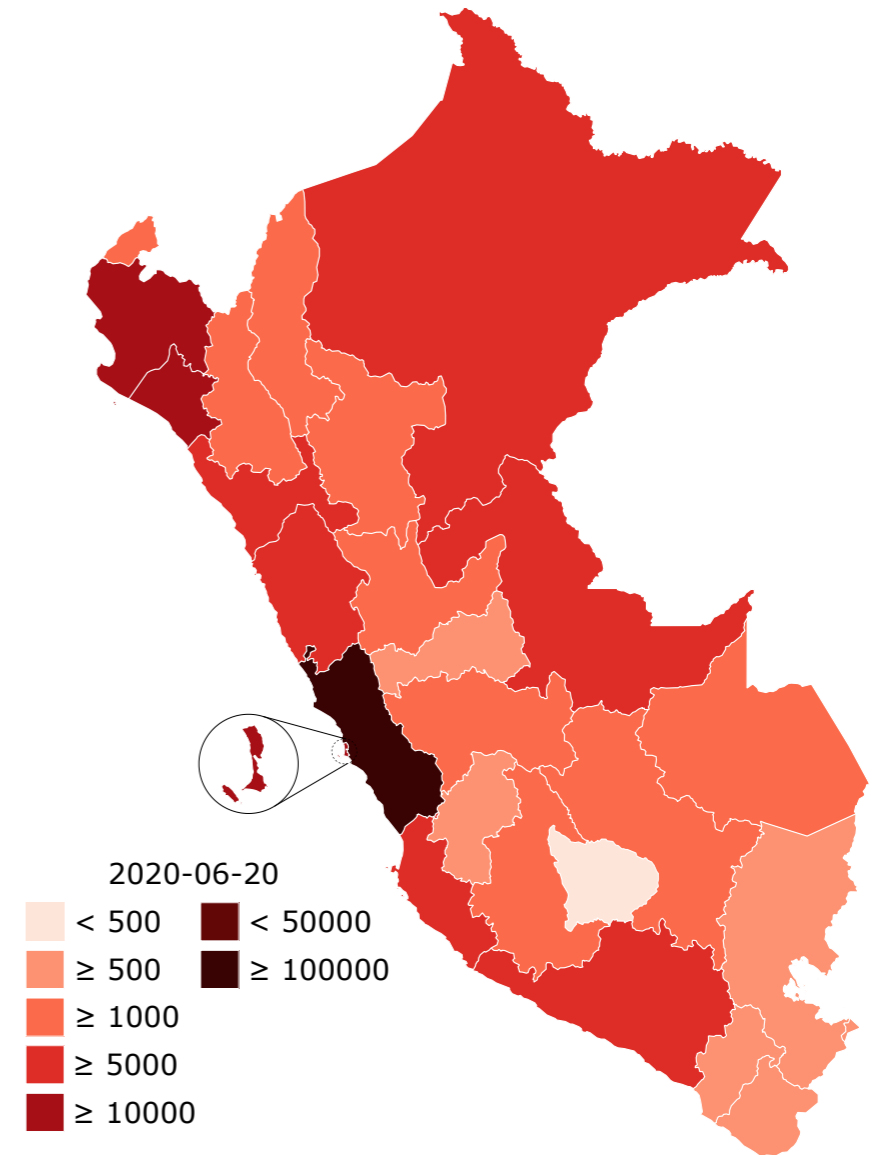
- Work**
- Radio Observatorio de Jicamarca
- 4.4 ★★★★★ (106)
- Observatory
- Temporarily closed

Below the information panel are icons for "Directions", "Save", "Nearby", "Send to your phone", and "Share". At the bottom of the panel, it indicates "You visited in March" and "Lurigancho-Chosica 15464". The bottom of the map shows the Google logo, a scale bar for 100 meters, and copyright information: "Imagery ©2020 CNES / Airbus, Maxar Technologies, Map data ©2020 Peru Terms Send feedback".

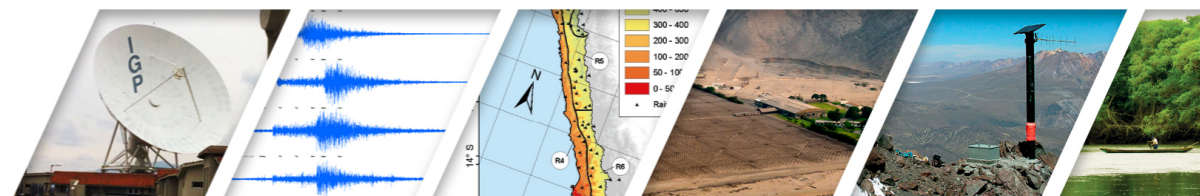


# Jicamarca Radio Observatory status

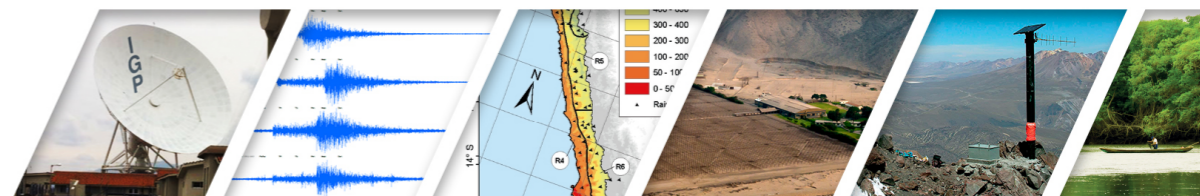
- Peru is in quarantine since March 16 until June 30, 2020.
- The observatory is currently closed.
- The main radar has been running in JULIA mode without interruptions since the beginning of the quarantine.
- JRO personnel are working from their homes.
- Expectations:
  - July: Radar operations team will return.
  - August: High-power operations will restart.



