SOPHy: Development of the first weather radar in Peru

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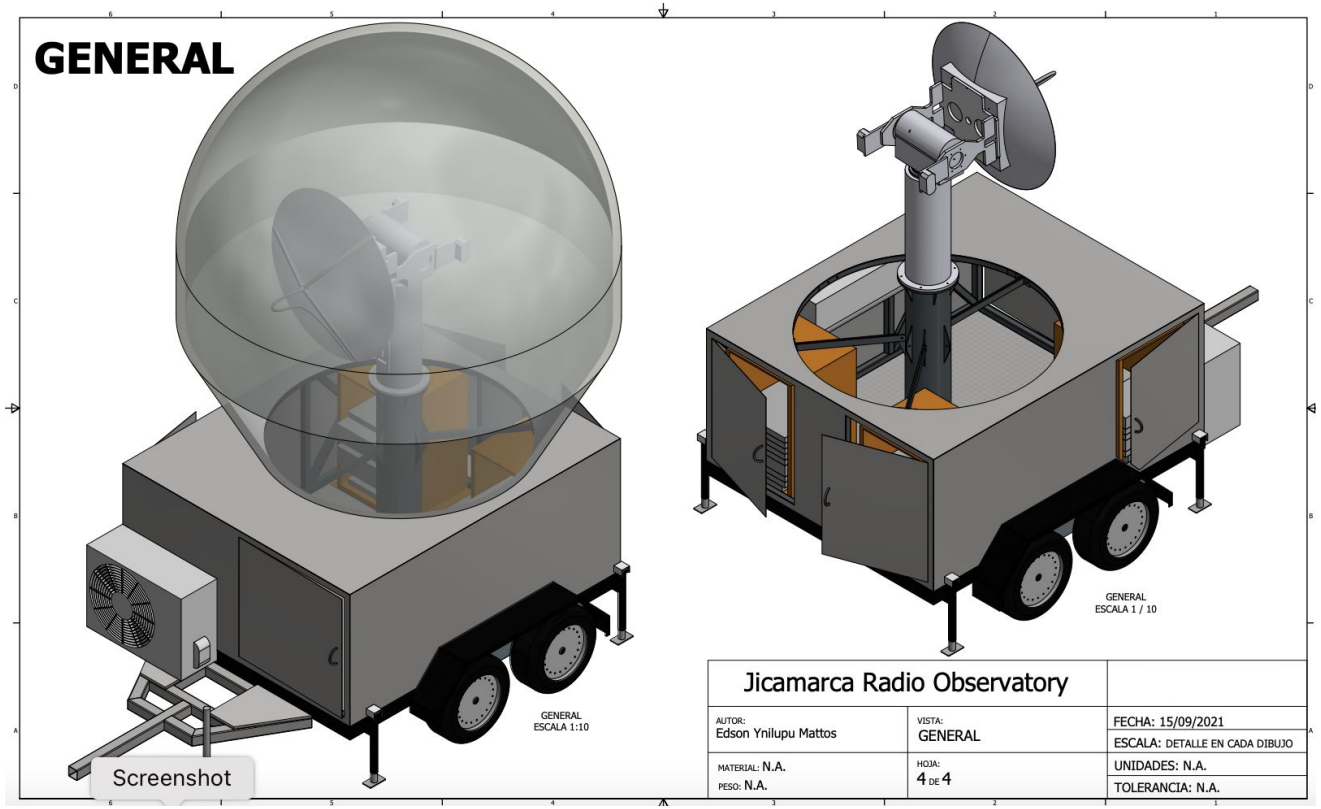
Background

- 2014 - 2017: Construction of a UHF profiler radar **CLAIRE**.
- 2015: Acquisition of a cloud profiler radar **MIRA 35C** (Ka-band)
- 2017: “El Niño Costero” phenomenon.
- 2018: Collaboration with the ARRC from OU to bring a weather radar **PX-1000** (x-band).
- 2019-2022: **SOPHy** (X-band)

