Servicio Meteorológico Nacional
Argentina

Joint WGNE-JWGFVR Pilot forecast verification project over South America

Ramón de Elía SMN

WGNE40 November 2025

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Nils Wedi ECMWF	*Lucia Castro SMN*	*Yanina Garcia Skabar SMN*	*Alejandro Godoy SMN*	*Cynthia Matsudo SMN*	*Federico Otero IANIGLA*	*Silvina Righetti SMN*
Marcos Saucedo SMN	*Paola Salio UBA*	*Marisol Osman UBA*	*Matias Ballarin UBA*			

and some more!...

Joint Working Group on Forecast Verification Research

WGNE40 November 2025

Co-Chair: Barbara CASATI, Environment and Climate Change Canada (ECCC
Co-Chair: Caio COELHO, Instituto Nacional de Pesquisas Espaciais INPE), **Brazil**
James BENNETT, Commonwealth Scientific and Industrial Research Organisation (CSIRO), **Australia**
Angie PENDERGRASS, Cornell University, **United States of America**
Ramon de ELIA, Servicio Meteorológico Nacional (SMN), **Argentina**
Javier GARCIA-SERRANO, University of Barcelona, **Spain**
Alfred Lawrence KONDOWE, Tanzanian Meteorological Authority (TMA), **Tanzania**
Zied BEN BOUALLEGUE, European Centre for Medium-Range Weather Forecasts (ECMWF), **UK**
Anumeha DUBE, National Centre for Medium Range Weather Forecasting (NCMRWF), **India**
Sabrina WAHL, Deutscher Wetterdienst (DWD), **Germany**
Jochen BROECKER, University of Reading, **United Kingdom**
Nicholas LOVEDAY, Bureau of Meteorology, **Australia**

Nov 2024 – 2025 main contributions

1: South America verification Pilot Project

ECMWF and SMN Argentina, monthly telecons since February 2024
summary statistics + in-depth HIW case studies (heat wave, zonda, precipitation)

2: Met.Apps. Special Issue in Forecast Verification **Guest Editors:**

B.Casati, C.Coelho, B.Ebert, M. Dorninger. ~20 papers (several already accepted, a few still in review). Editorial expected by the end of 2025

3: Advance verification methods for AI

VerAI workshop June 2025
VerAIops workshop October 2025
WGNE+JWGFVR WP-MIP

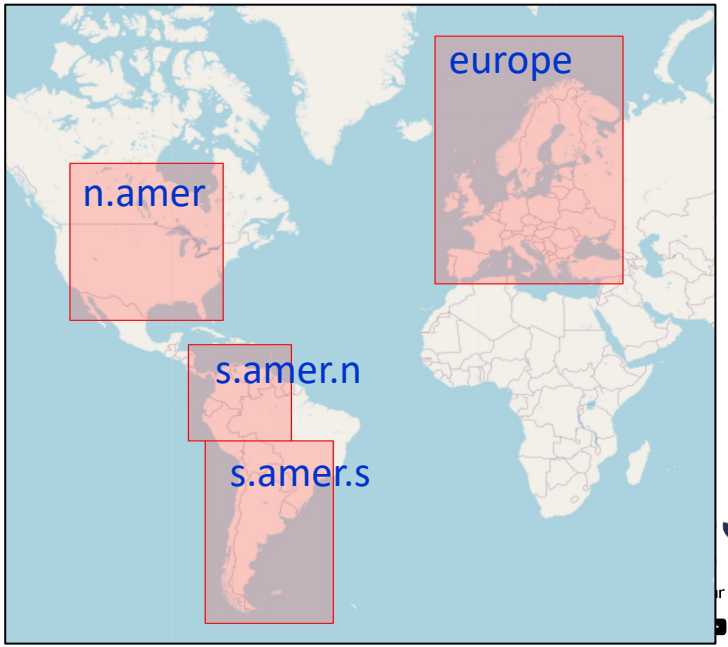
4: Contribution to renewal of WIPPS verification standards

How was it born and what it is

- Triggered during the joint WGNE38-JWGFVR meeting in November 2023 (Brazil). (Nils Wedi and Nico Caltabiano main facilitators!)
- Mutual interest from representatives of WGNE, JWGFVR and WMO for targeting South American regions for forecast verification.
- Informal, interest and oportunity -driven, loose planning, no financing
- Monthly on-line meetings since January 2024, with a good number of (mostly Argentinian) scientists and forecasters, ECMWF personnel and members from WGNE and JWGFVR.

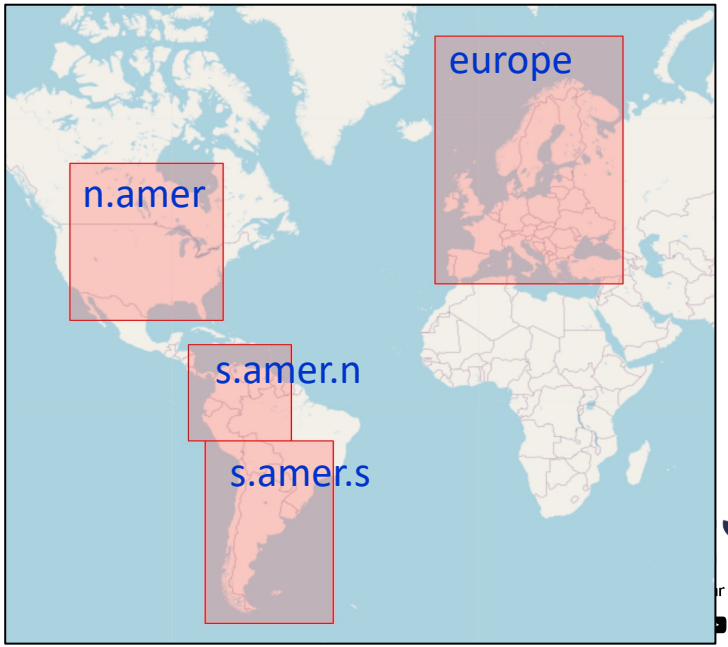
Official WMO exchange verification domains

- And these are the ECMWF´s



Official WMO exchange verification domains

- Thanks to Task Team on Reviewing NWP Standardized Verification (TT-NWPSV)
- Proposition to expand the WMO official verification regions to uncovered parts



What we have been doing

Summary verification over South America

- Barely done with any global model
- Control run (IFS HRES)
- Comparison with local limited-area models (WRF-SMN)

