



Space Weather Activities in Argentina



Dr. M. Graciela Molina (1)

Dr. Sergio Dasso (2)

1. TSWC - FACET-UNT and CONICET

2. LAMP - IAFE (UBA-CONICET) and DCAO (FCEN,UBA)

SPACE WEATHER ACTIVITIES IN ARGENTINA

Research Groups and Programs

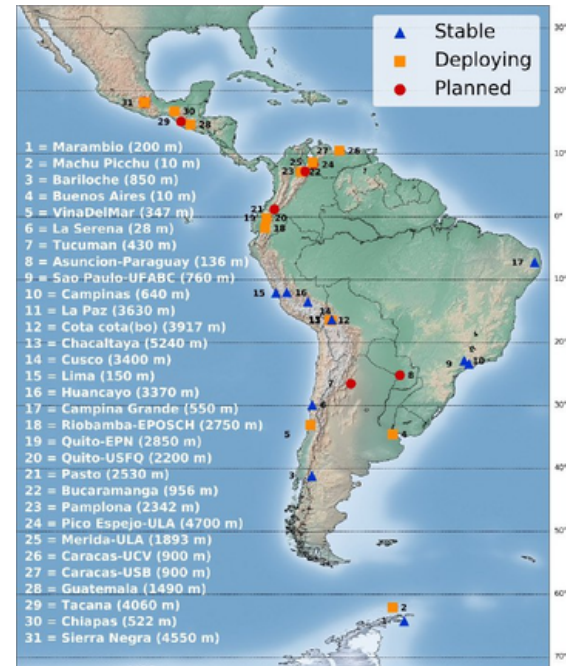
- from low (~ 15 dip) to high lat (Antarctica)
- > number of instruments in the South Hemisphere
- Not Centralized



<http://lagoproject.net/>



- SWx program
- ML program
- Cosmic Rays



<https://www.argentina.gob.ar/ciencia/conae>



- Argentina Space Program: SWx panel
- Working in collaboration with other groups
- Instrumentation in space (SABIAMAR-SAOCOM-etc)



<https://www.smn.gob.ar/>



- Instrumentation deployment (e.g. magnetometers, meteorological stations, lidar, etc)
- Instrument Networks
- Service oriented and 7/24 operations