FONDES

Funds for intervention in the occurrence of natural disasters

Design

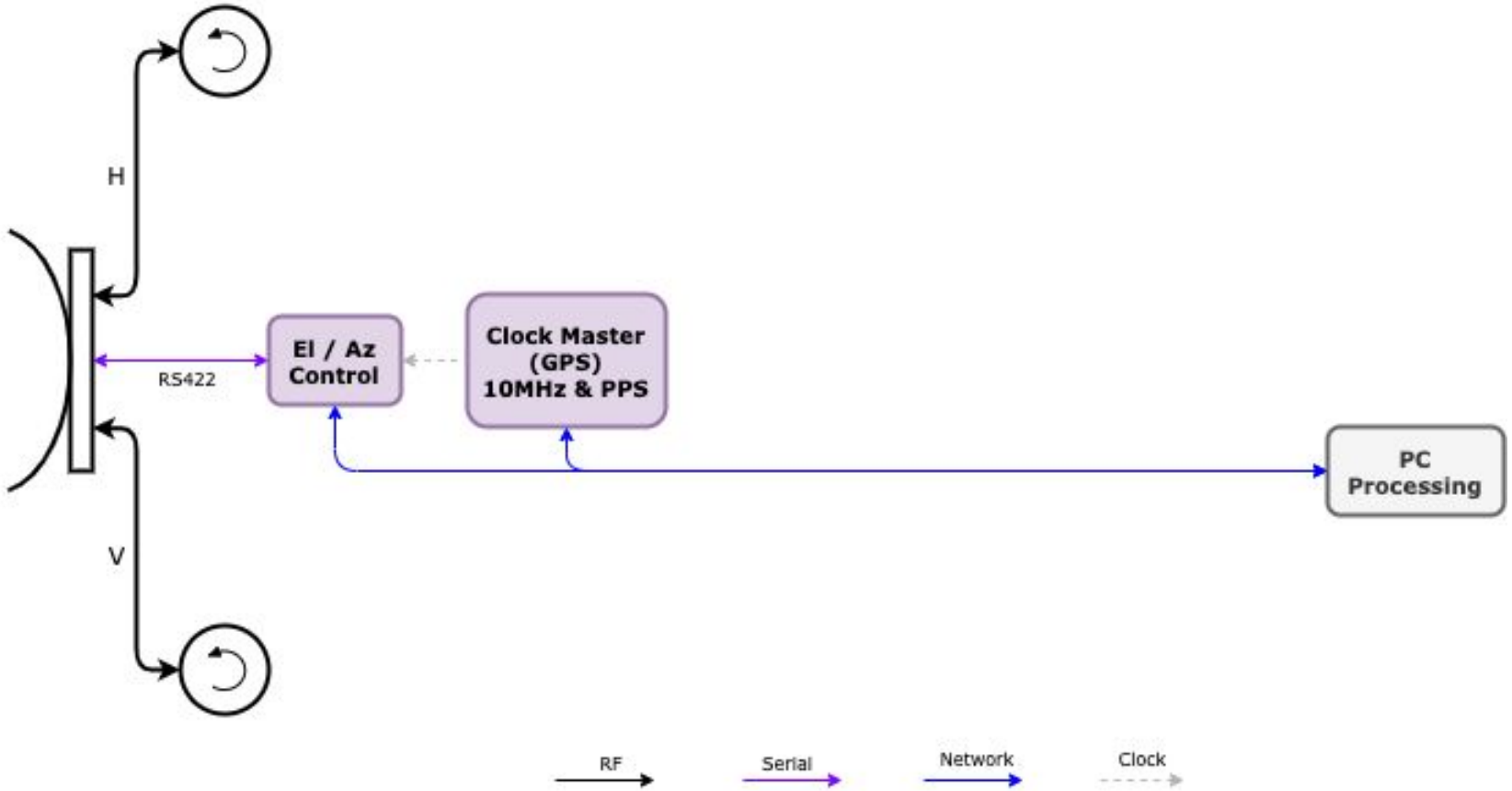


- X-Band
- Doppler Radar
- Dual Polarization
- SDR technology
- Transportable
- Open Source