COVID-19 - Peru situation



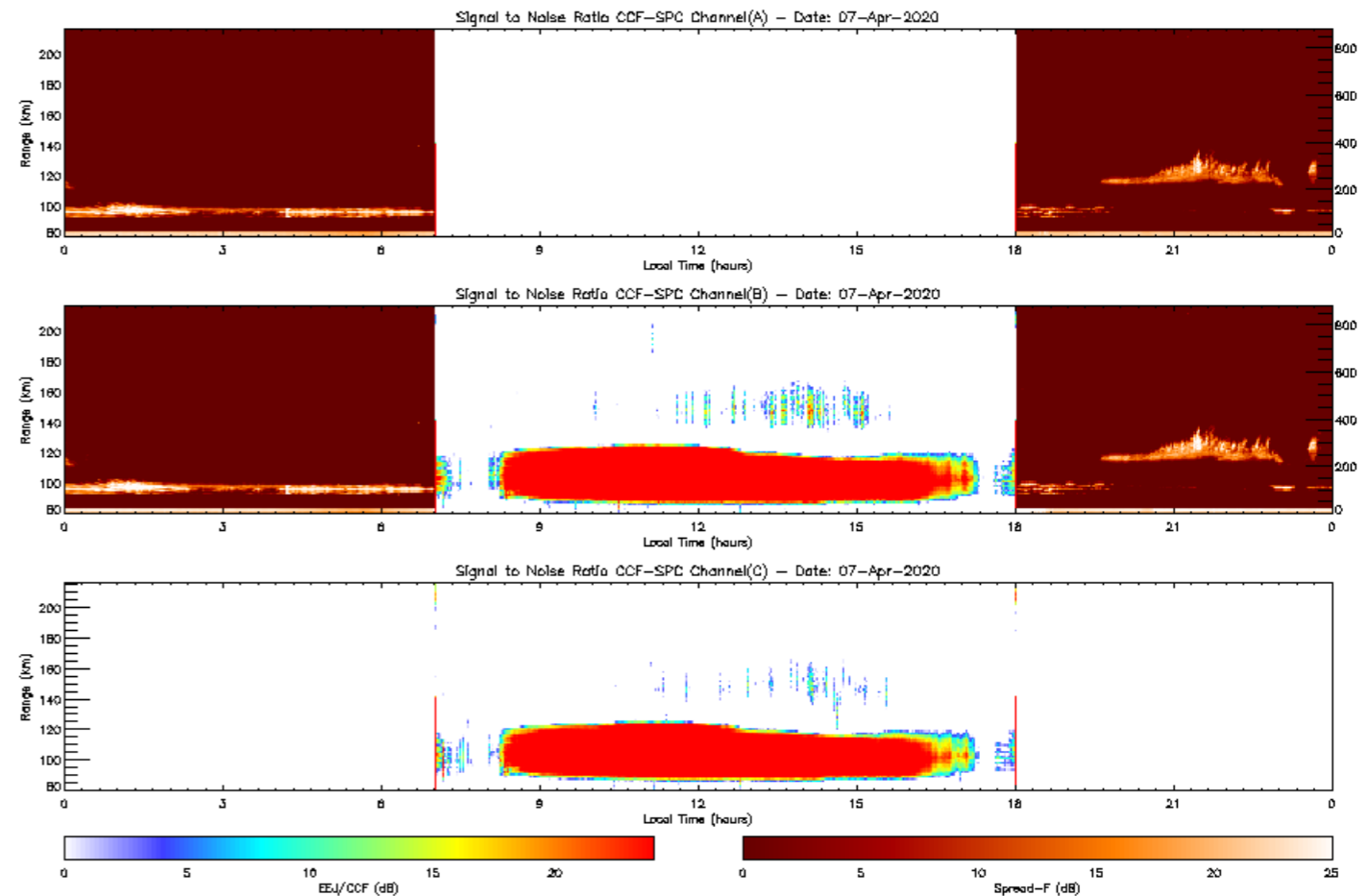
# Jicamarca radar and other instruments status



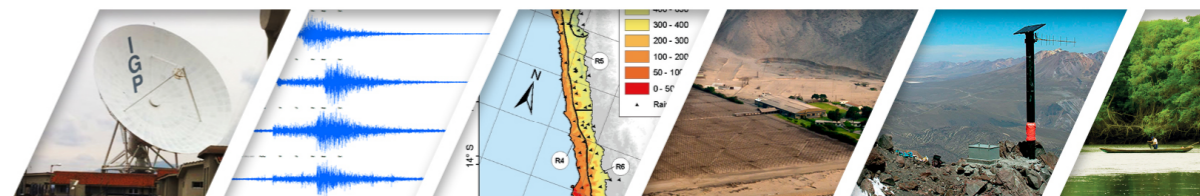


# Jicamarca radar operation status

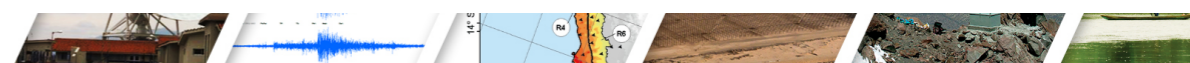
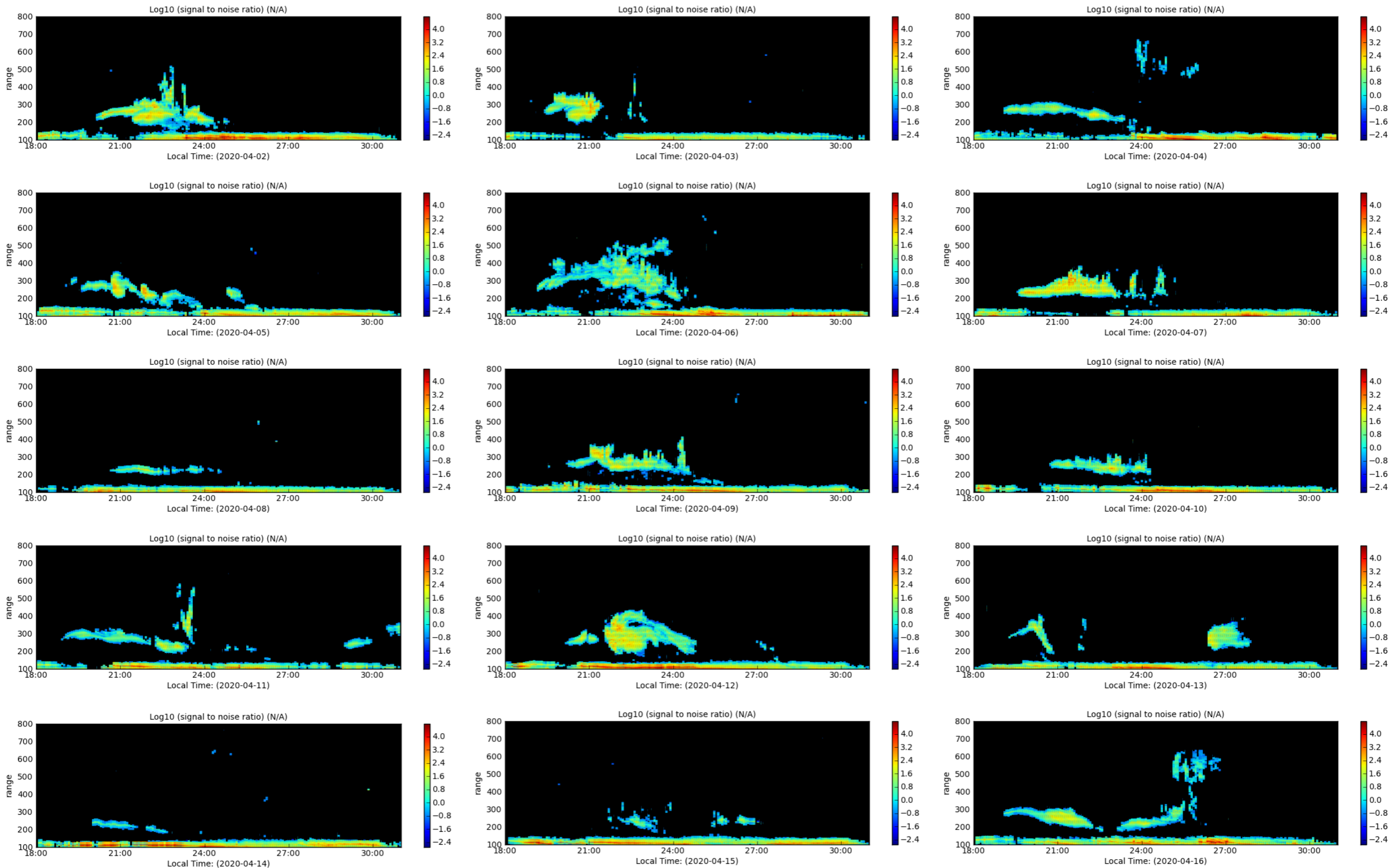
- JULIA observations status
  - Spread-F and imaging data are collected every night.
  - 150-km echoes are low during this season.
  - EEJ oblique observations stopped due to a TX failure.
- To-do list after the quarantine.
  - Full antenna maintenance.
  - Low-power transmitters maintenance.
  - Review interference issues in reception.



