



ChumPIS: Convección Húmeda Profunda y sus Impactos en Sudamérica

ChumPIS: Deep Moist Convection and their impacts in South
America
Buenos Aires
April 14, 2023



Interest on:



Understand

processes that **initiate**, **organise** and **maintain** deep moist convection in Southeast South America, with special emphasis on extreme convection events.



Improve

detection and **characterisation** of deep moist convection.



Innovative approaches

to spatio-temporal data analysis using in situ observations (field campaigns), remote sensing (satellite instruments and weather radars), statistical techniques, artificial intelligence techniques and numerical modelling



Our Team



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Student



<https://conveccionar.github.io/>



International Projects and Collaboration



USA
RELAMPAGO-CACTI
UIUC - NASA

Japan
PREVENIR
University of Osaka

WMO
Nowcasting and
Mesoscale Research WG

Switzerland
University Of Zurich -
UnWizard

Severe Weather Database
Argentina - Brazil - Chile -
Paraguay - Uruguay

France
LERMA. Observatoire de Paris. Teledetection Group

National Collaboration



Juan Ruiz and his team. Inside the Institute.
Fido Garcia.



SMN. Dirección de Productos de Modelación Ambiental y de Sensores Remotos. Meteorología y Sociedad.

Marisa Gassman. DCAO. CABA



Vanina Fiorini. LEyCA. EXACTAS. CABA



Gabriela Nicora. CITEDEF.



Marcelo Garcia. UNC. Córdoba.



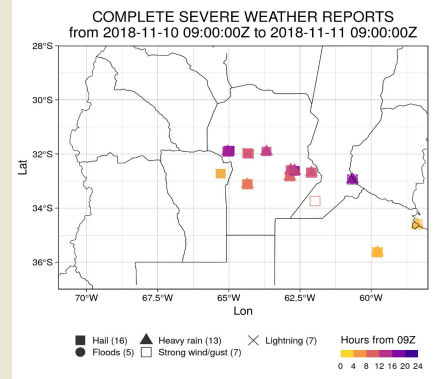
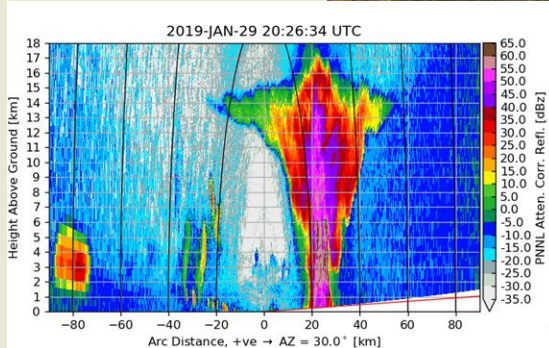
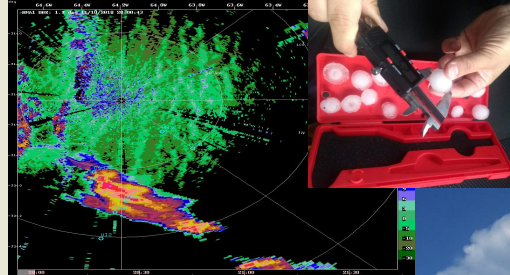
Maximiliano Viale. IANIGLA. Mendoza