<https://www.maggia.unlp.edu.ar>



- vTEC modeling using GNSS
- operative vTEC maps
- Capacity building



<https://www.ign.gob.ar>



- Argentinean network of GNSS receivers, covering all the Argentina surface



CONICET



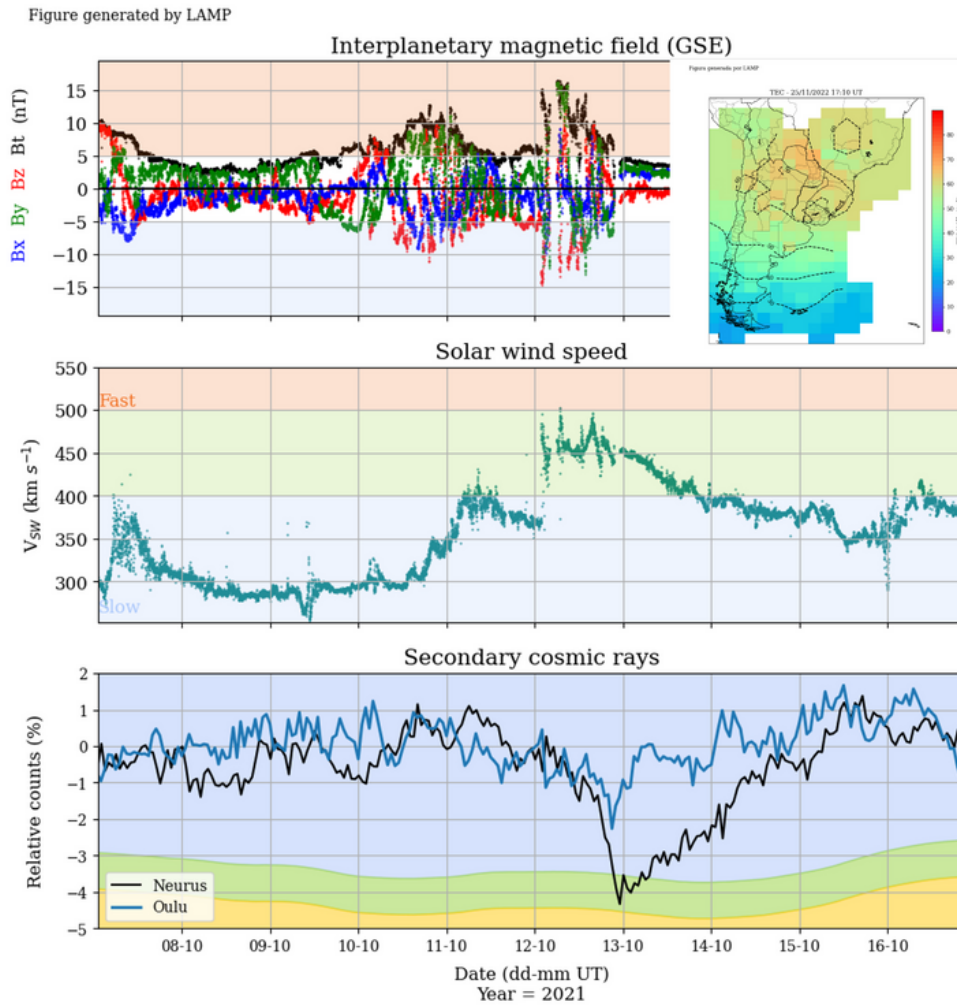
+ Universities

- Many research groups working in the full Sun-Earth system (UNLP, IAFE, UBA, UNT, GEHMe-UM, UTN, US, UNC, etc)
- Human Resources (PhD programs, Courses, etc)
- Infrastructure



Laboratorio Argentino de Meteorología del esPacio (LAMP)