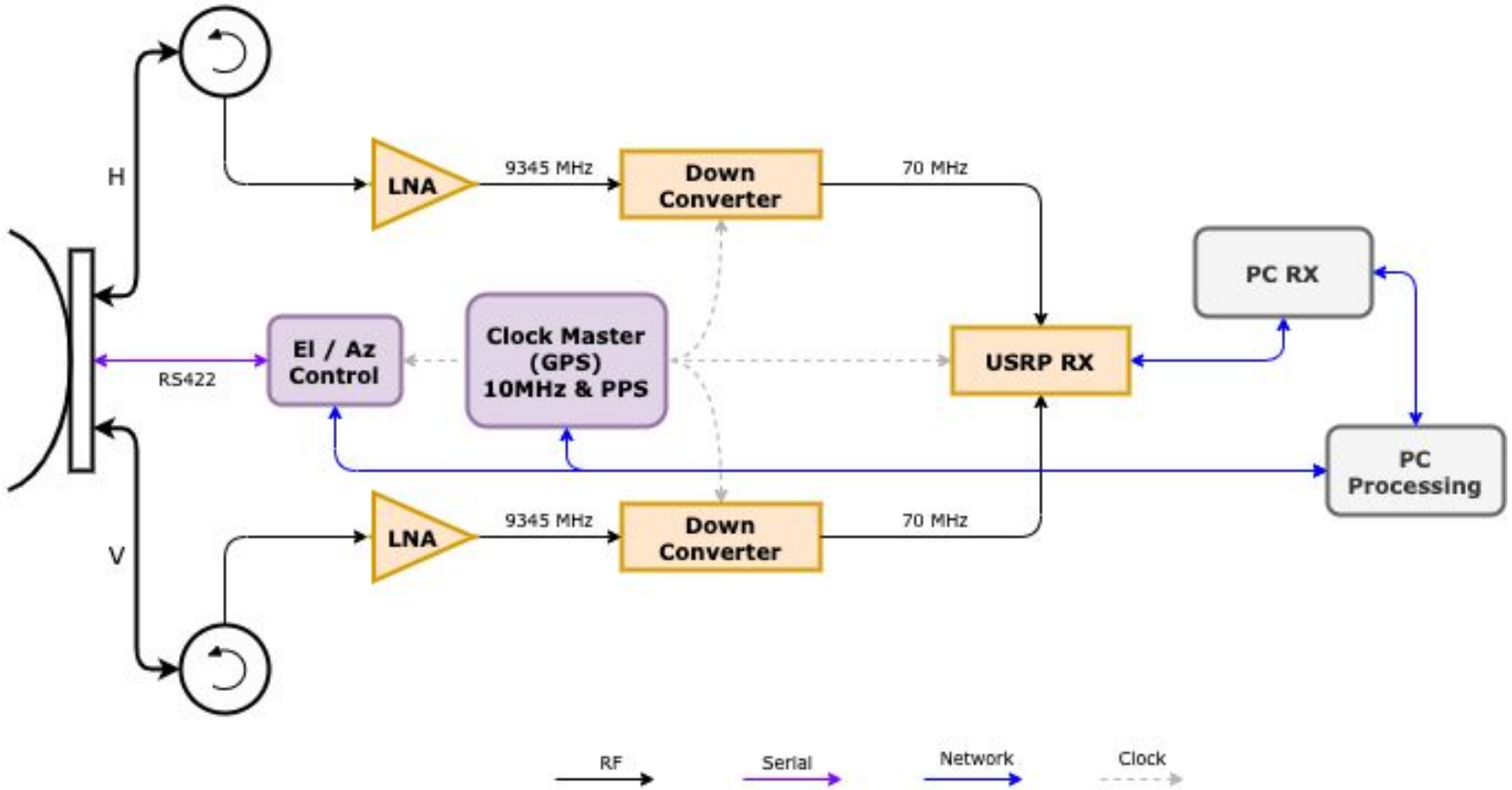
Specs

General	**Frequency**	**9345 MHz**
	Range	**60 Km**
	Resolution	**60m / 1°**
Positioner Orbit AL-4016S	Coverage	AZ (0° a 360°), EL (-5° a 185°)
	Máxima velocidad angular	**20°/s**
	Interface de control	RS422
Antenna Seavey C0824-810A	Gain	38.5 dBi
	Diameter	1.21 m
	Beamwidth	1.8°
	Polarization	**H & V**
Power Amplifier Advantech Wireless SSPA	**Peak Power**	**200 W**
	Pulse Width	1 µs to 100 µs
	Duty cycle	15%
RF Transceiver USRP N200	Intermediate frequency	70 MHz
	ADC	14-bit @ 100 MS/s
	DAC	16-bit @ 400 MS/s
	Bandwidth	**10 - 2 MHz**