Relevant Activities





<http://catalog.eol.ucar.edu/relampago>

6 years planning the field campaign; 3 site surveys before the campaign; more than 10,000 km toured to determine possible deployment sites.
234 scientists, technicians, and students at the Operational Center from 6 countries (the United States, Argentina, Brazil, Australia, Spain, and the United Kingdom)
94 graduate and undergraduate students from the United States (51), Argentina (34), Brazil (5), Australia (2), Spain (1), and the United Kingdom (1) participated in the field campaign
16 universities and research centers collaborating for RELAMPAGO organization and deployment from 3 countries (United States, Argentina, and Brazil)
2 forecast dry runs before the campaign; 89 forecast briefings during the campaign; 3 mesoscale forecast models and one 60-member model ensemble ran over the RELAMPAGO domain
5 research themes: convective initiation, severe convective weather, upscale growth of convection, lightning, and hydrometeorology
47 IOP days directed from the operations center at Villa Carlos Paz
19 missions: 3 DOWs, 1 COW, 3 mesonets, 12 Pods, 3 disdrometers, 6 sounding operating units driven more than 30,000 km; 3 operational and 1 fixed sounding station with additional observations per request from the RELAMPAGO team
1,192 fixed and mobile soundings
3 ground-based C-band radars operating over the RELAMPAGO Córdoba sector
1,010 h of GOES-16 Mesoscale Domain Sector observations during EOP and IOP
>49 million raindrops measured by RELAMPAGO disdrometers
2,285 impacts on RELAMPAGO deployed hailpads
2 storms reaching more than 18 km in altitude; more than 45,000 GOES overshooting tops during EOP
2.9 million lightning flashes observed with a lightning mapping array over 163 days
3 river basins observed and runoff-rating curves determined
21 TB of mobile radar data collected
1 open house at Córdoba, 2 open houses in collaboration with CACTI, 15 visits at schools and community centers; more than 5,000 people were interacted with; innumerable people stopped at instrumentation on the roads during RELAMPAGO deployments
5,500 followers at the @RELAMPAGO2018 Twitter account; 690 severe weather reports received using the @RelampagoEdu Twitter account; 3 citizen crowdsourcing projects, dissemination of ~10,000 hail rulers
19 institutions and local government agencies hosting instruments, 25 families hosting instruments at their own homes or farms



On going Activities



Hazard identification

Generate a database of severe events associated with deep moist convection and their impacts.



Meteorological Hazard



Detection

Advancing algorithms for detecting deep moist convection systems with extreme features using remote sensing



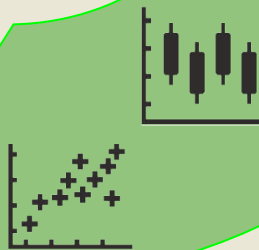
Hazard forecasting

Develop and implement a system for very short-term forecasting of precipitating systems.



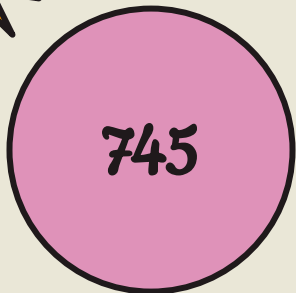
Characterization of the environments associated with hazards

Advancing the characterization of environments associated with deep moist convection systems with extreme characteristics.



Hazard identification:

Severe Weather Database



745

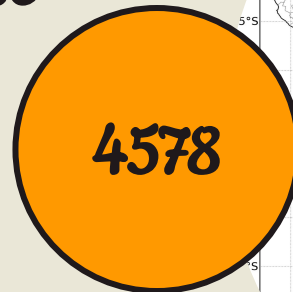
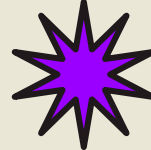


Tornadoes



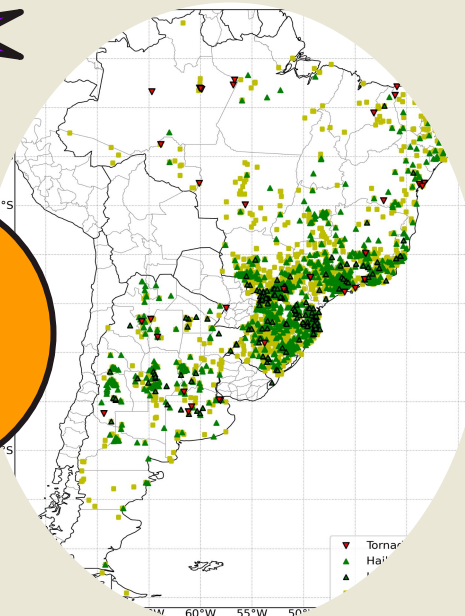
20819

Hail



4578

Wind



Ongoing and near future activities

- Integration with SW databases from SMN AR, INUMET UY, DINAC PY
- Include impact information
- Include historical datasets
- Include citizen collaboration (schools and enthusiasts). Training course.
- Development of tools to citizen report (WhatsApp bot)