Data available in madrigal  
<http://jro.igp.gob.pe/madrigal/>

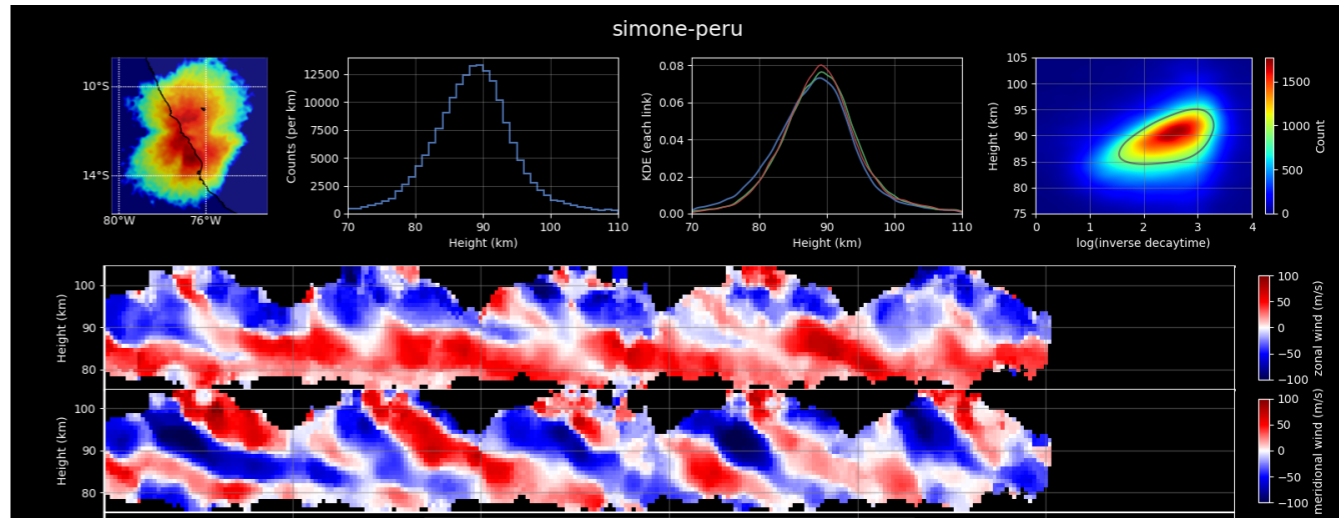
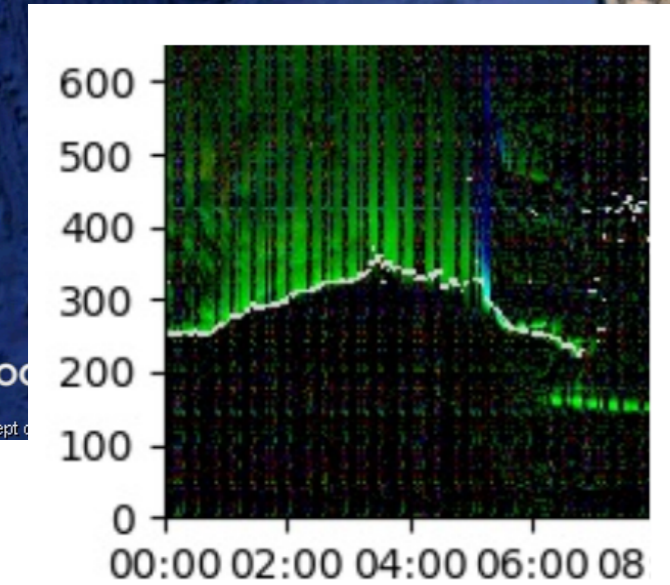
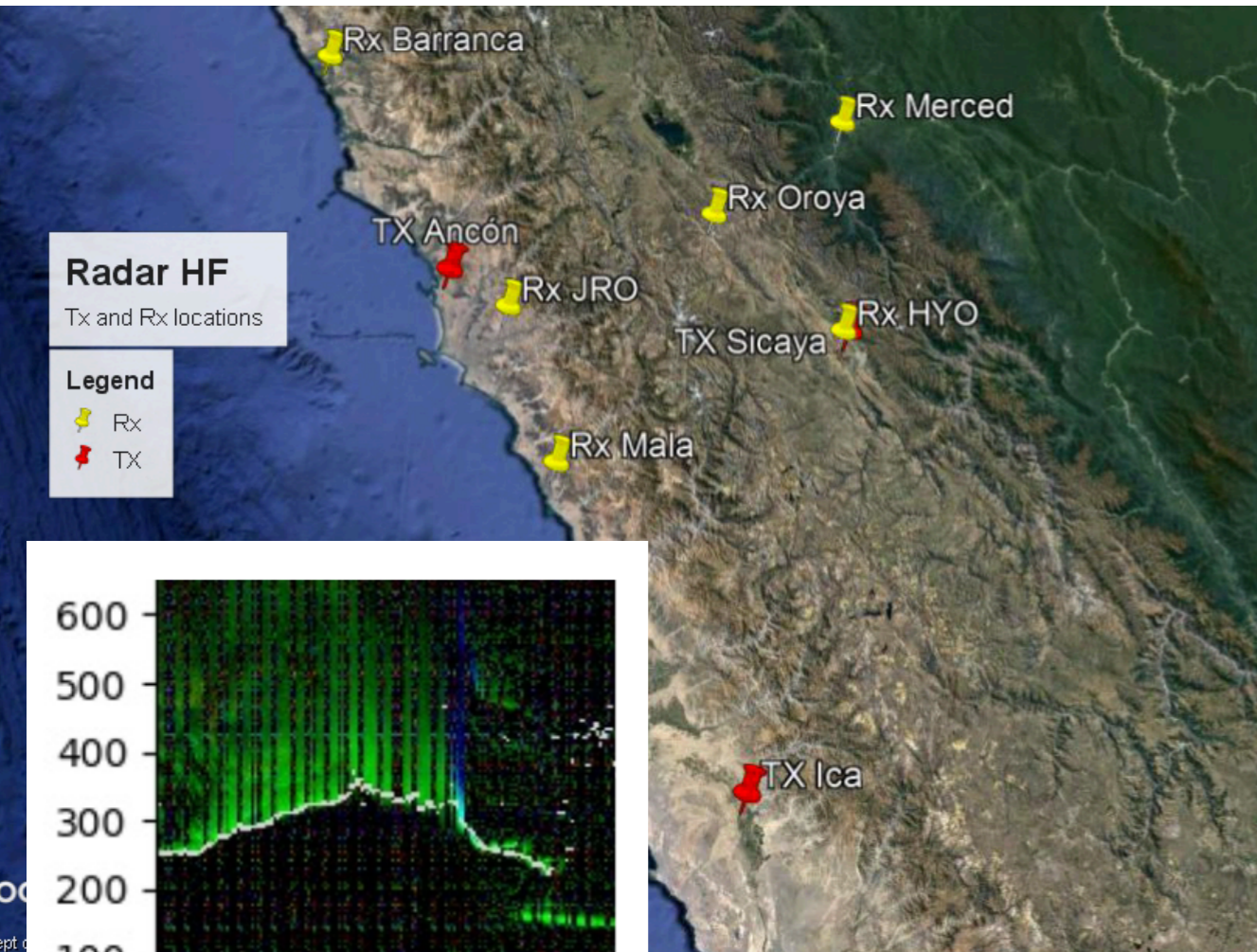