Space Weather Laboratory for Argentina



spaceweather.at.fcen.uba.ar
www.iafe.uba.ar/u/lamp

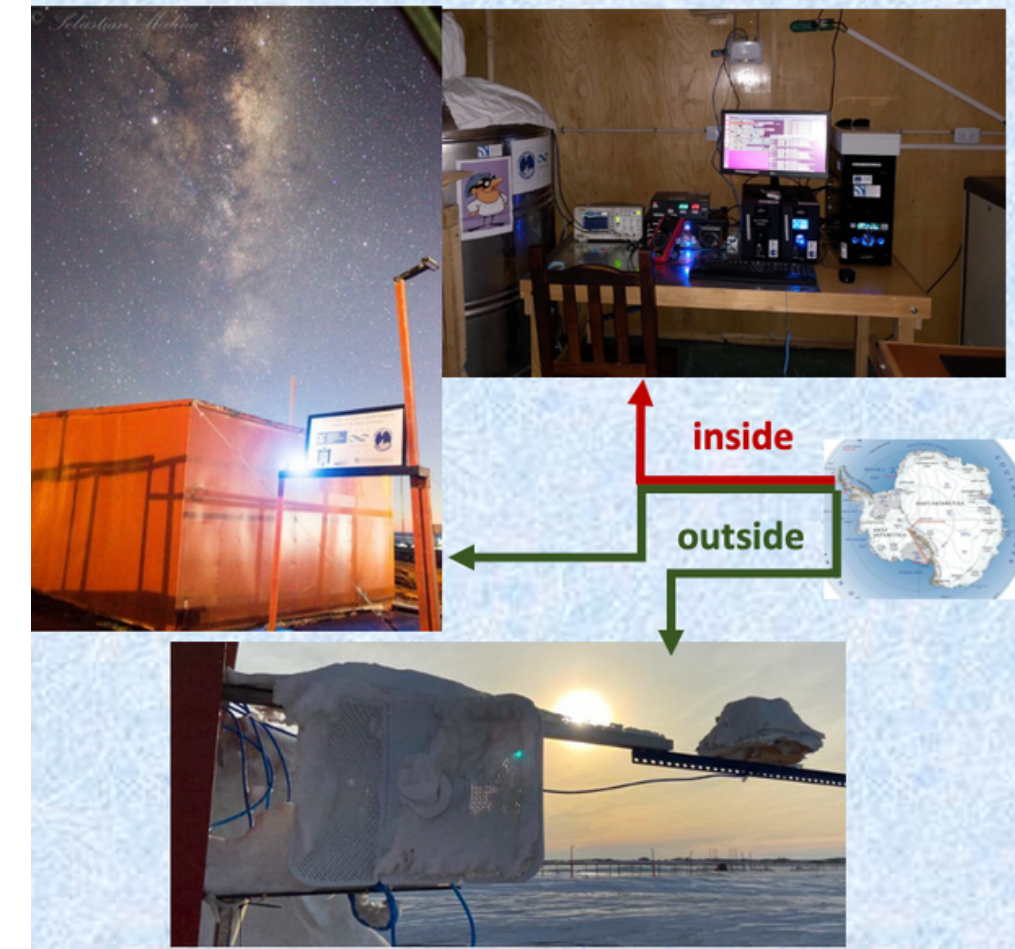


INSTITUTIONS

- UBA
- IAFE (CONICET)
- IAA (DNA) - Antarctic Institute

- LAMP is the Argentina Regional Warning Center of ISES. Since 2023 LAMP exercises the vice direction of ISES
- web-site offering 14 operative real-time products (Sun-SolarWind-radiationBelts-Bge-Ionosphere-CRs)
- Antarctic SWx laboratory: Different operative SWx instruments (24/7) with 5 minutes real-time
- Daily monitoring and publication of a weekly Bulletin reporting SWx conditions
- Capacity Building: Regional Training Center of WMO (~10 SWx training courses last 5 years).
- Participation in SWx groups: WMO-ET-SWx, LAGO, AGATA-SCAR, PSW-COSPAR, ISWI, E-SWAN, ALAGE, PRESTO-SCOSTEP, ROB-Belgium, etc.