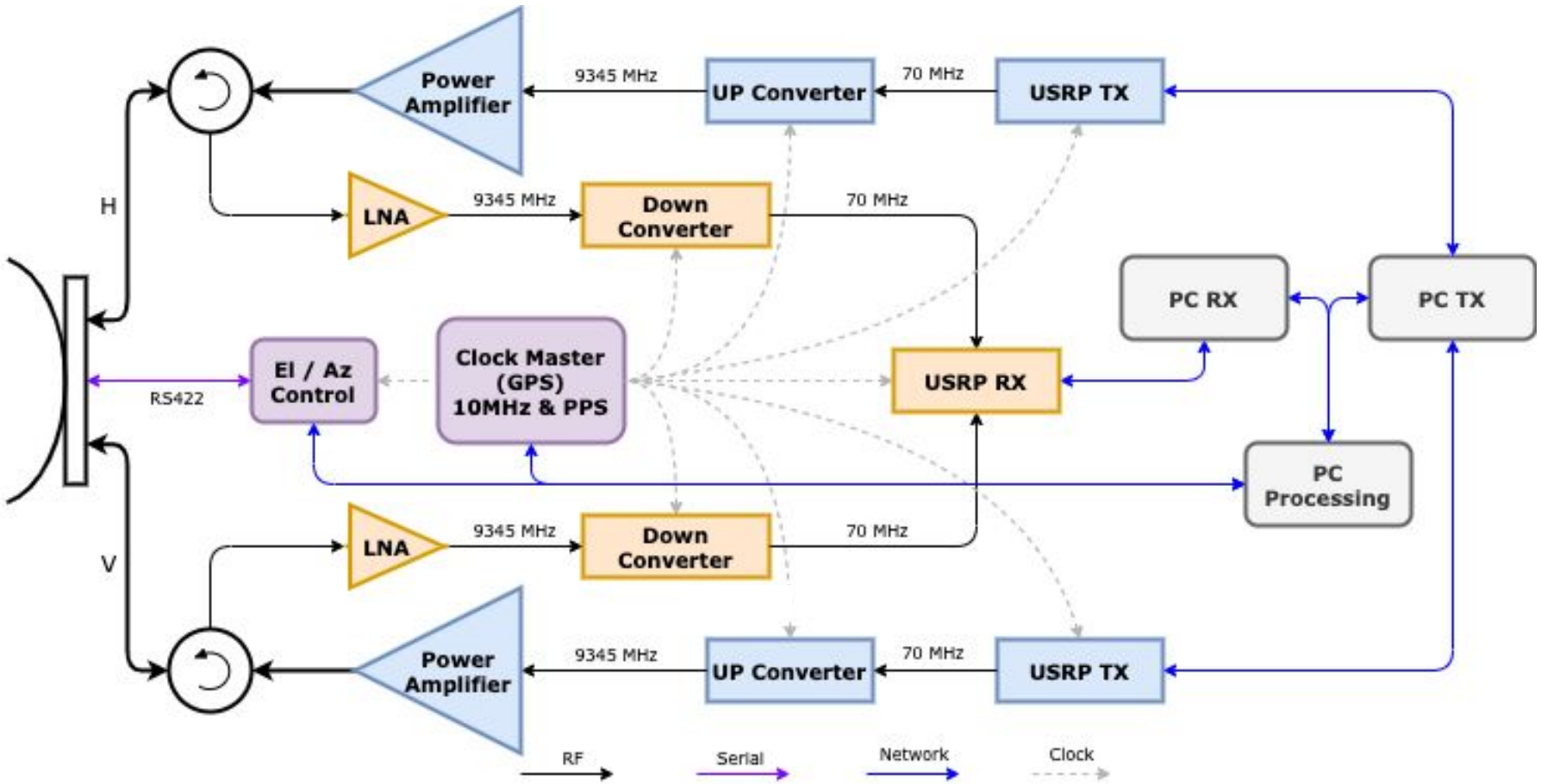
Block diagram



Block diagram



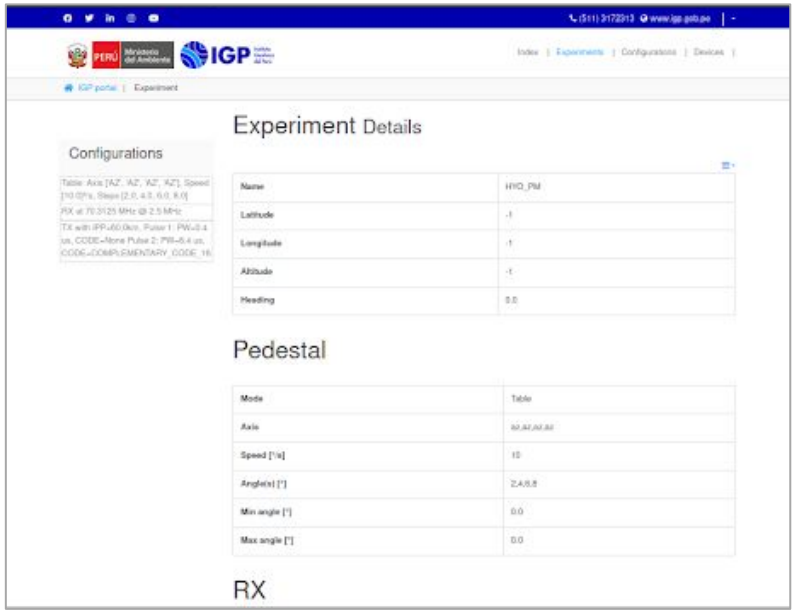
Block diagram

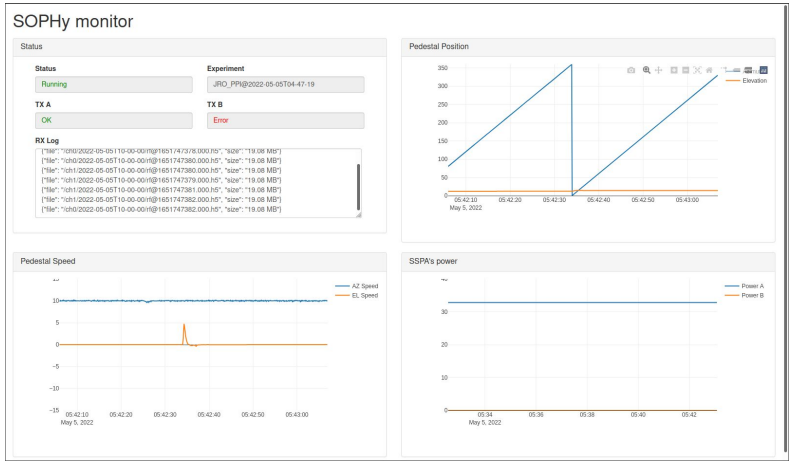


Assembling