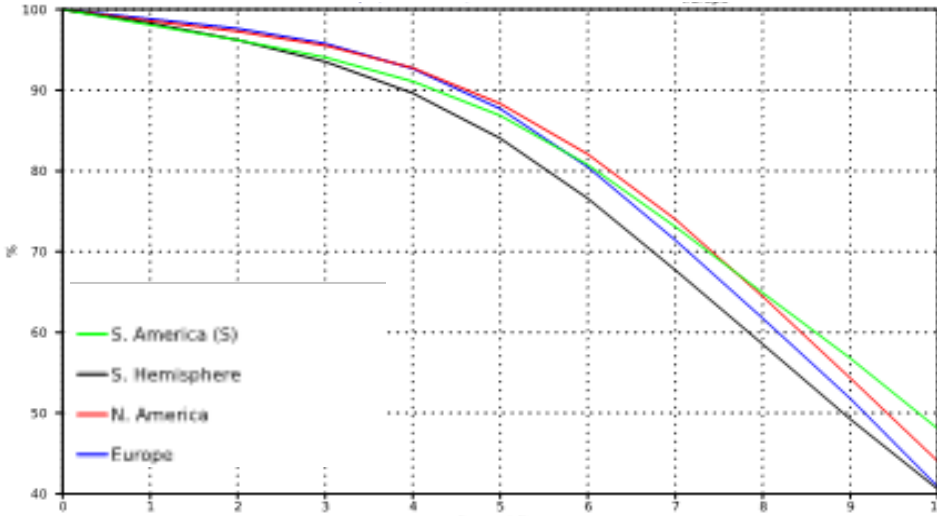
Case studies of extreme events

- IFS, DestinE, GFS, WRF-SMN
- Different kinds of events
  - Heat wave
  - Severe convective storm
  - Foehn (Zonda)
- Predictability, EFIs
- ECMWF *Severe Event Catalogue*
- EW4All
- Warning Value chain Database (HIWeather)

Summary verification of IFS over South America

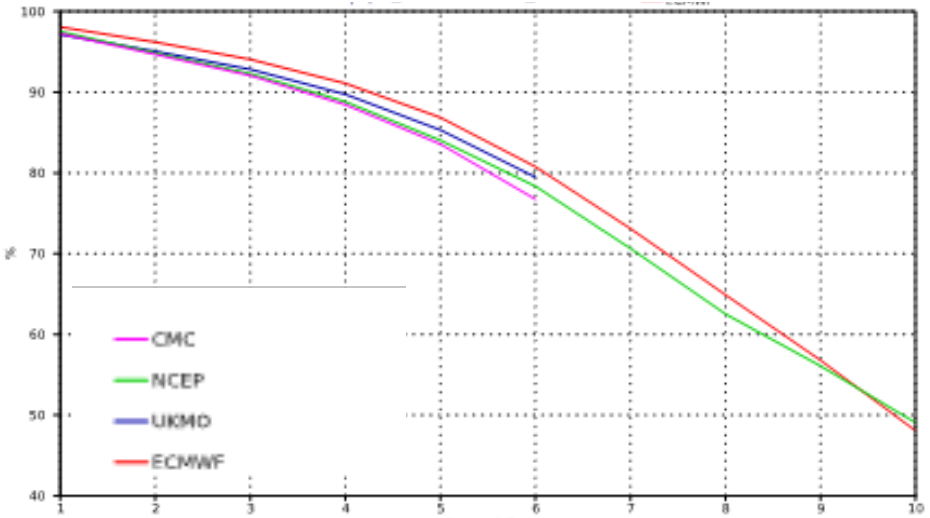
Verification against own analysis

Anomaly correlation 850-hPa Temperature 2023



Forecast day

Anomaly correlation 850-hPa Temperature 2023

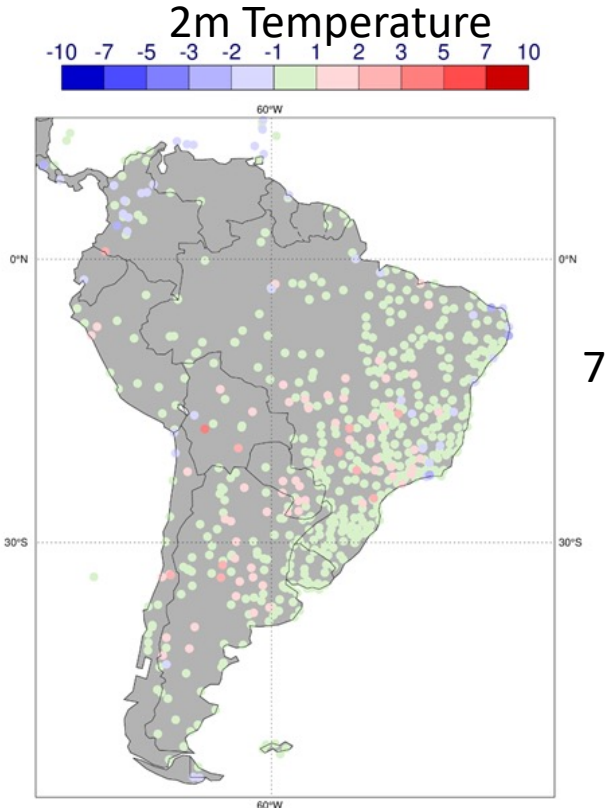


Forecast day

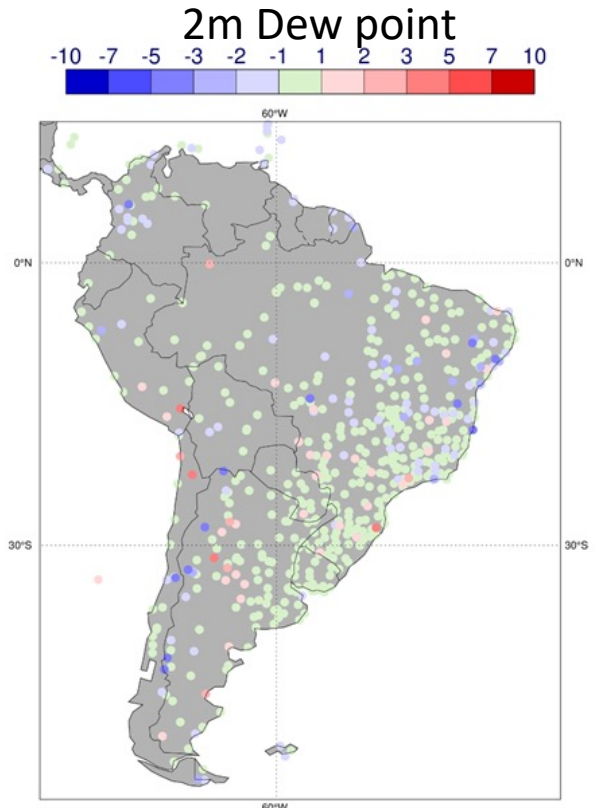
- Predictability comparable to other domains
- Global models show comparable skill