<https://baseveros.cima.fcen.uba.ar/>

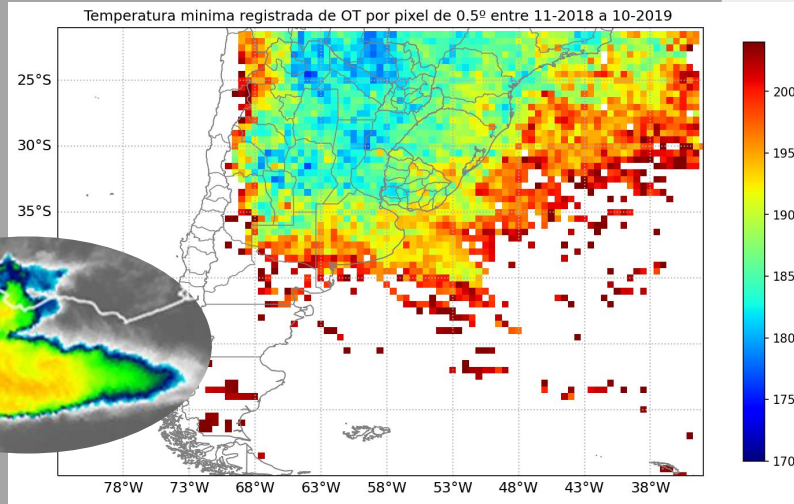


Information:

Argentina from 1937
Brazil from 2018

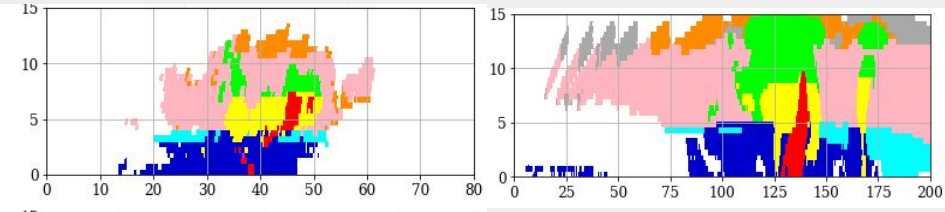
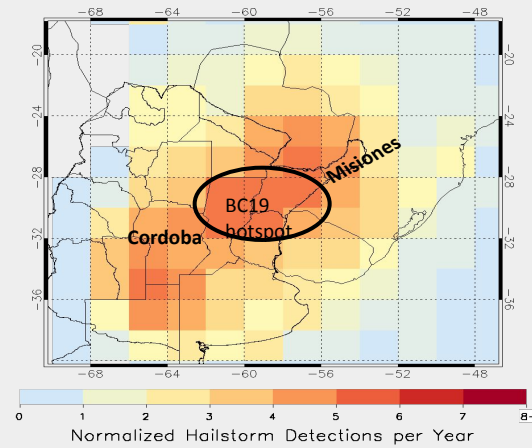
Detection:

OT



- Describe relationships between overshooting tops (OT) and severe surface phenomena in Southeastern South America (SESA)
- Development of an automated OT DETection algorithm (OT-DET) based on GOES-16 data IR.
- Characterize the occurrence of OTs in SESA through their spatial distribution, sizes and temperatures as well as their diurnal and seasonal cycles.