Integration

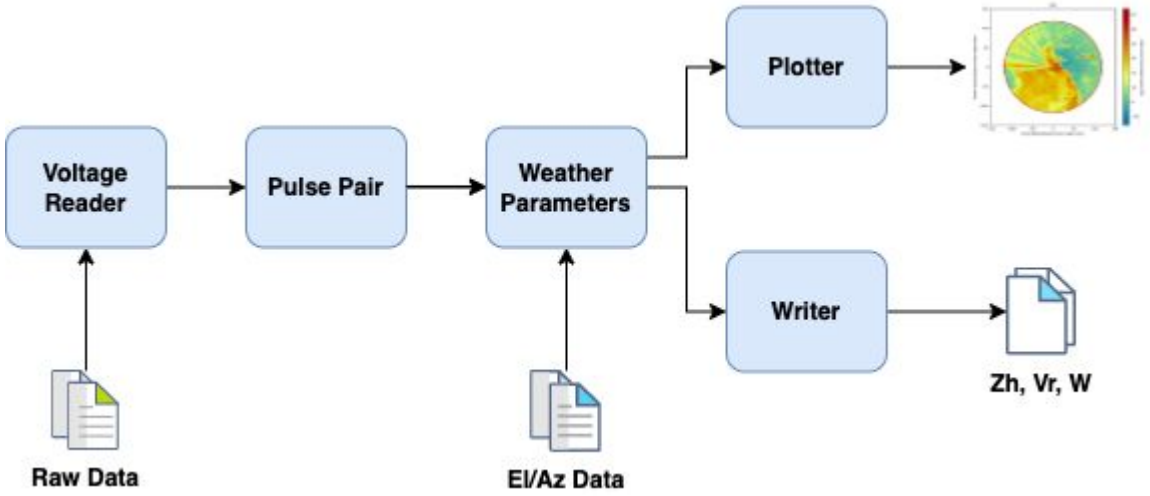
- Use of web applications for control and monitoring.
- Python language.
- Standard protocols e.g RESTFul and MQTT.