# JULIA ESF mode running every night





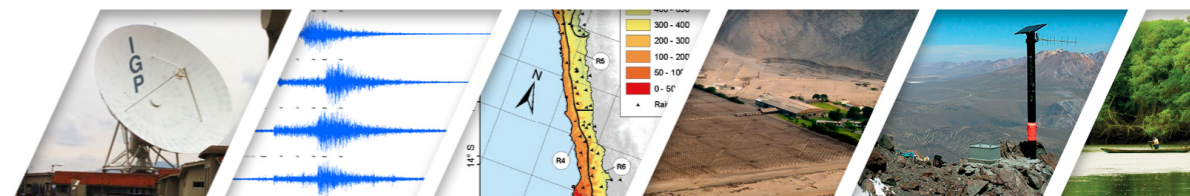
# HF radar & SIMONE Peru situation



## Multistatic HF Sounding System

- 3 Tx Stations: Ancón, Sicaya, Ica
- 6 Rx Stations: Barranca, JRO, Mala, Huancayo, Oroya, La Merced
- Some stations are not running properly and require maintenance.

- SIMONE deployed in September 2019.
- 1 TX station at JRO
- 4 Rx stations in Ancón, Azpitia, Huancayo, Sta. Rosa. 1 Rx station pending to be installed.
- Preliminary wind maps generated daily.