By Thomas Haiden
ECMWF

Summary verification of IFS over South America



72 h forecast
BIAS

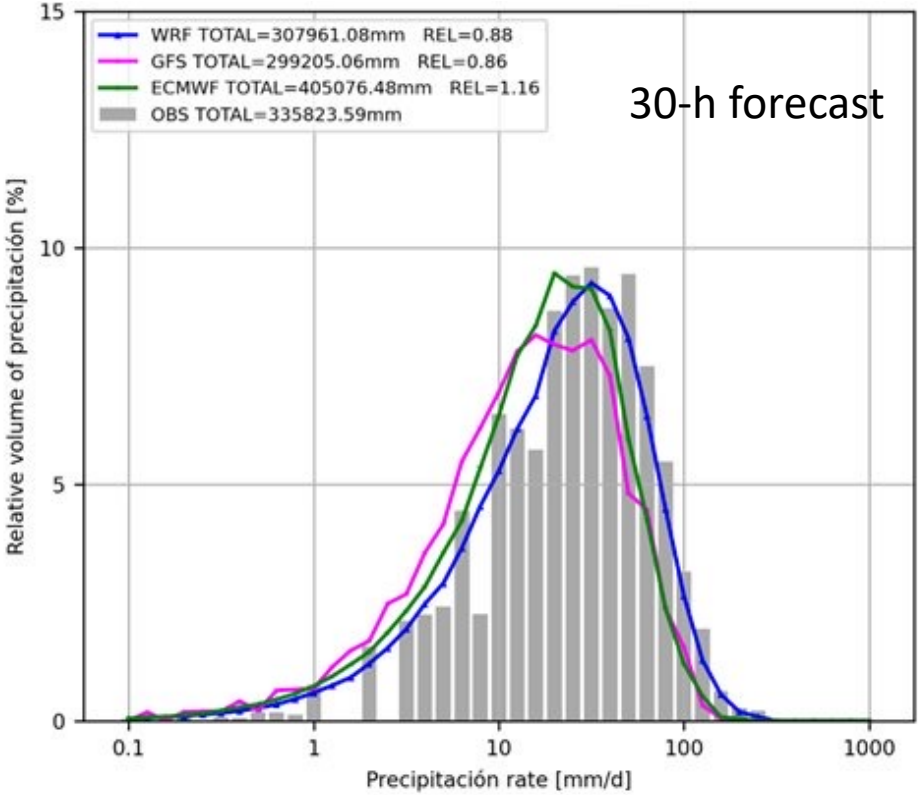


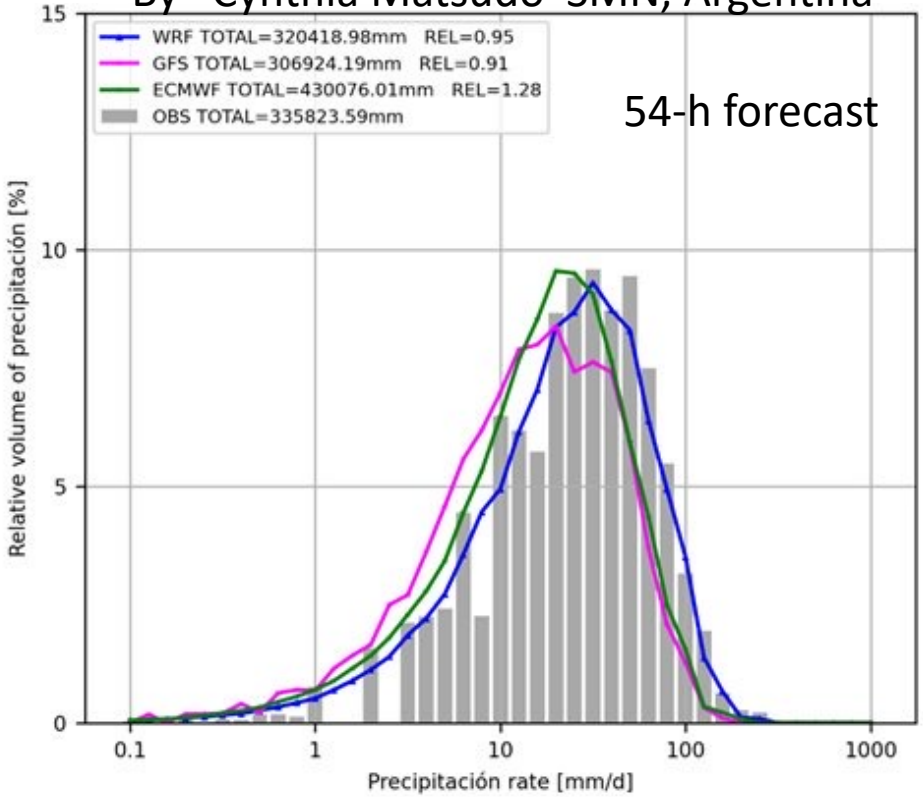
Bias of the 72h CTRL (ex-HRES) forecast for the year 2024 measured against SYNOP observations. The left side shows the 2m Temperature, while the right shows the Dew point. Results correspond to the 12 UTC run, units are Kelvin.