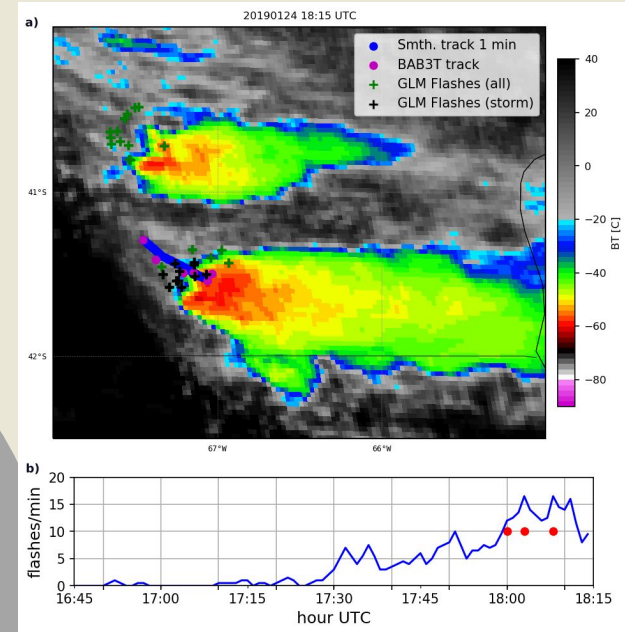
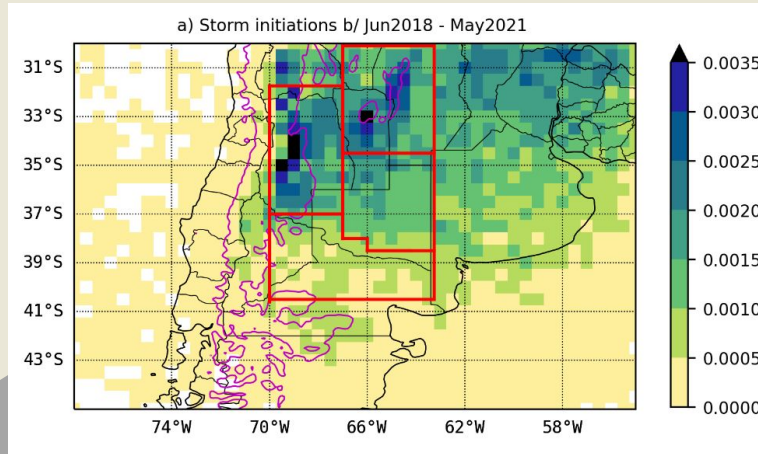
TRMM & GPM Combined Hail Climatology 1998–2022



Hail detection

- 10 to 30 storms considering BC19, climatology shows 3 cases per year.
- Analyse the potentially different characteristics of hail within Argentina as detected by BC19.
- Evaluate a new calibration of BC19 considering local hail reports

Characterization: Convective Initiation and Parameters



Ongoing and near future activities

- Satellite-based detection and tracking of thunderstorms
- Detection of potentially severe storms by using GLM-based lightning jumps algorithm.
- Determination of environments favourable for severe weather development
- Development of severe weather forecast tools from a climatological perspective.

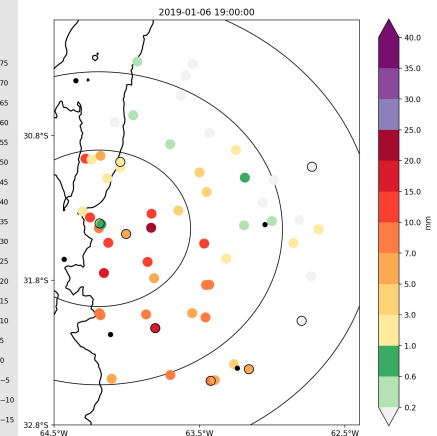
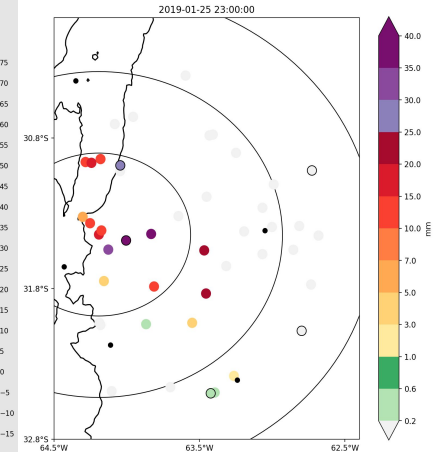
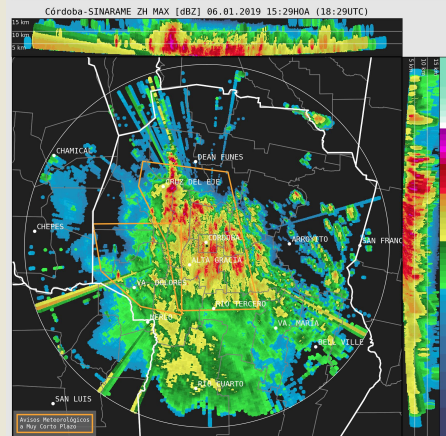
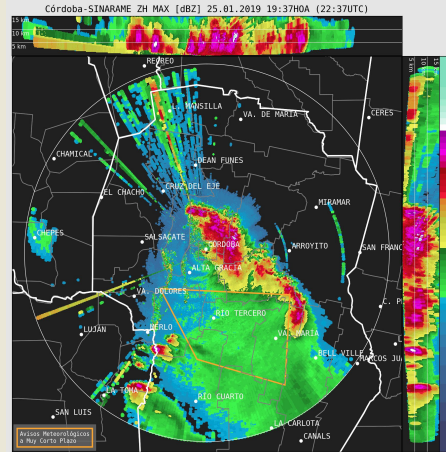
Nowcasting: RQPE