# LISN network status

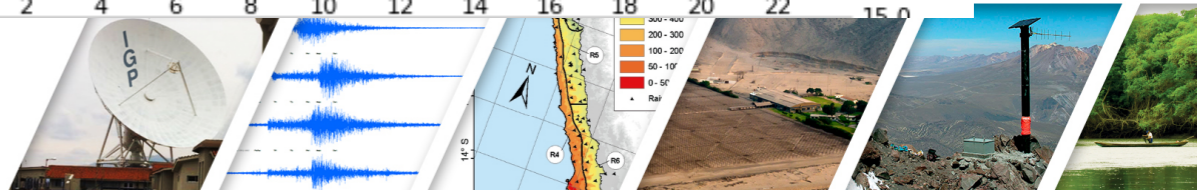
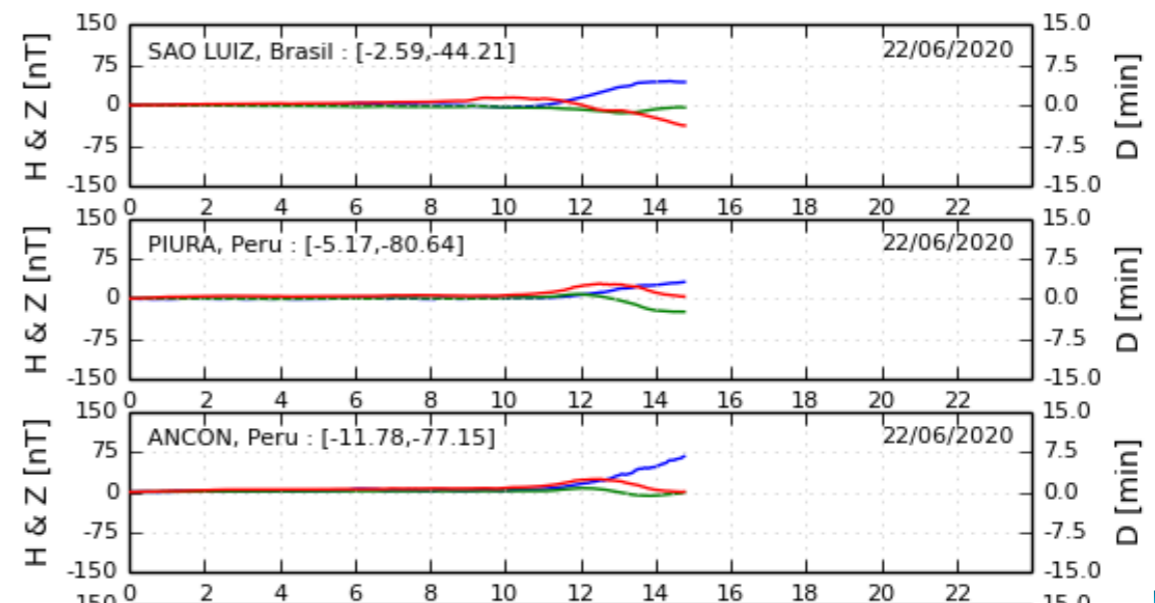
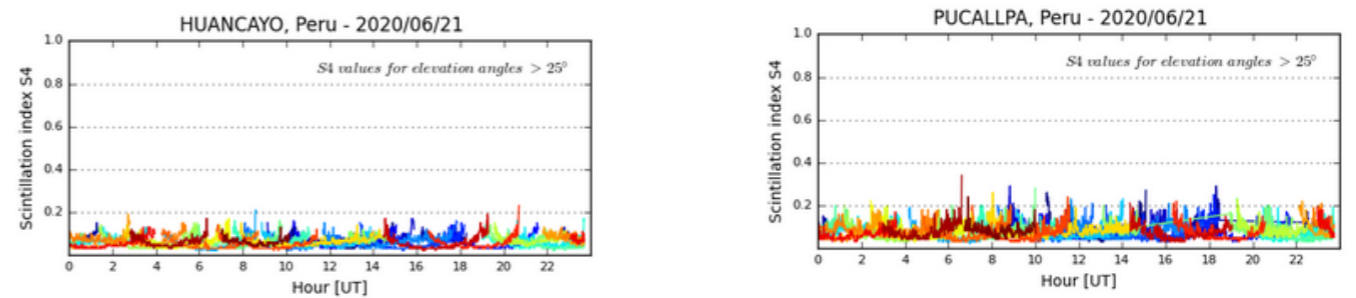
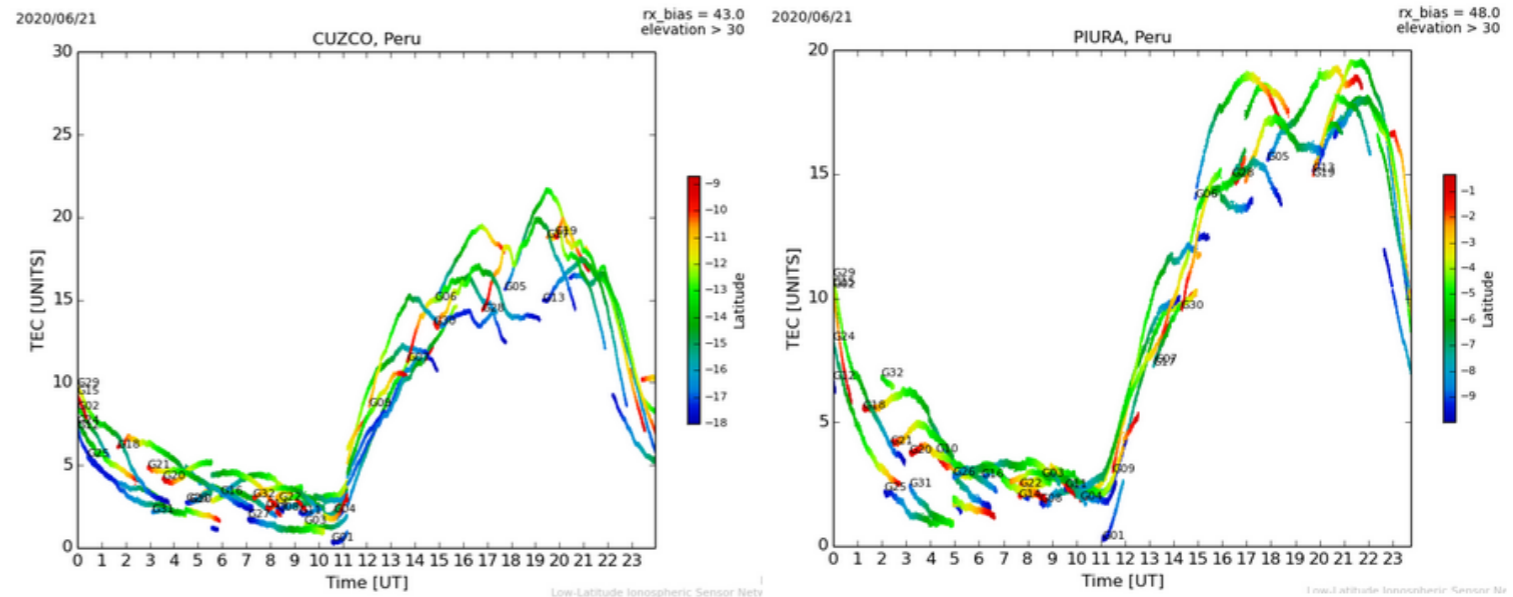
LISN has continued operating during the quarantine period.

TEC, S4, magnetograms, ionograms and other products are available in the LISN website.

<http://lisn.igp.gob.pe>

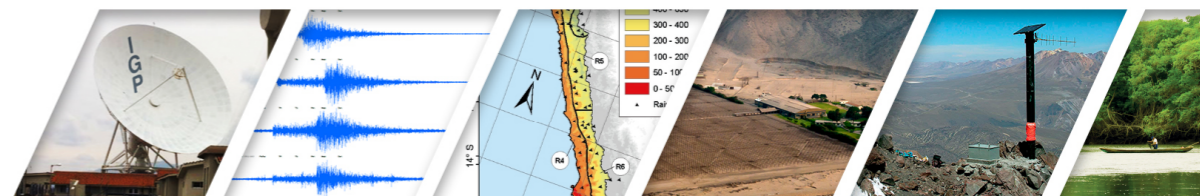
However, some instruments, including all four ionosondes, are not operating now due to maintenance issues.

Maintenance trips to LISN stations are needed, but we cannot plan them yet due to lockdown in South America.