By Thomas Haiden
ECMWF

Summary verification of IFS over South America

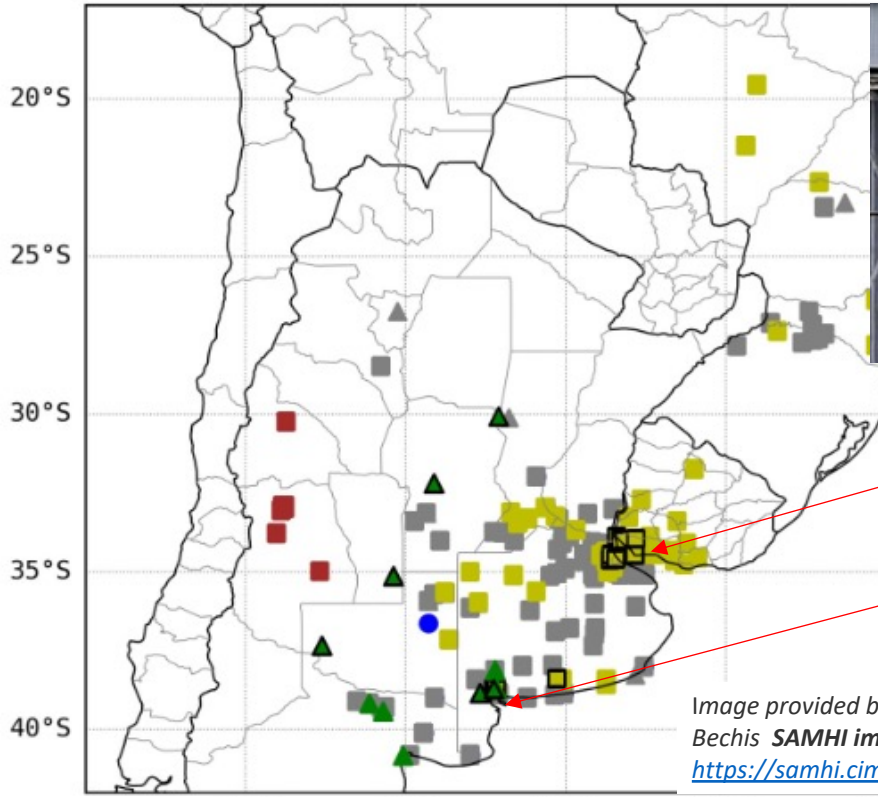
By Cynthia Matsudo SMN, Argentina





Distribution of precipitation volume as function of precipitation rate for 24-h precipitation forecasts at 30 hours (left panel) and 54 hours (right panel) for each model (color lines), CTRL (ECMWF in legend), GFS and SAP.SMN-DET (WRF in legend). Observations are represented with grey bars.

Convective case December 16-17, 2023



Buenos Aires, Sunday 17, 4 AM

Bahia Blanca, Saturday 16, 20 PM

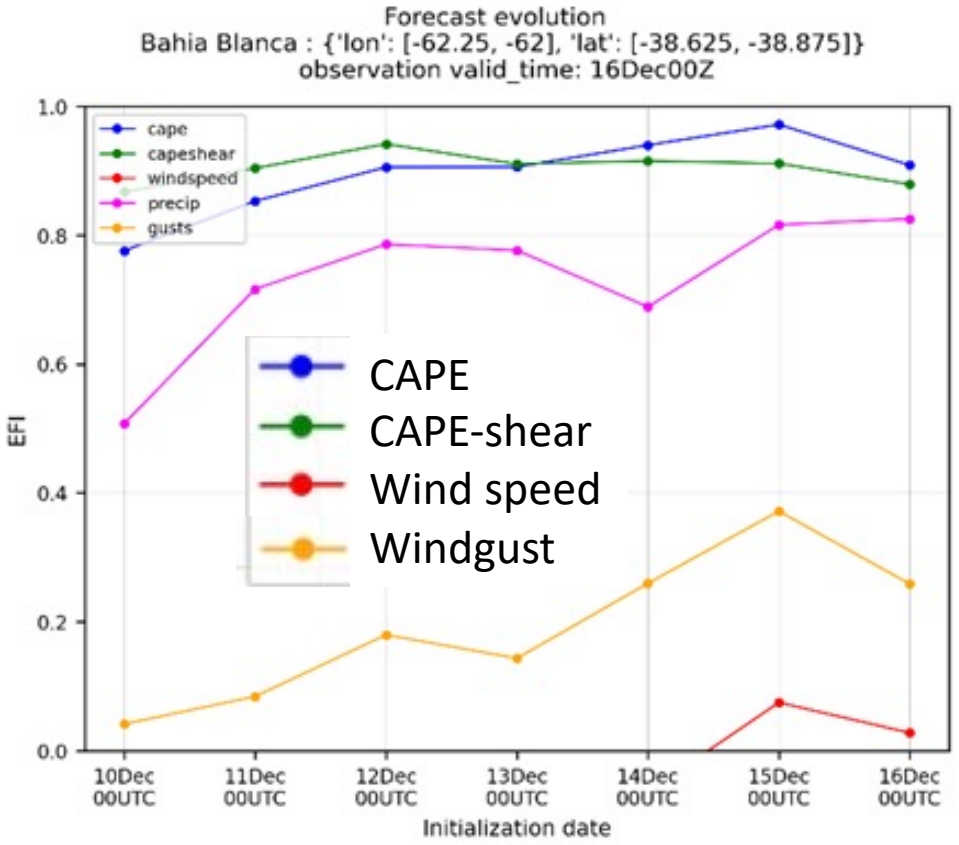
Image provided by Hernán Bechis ***SAMHI impact database***
https://samhi.cima.fcen.uba.ar

wind

hail

Evolution of ECMWF EFIs for different starting dates

- Two distinctive issues:
  - reproducing environmental conditions (ingredients)
  - Reproducing the hazards
- "Ingredients" are present in some EFIs many days before the event
- "Hazards" not much (e.g. windgusts)