Antarctic SWx Lab in Argentina

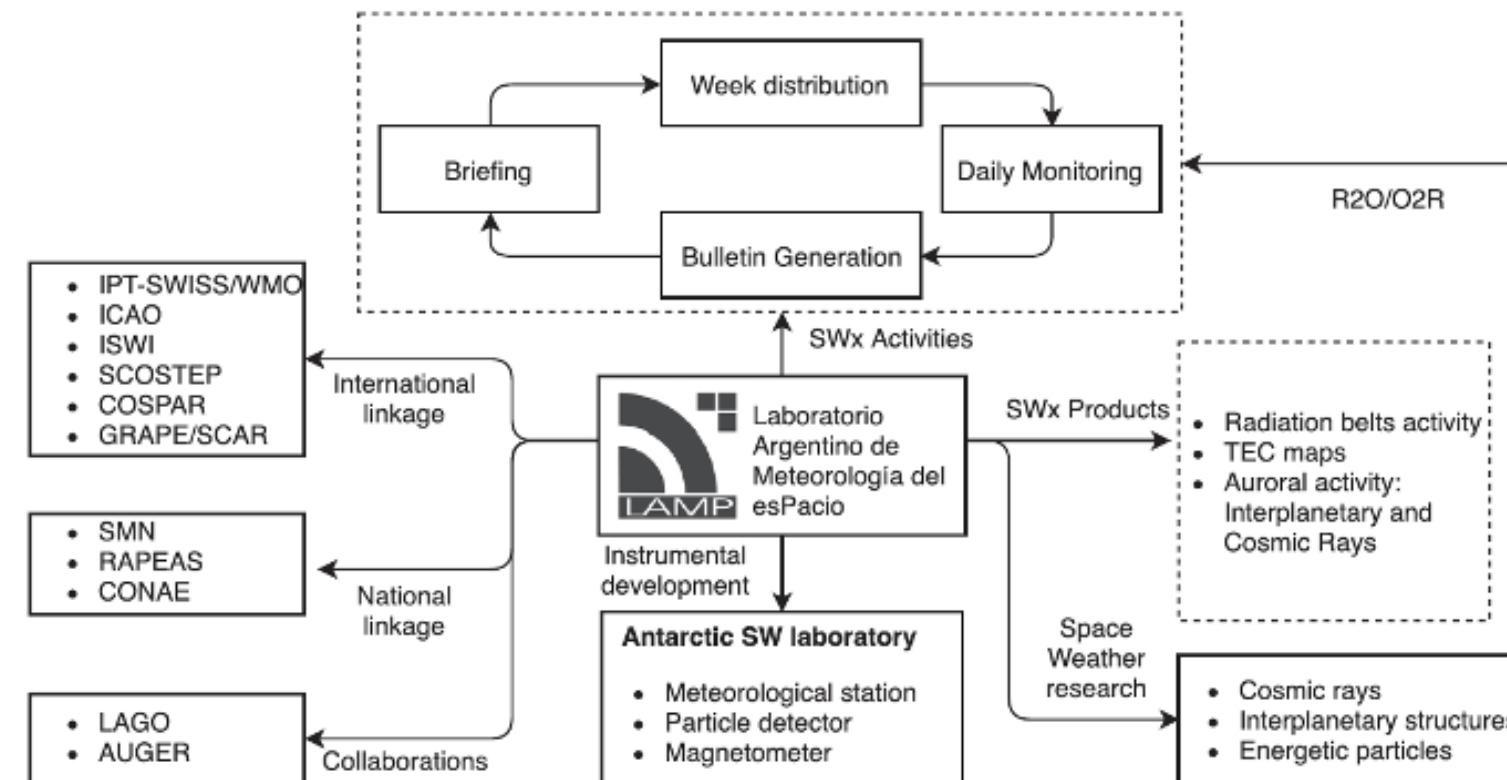


Meeting at ISSI-Beijing. Definition of PRESTO



References:

- Dasso+2015, Proc. of Science, 105
- Lanabere+2020, JASR, 65, 2223
- Dasso+2020, ESWS-instrumentation, 4
- Lanabere+2021, Bull. Arg. Astron, 62, 4
- Gulisano+2021, Bull. Arg. Astron, 62, 280





Tucumán Space Weather Center (TSWC)



<https://spaceweather.facet.unt.edu.ar/>



[/spaceweatherargentina/](https://www.instagram.com/spaceweatherargentina/)