# Status of radar upgrades for continuous operation

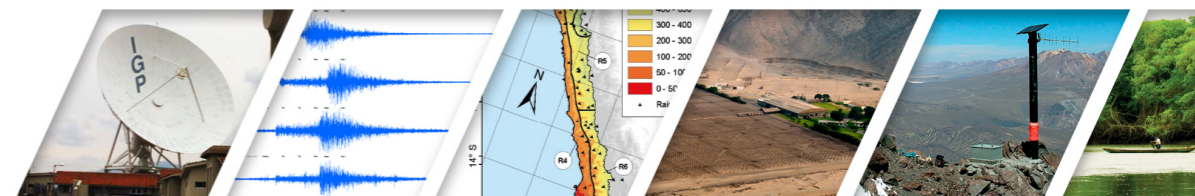
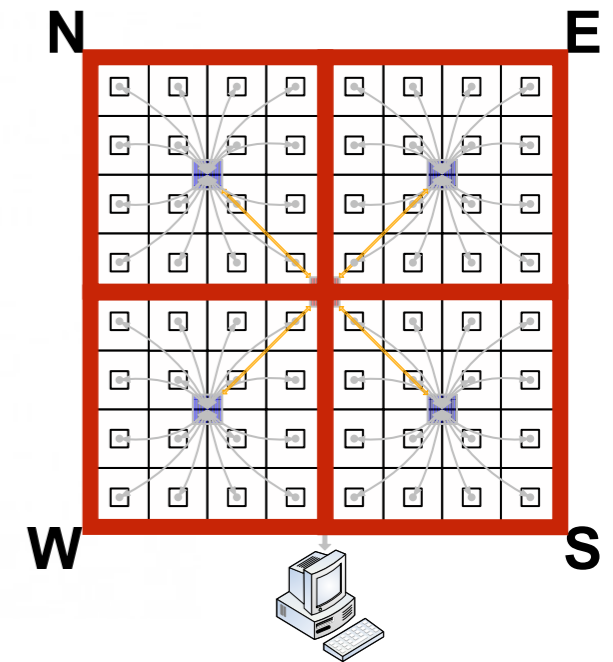
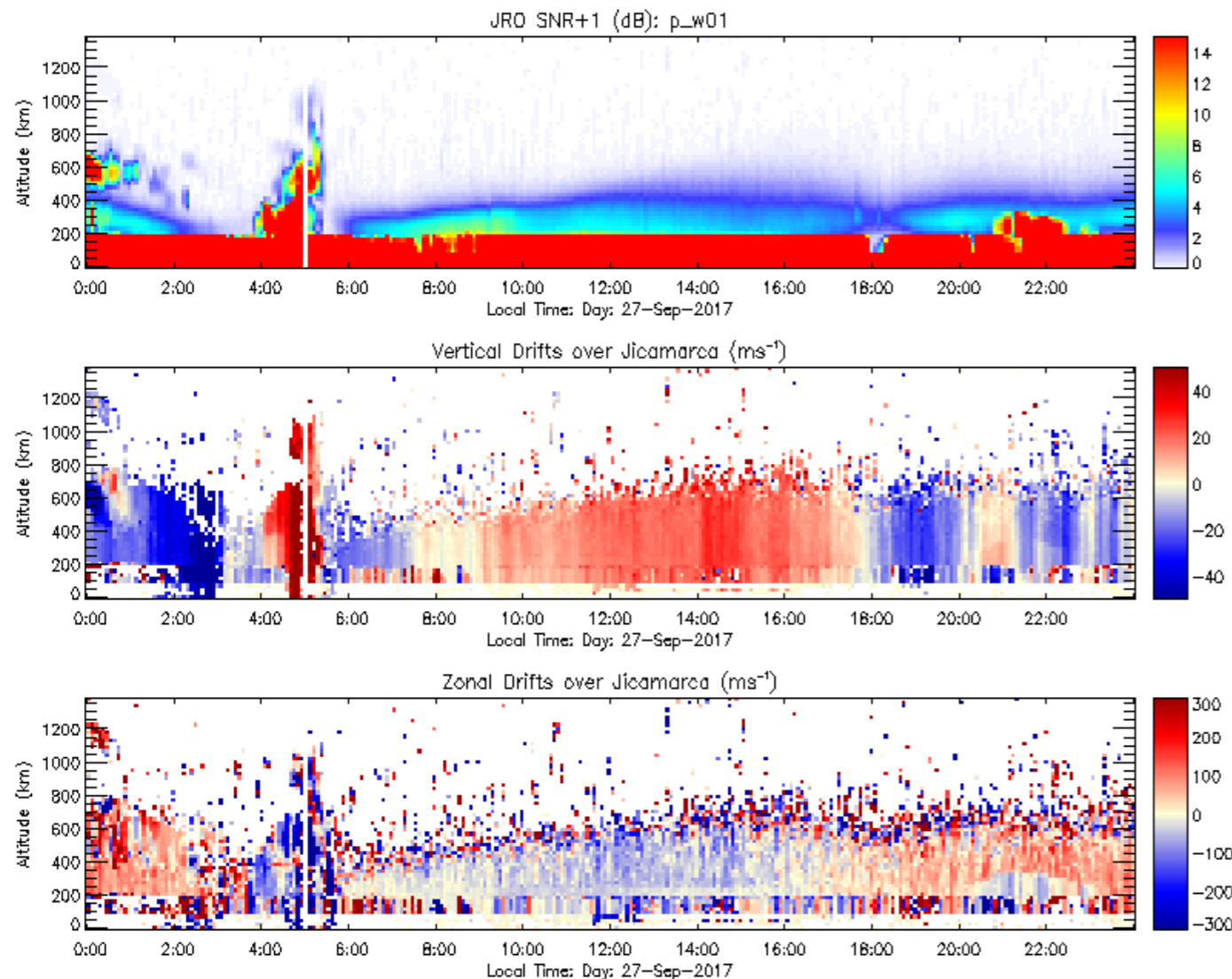


# Jicamarca Radar upgrades

We have received support from NSF to carry out the following radar upgrades.

- Complete the electronic antenna beam switching system.
- Replace the tetrode-based 100kW transmitters with solid-state technology.
- Replace the antenna ground plane.