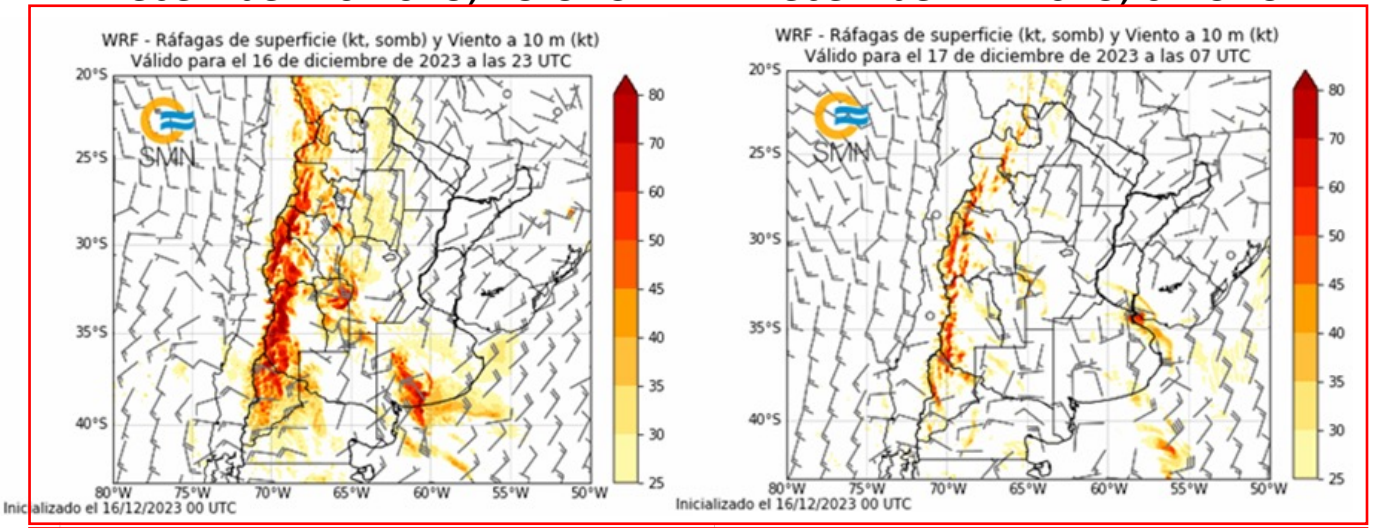
By Cynthia Matsudo
SMN, Argentina

Wind gusts forecast

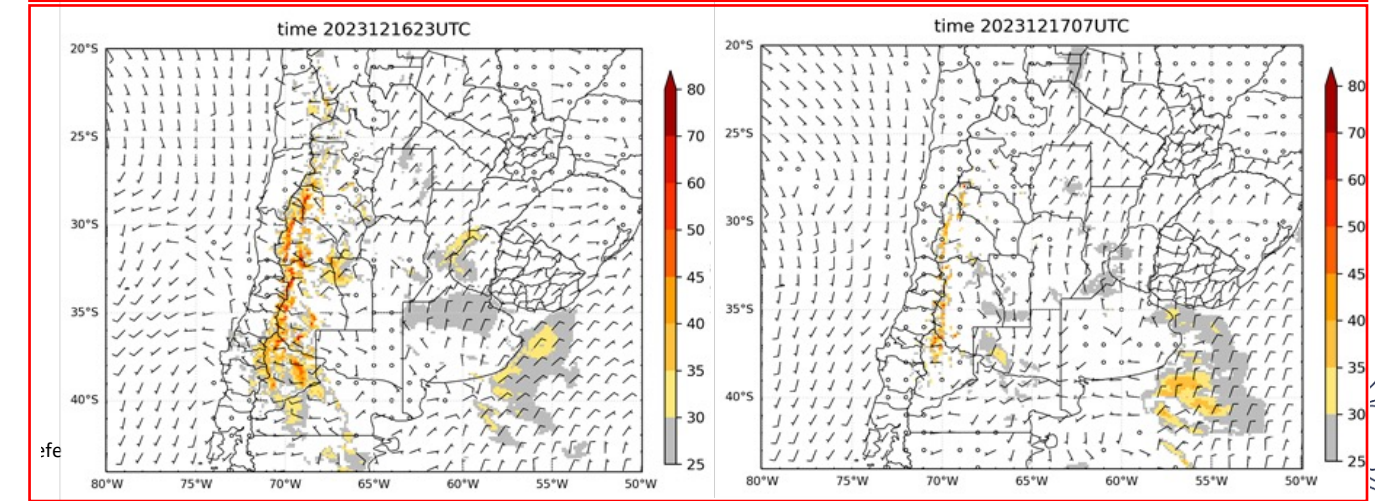
December 16 2023, 23 UTC

December 17 2023, 07 UTC

WRF

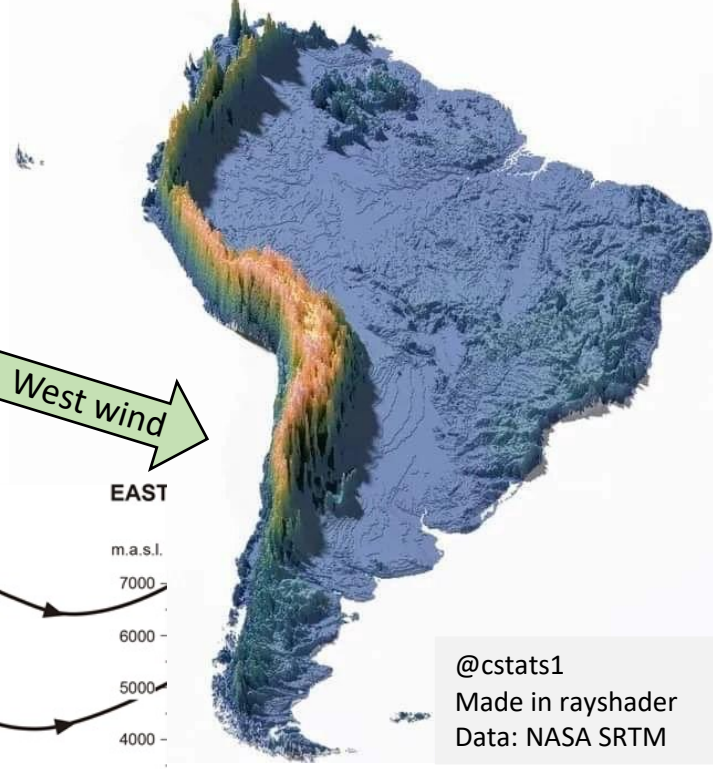


IFS-HRES



By Cynthia Matsudo
SMN, Argentina

Zonda (Foehn) severe wind
July 21, 2023



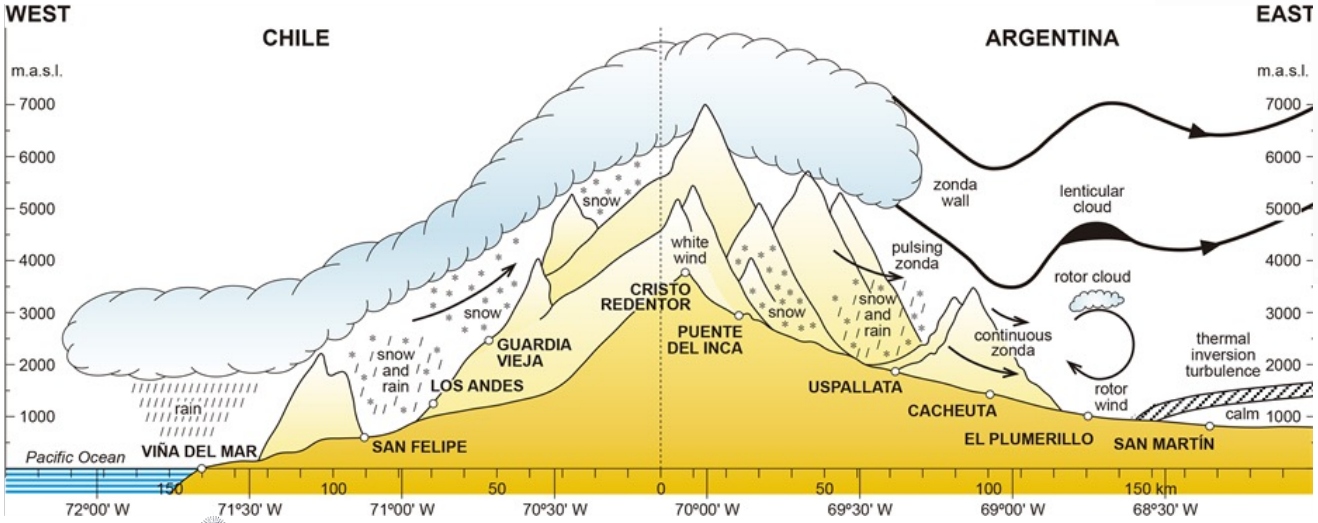
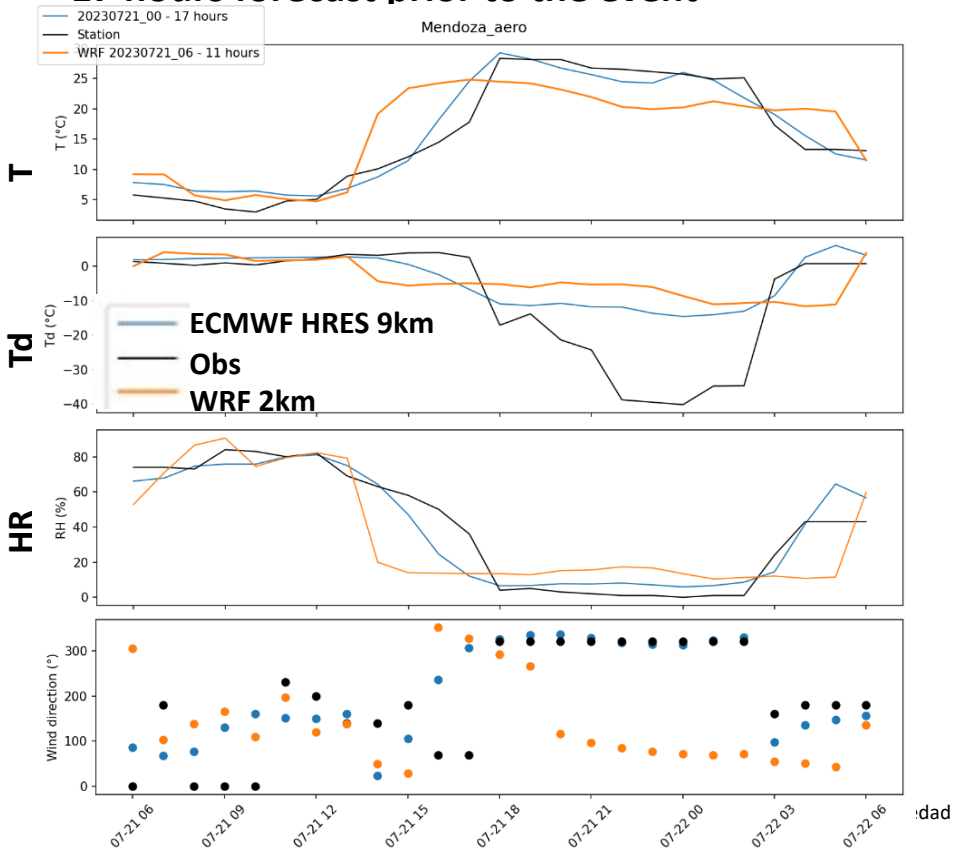


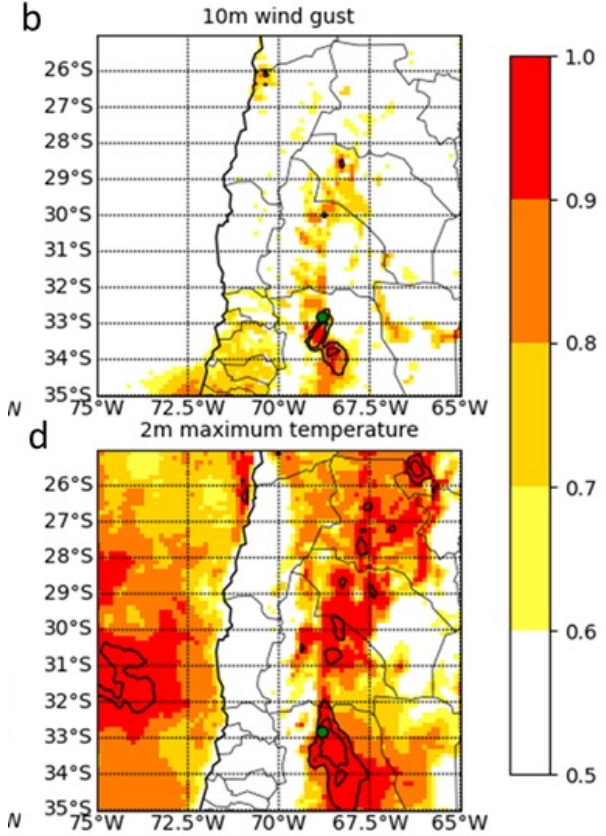
Diagram by Federico Norte

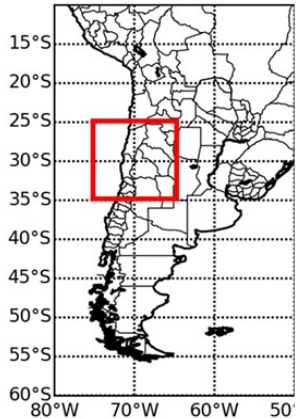
Mendoza airport July 21, 2023

17 hours forecast prior to the event



EFIs





By Federico Otero

www.smn.gob.ar

Bonus Track: Oportunistic case studies

Flood in Bahía Blanca, March 2025

By Linus Magnusson

Contributions from the Pilot project

- Team building between WGNE, JWGFVR, ECMWF and SA institutions for mutual benefit
- First in-depth forecast verification effort over SA
- Remarkable development of expertise within the weather service of Argentina (SMN) (very succesful Twinning!)
- Successful absorption of EFI as tool for early warning among forecasters of SMN
- All of the above contribute to the advance of the EW4All campaign in the region

- *de Elia and (many) others, 2025: Verification of global and regional NWP models over South America. ECMWF Technical Memorandum 928.*
- *Gasncon and Matsudo, 2025: Verification of global and regional NWP models over South America. ECMWF newsletter, 185, Autumn 2025, page 13-14.*

The Future

- We answered some important questions
- A number of additional questions are in the pipeline. Verification of
  - Ensemble forecasting
  - Extremes: particularly "flash" extremes (Cell broadcast)
  - AIFS models (this has been a nice driver of new blood)
- Pushing for expansion in other countries of South America
- Getting more attention in local academia
- We plan to slow down the pace of meetings (less need of babysitting)
- … and work on building a strong legacy, perhaps related to other projects such as WP-MIP and AINPP (WIPPS).