INSTITUTIONS



- FACET- UNT
- UTN - Tucumán
- UTN - Bahia Blanca

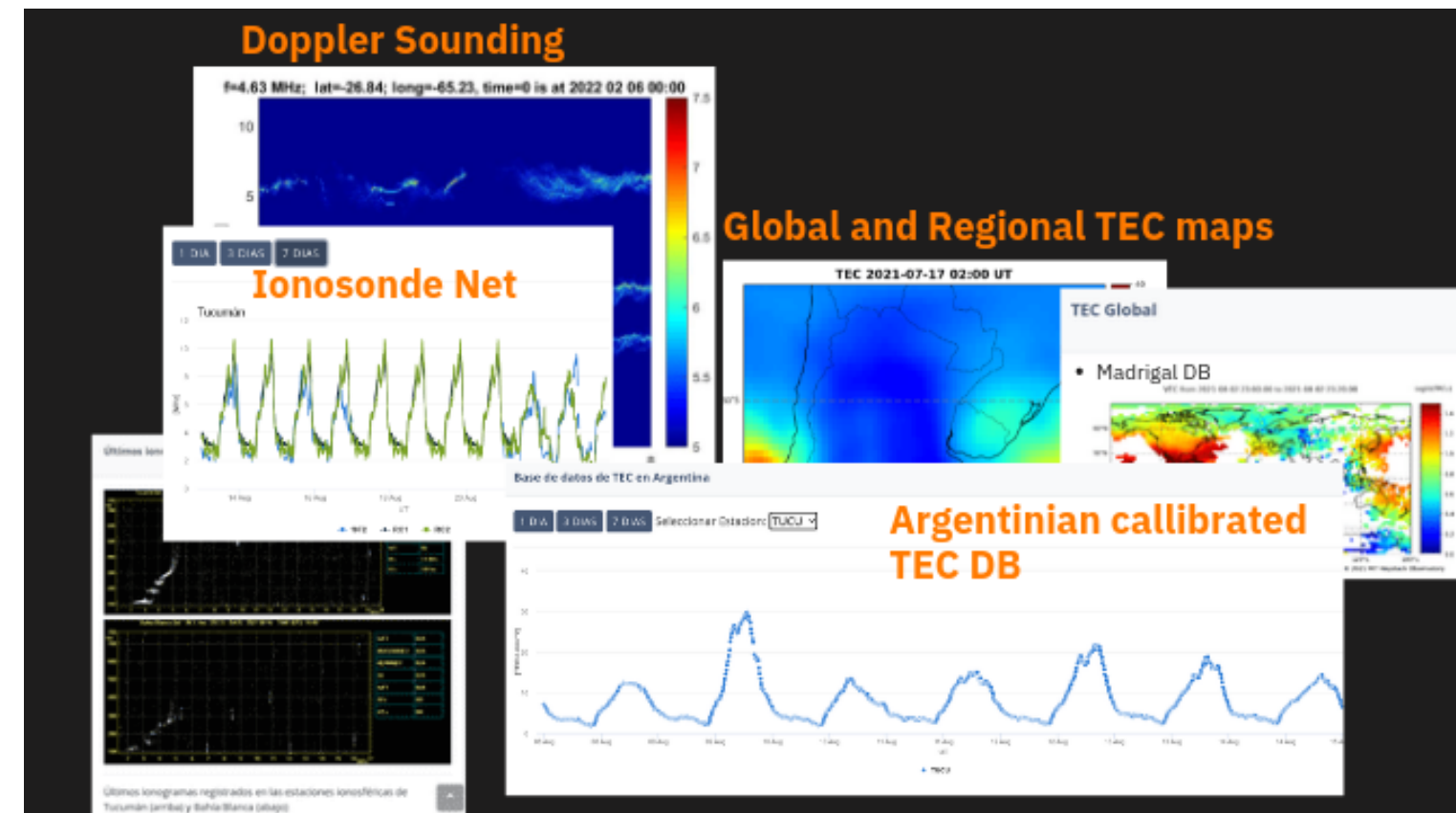


TRAINING

- SWx Postgraduate Curricula (UNT)
- International Workshop on ML for SWx: Fundamentals, Tools and Future Prospects
- Specific training courses



- SWx continuous monitoring.
- **Ionogram validated DB [Arg-Chile]**
- TEC calibration service [on request & on the web]
- **Automatic AGWs detection**
- ML-based ionospheric forecasting (global & regional).
- **Tailored Software Development & Data infrastructure for SWx. UNT-ICTP-INGV-Univ. Newcastle**
- Participation in SWx committee/panels: ISWI - PRESTO/SCOSTEP - CONAE - RAPEAS - ALAGE - LAGO, INGV, AGATHA-SCAR, Universidad de Costa Rica, etc



INSTRUMENTATION

- Real-time
- Radar design and development (ionosonde, OTH)
- Ionospheric data for civil aviation: PECASUS Consortium (FMI, INGV) for ICAO
- **2 Iono sounders** - (low and mid lat). UNT-INGV-UTN.
- **2 GNSS receivers Tuc and Usuahia** (multi- freq & multi-constellation). UNT-INGV-SMN.
- **1 Magnetometer** (SA Net). UNT-INPE
- **1 Continuous 3D Doppler System** (TIDs/AGWs). UNT-CAS. **[upgraded in 2022]**
- **1 Riometer**
- **to be deployed:** 1 GNSS receiver, 1 magnetometer, 1WCD

Summary & future steps

- Different institutions in Argentina carry out complementary SWx activities. In this sense, Argentina has a non-centralized system with major capacities in LA.
- During the last years Argentina reached a critical point, and now it is ready to develop a National Operative Center for Space Weather, and to collaborate in a regional Operative Center.

Next steps

- To create a national center for capacity building in SWx
- Strengthen the SWx instrument network throughout the region
- Establish a national network of SWx institutions, with the aim of forming an Argentine operational SWx center.
- Enhance data and computing infrastructure