Data Processing

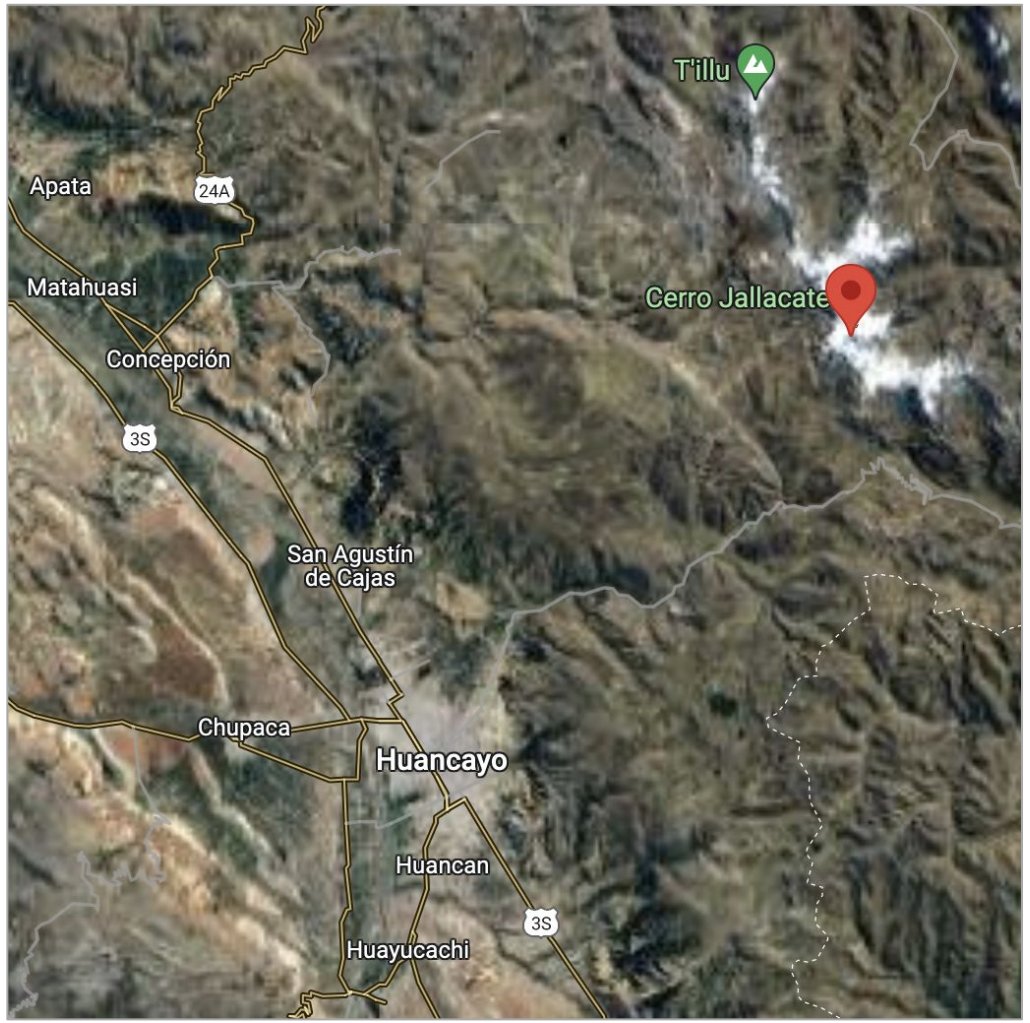
- Use of **Signal Chain** library (developed at JRO).
- Support for Multiprocessing,
- Modular: Reading units, Processing units and operations.
- Python language.
- Operations: plotting, publish and writing
- Use of standard formats (HDF5)



First campaign - TAMYA

Impacts of the climate change in the andean glaciers (Huaytapallana)