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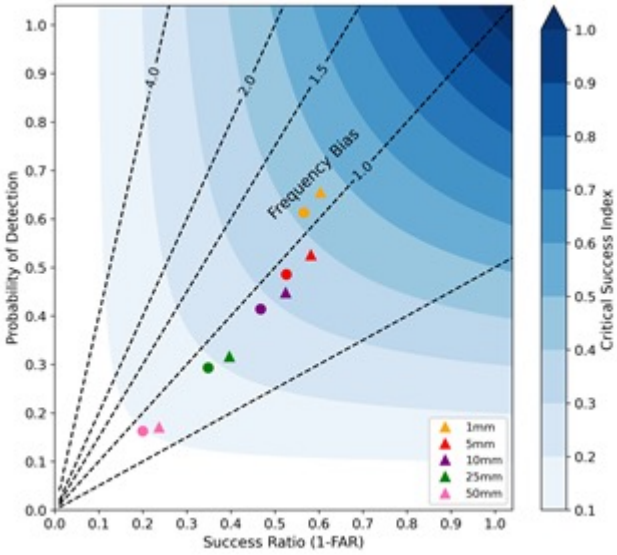
Argentina

Thanks!　　谢谢！

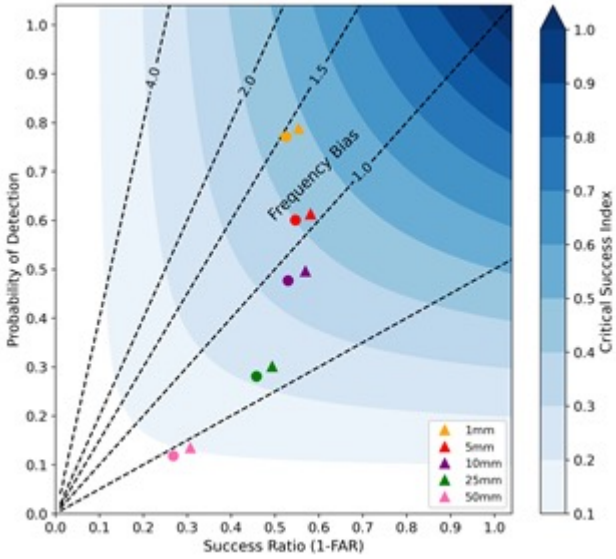
Summary verification of IFS over South America