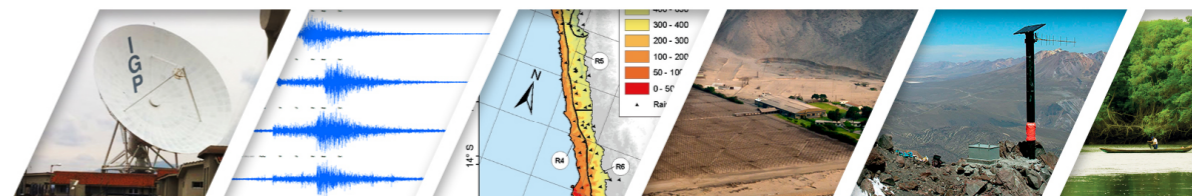
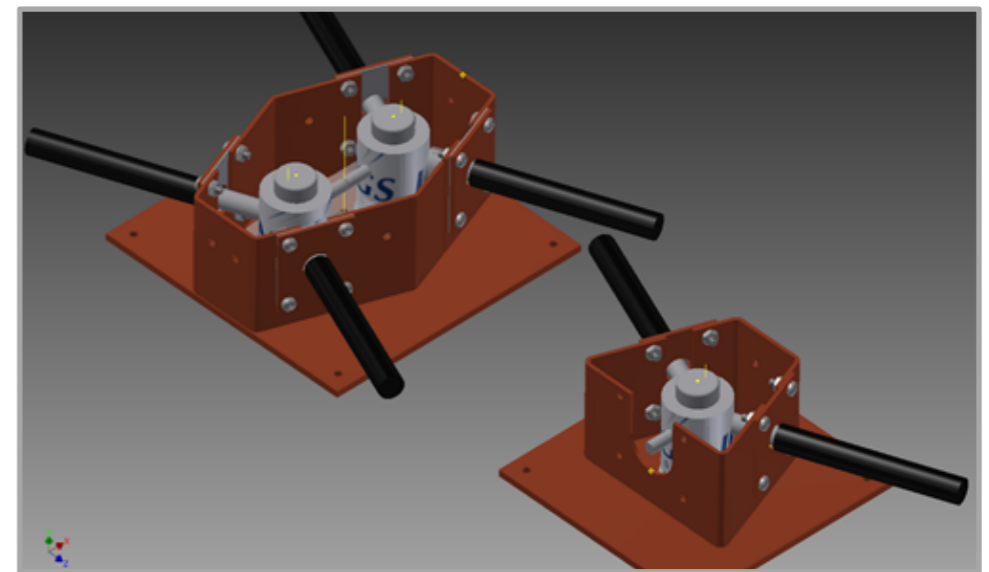
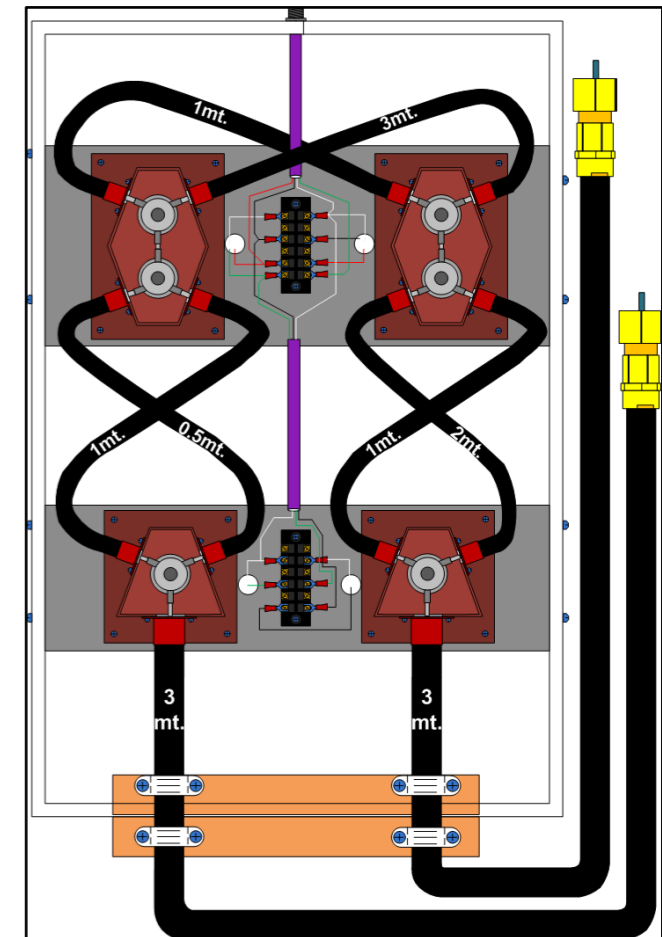
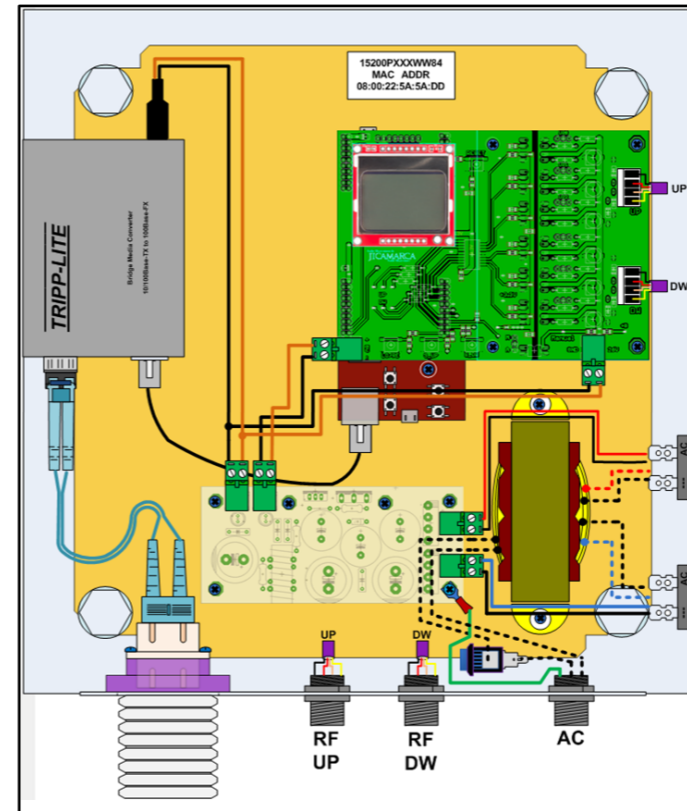
Goal: A new JULIA mode to measure F-region densities and drifts in a routine basis.





# Automatic Beam Switching - ABS

- Updated control modules:
  - Use of IP66 metal enclosure.
  - System control based on a MCU instead of an old embedded linux board.
  - Use of linear power supply to avoid interferences.
- Updated RF modules:
  - Use of IP66 metal enclosure.
  - 3d printed insulation pieces.
  - Compact and smaller size.
- Currently the ABS modules for the east and west antenna quarters are under construction.



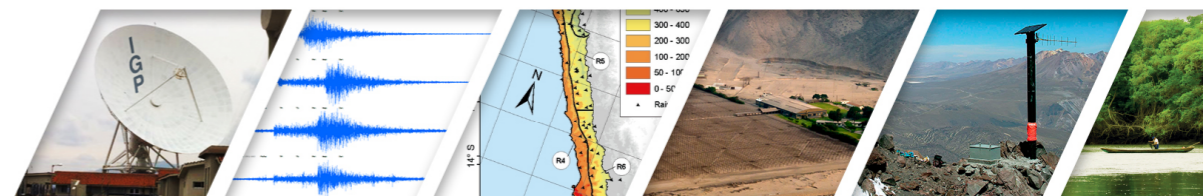
# New Drivers - solid state transmitters

Two 96-kW solid-state transmitters have been ordered and should be delivered by the end of this year.