- Weather radar
- Disdrometer: hydrometeors classification (type and size) also falling velocity
- Weather station: atmospheric conditions (precipitation, temperature, humidity, winds)

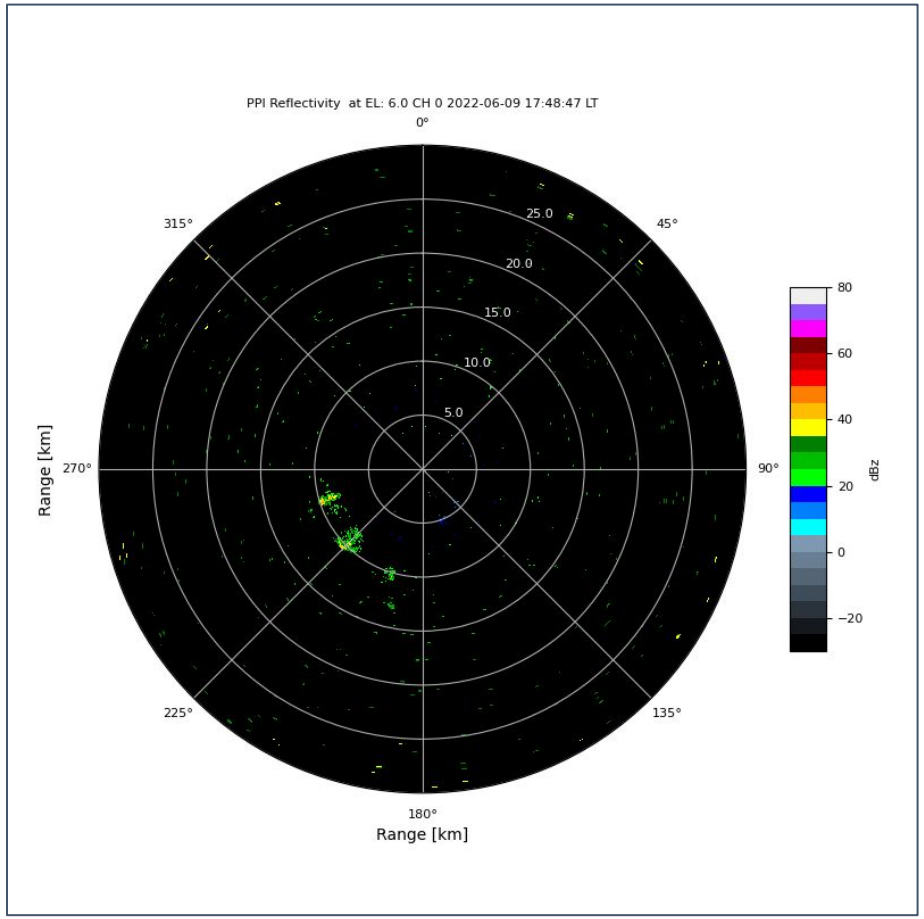


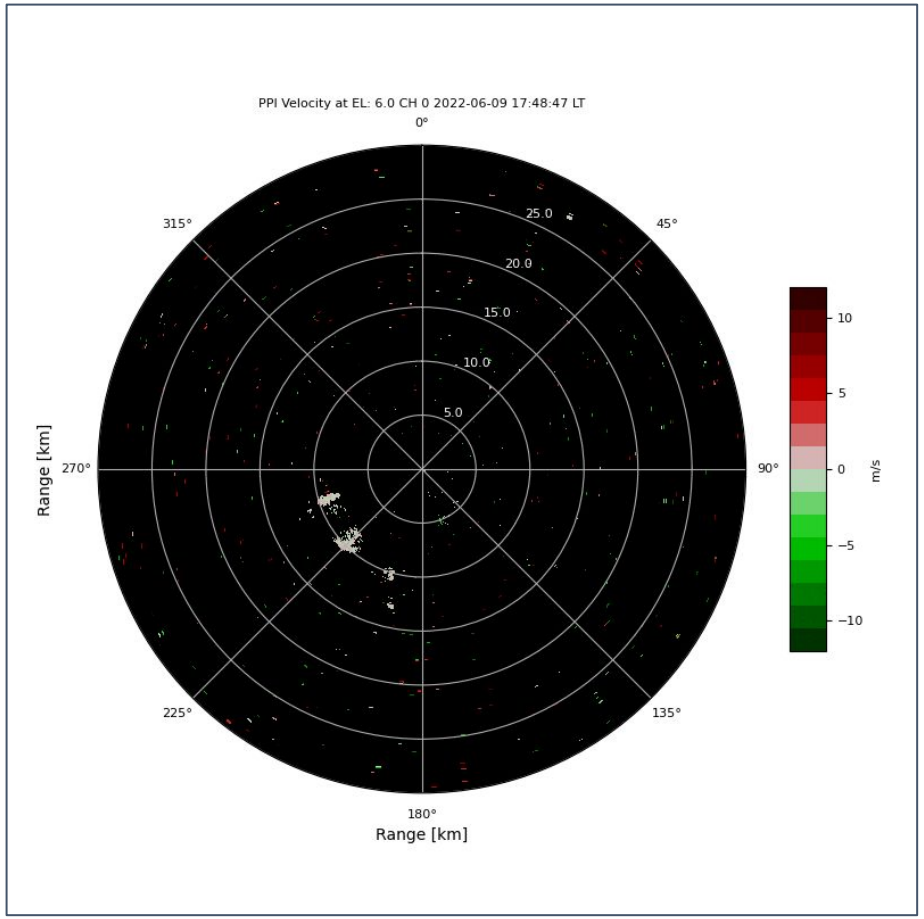
First campaign - TAMYA

Research:

- Quantitative precipitation estimation (QPE)
- Hydrometeor classification: rain, snow, hail.
- Attenuation correction.
- Clutter identification.

First campaign - TAMYA





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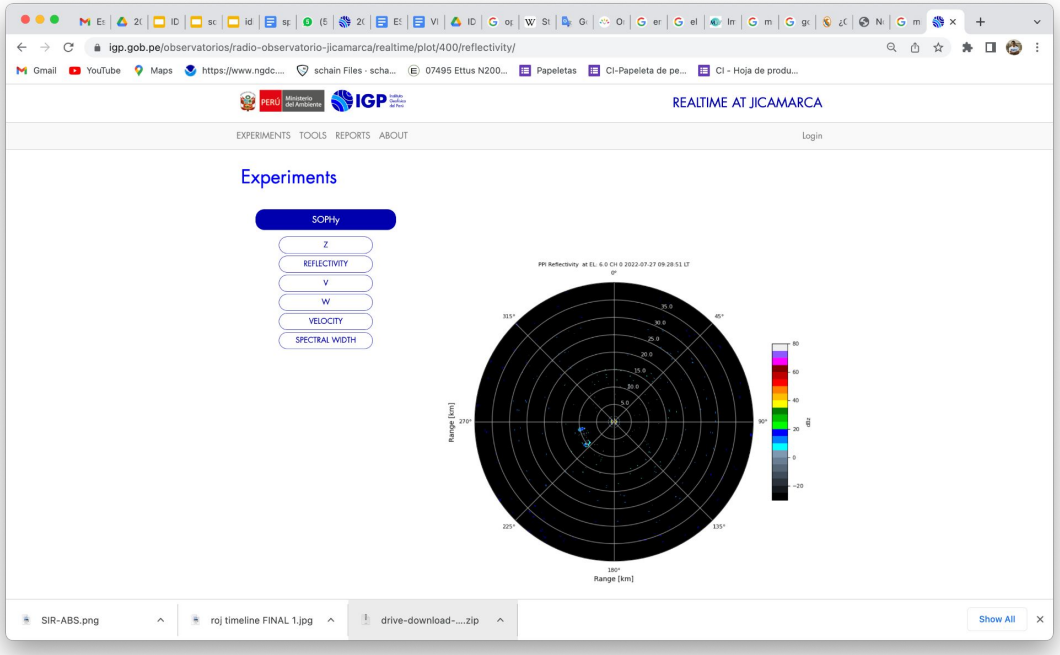
Next steps

- Data validation.
- Other applications (weather service, biological targets)



Summary

- SOPHy is the first dual polarization weather radar built in Peru.
- IGP through Jicamarca has extensive experience in radar development as well as strategic alliances with international research centers to improve radar-based precipitation estimates.
- We can use SOPHy data in a variety of applications.

IGP

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*Ciencia para **protegernos***
*Ciencia para **avanzar***