Ongoing and near future activities

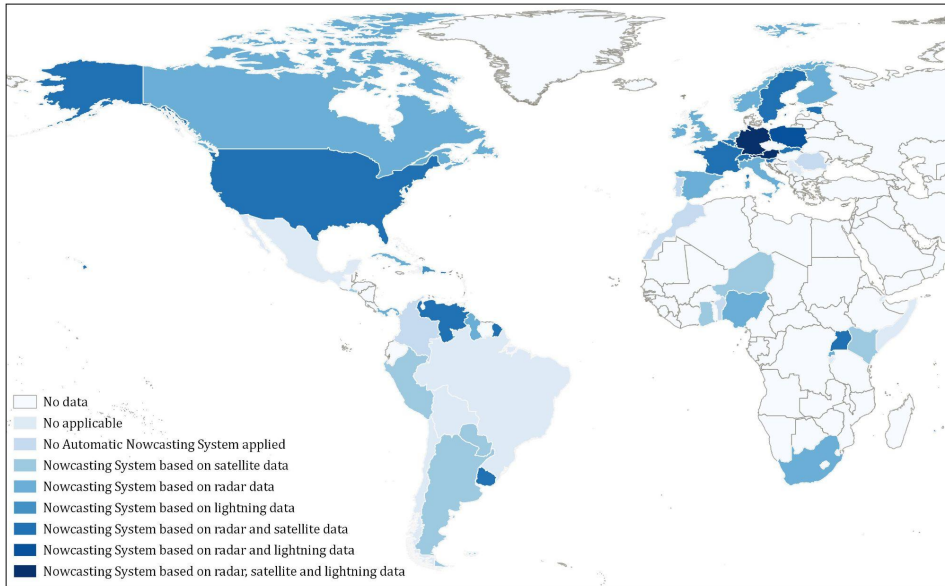
- Construction of a validation database for precipitation data over the Córdoba radar range.
- Selection of events with different types of precipitation, not only extreme, to extend the validation.
- Calculation of accumulated precipitation using the relationships obtained with the disdrometer and the KDP and Ah estimated by Daichi's algorithm.

Future trip to University of Osaka (Jul-Sep 2023)

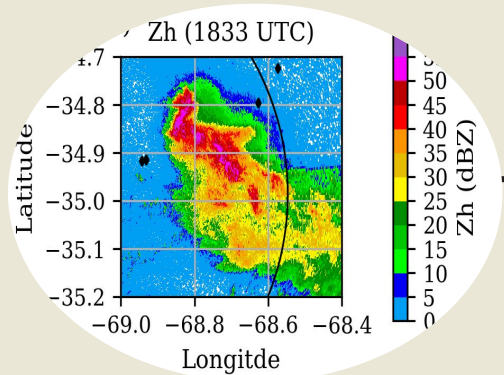
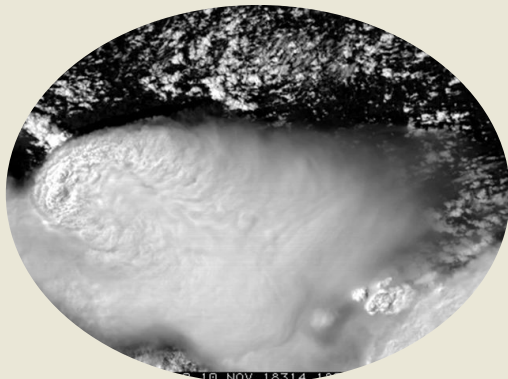
- *Validate and improve GSMAP algorithm over the region.*



<https://wwrp-nowcastingcapabilities.com/>



- NMR WG activities - WMO
- Nowcasting Course 2024
- Nowcasting modules at COMET
- Early Warning for All
- Impact Based Forecast



Thanks



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Argentina's mega-storms attract army of meteorologists

Massive project aims to improve predictions of intense lightning, hail and flash floods in the shadow of the Andes mountains.