Specifications:  
Power: 96 kW  
Frequency: 49.92 MHz  
Duty cycle: 10%  
Max pulse width: 2 msec

Preliminary design of the new TX room for the solid-state “Drivers”.

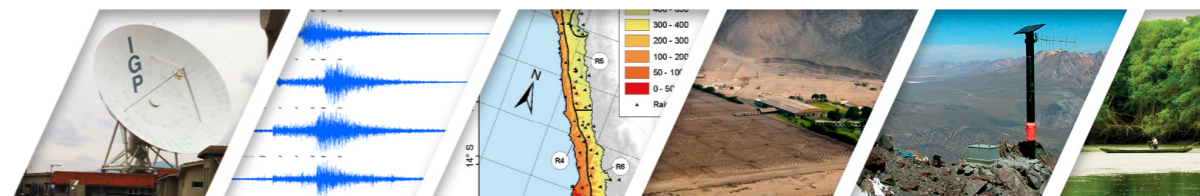




# Conclusions

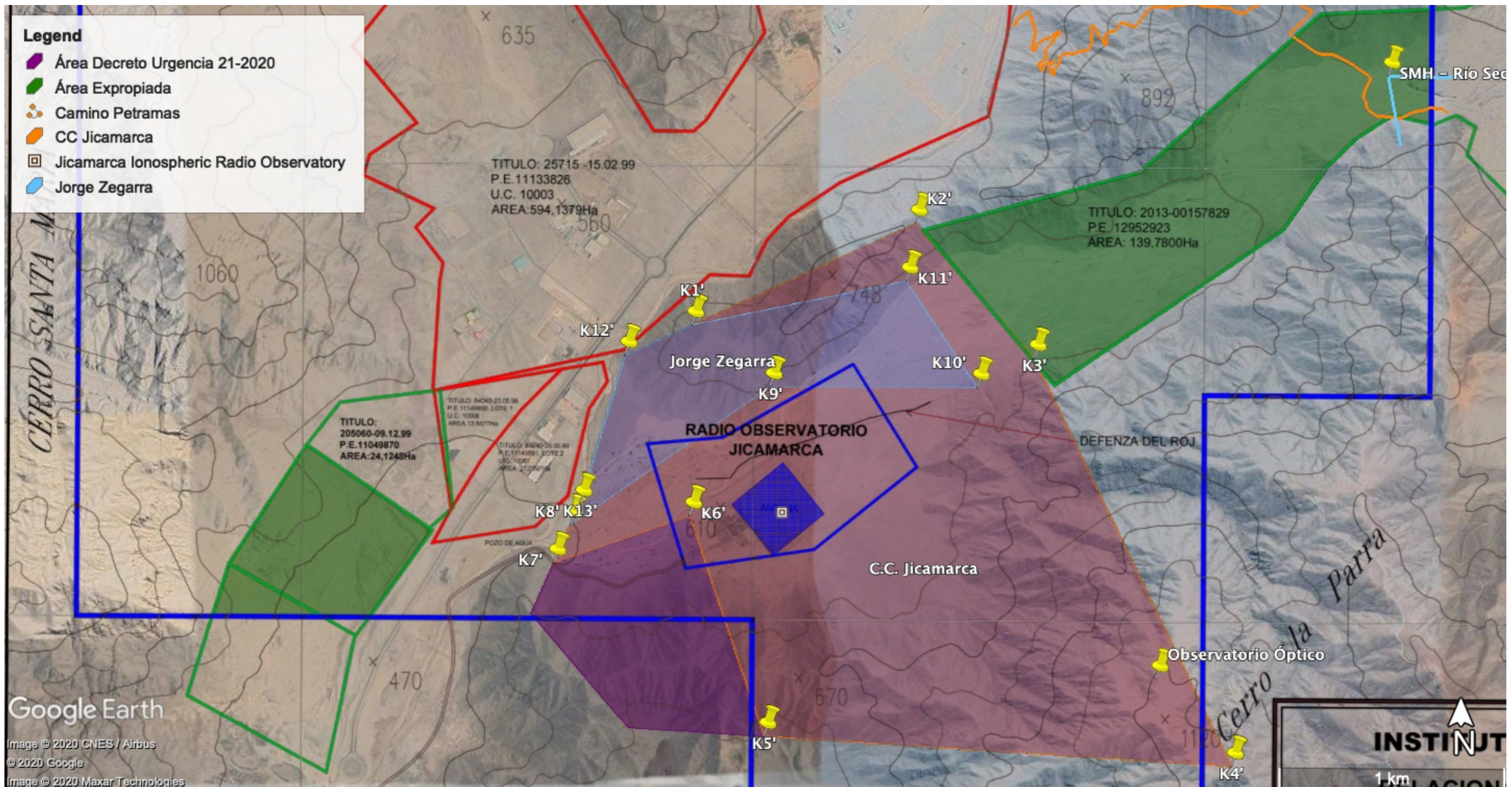
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- The Jicamarca radar has been operating in JULIA mode for about 3 months continuously during the quarantine period.
- It is expected that the radar operations team will return to the observatory in July 2020 and that high-power operations will restart in August 2020.
- Other instruments have suffered due to the lack of maintenance. Trips should be scheduled in the next months.
- Radar upgrades are under implementation.
  - Solid-state TXs should be delivered by the end of this year.
  - ABS modules should be deployed in the first months of 2021.

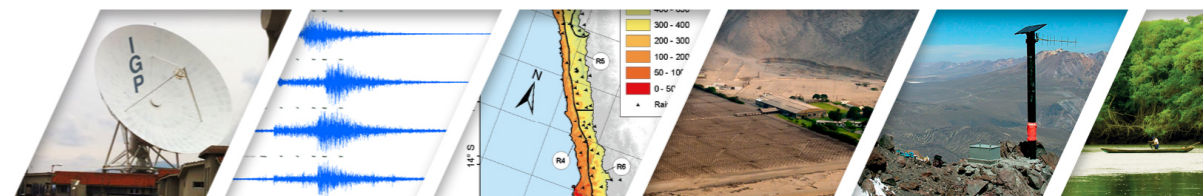




# Good news - JRO Protection Area



In January 2020, the Peruvian government declared of national interest and public necessity the implementation of a protection area for the observatory. The goal is to acquire 400 hectares around JRO in order to secure its continuity.





A wide-angle photograph of a solar farm in a desert. The foreground and middle ground are filled with rows of solar panels, their metal frames and glass surfaces reflecting the bright sunlight. The panels are arranged in a grid pattern that recedes into the distance. In the background, there are several mountain ranges under a clear, bright sky. The overall scene is one of a large-scale renewable energy project in an arid environment.

Thanks for your attention!