By Cynthia Matsudo
SMN, Argentina

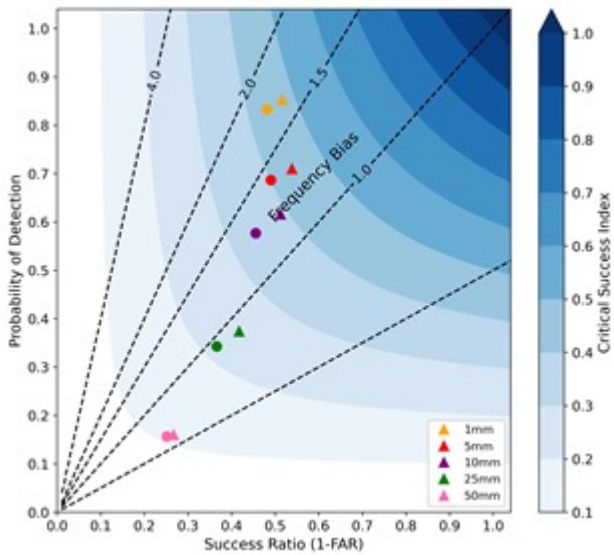
WRF



GFS



IFS

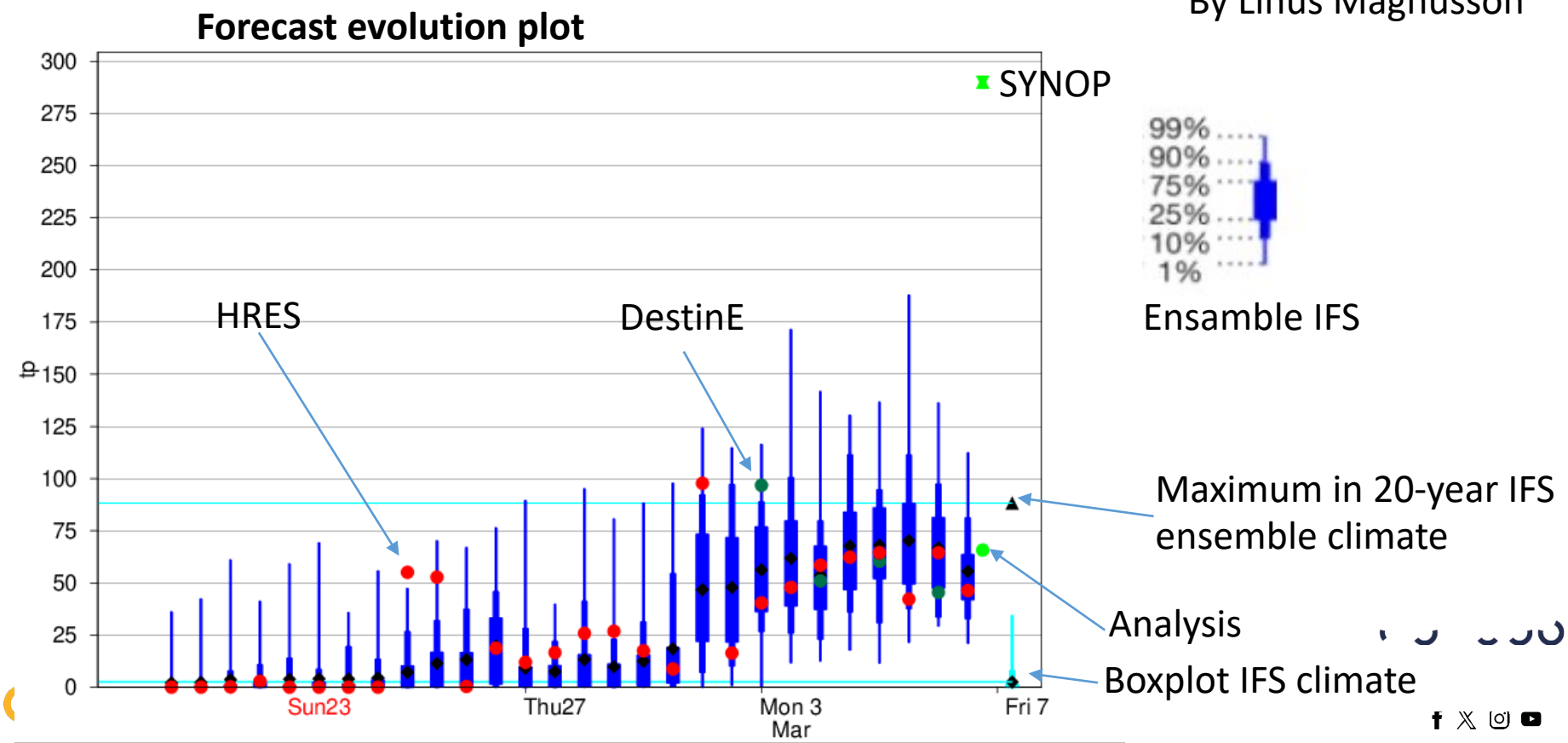


Performance diagram for 24-h precipitation for different thresholds (color) and forecast lead times (triangles for 30 h, and circles for 54 h). The left panel presents the SAP.SMN-DET, the center panel the GFS and the right panel the CTRL (ex-HRES), the center panel the GFS and the right panel the CTRL (ex-HRES)

Bonus Track: Oportunistic case study

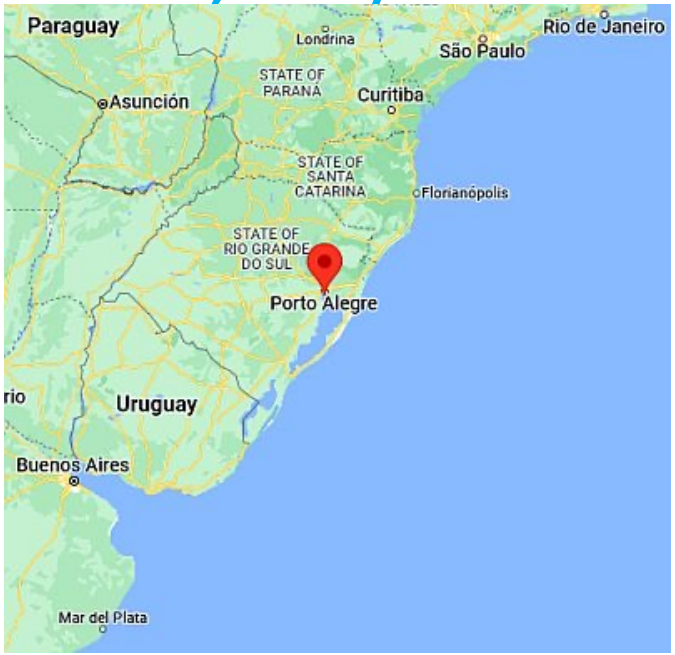
Flood in Bahía Blanca, March 2025

By Linus Magnusson



Channel	Theme	status
Nota Técnica SMN	In-depth study of convective event 16 December 2023.	https://repositorio.smn.gob.ar/handle/20.500.12160/2890
Warning value chain questionnaire, HIWeather-UCL	The same study as in previous point, but following a pre-established questionnaire and with more emphasis on impacts	https://drive.google.com/drive/folders/1a8T91_7hXmanZNsL2WVTR5BFKr8aRxOZ
Technical Memo or other	South American domain HRES verification for some variables, plus three case studies: convective, heat wave Zonda.	https://www.ecmwf.int/en/publications/technical-memoranda (No 928)
Nota Técnica SMN	Heat wave	http://repositorio.smn.gob.ar/handle/20.500.12160/3023
Newsletter	Dissemination of Tech Memo article	Soon to be published
Paper	Zonda events	Advanced research stage
Paper	Heat wave	Early stage

Massive flood in Southern Brazil , May 2024

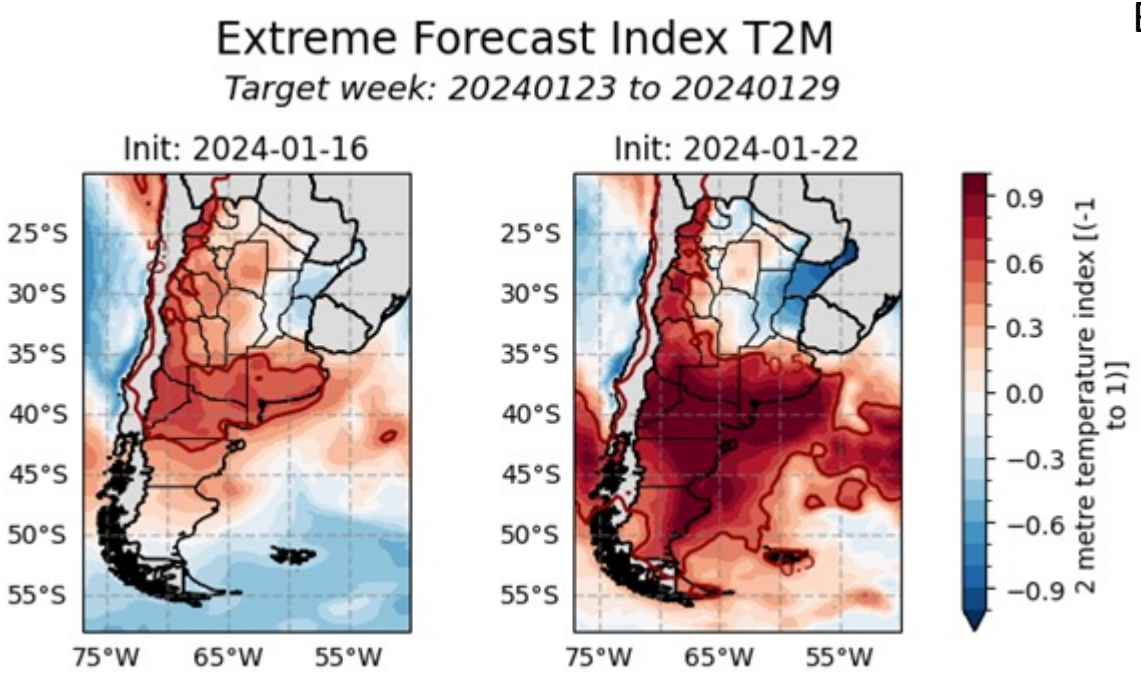


ECMWF Severe Event Catalogue
https://confluence.ecmwf.int/display/FCST/202404+-+Rainfall+-+Brazil

Porto Alegre: 180 fatalities

23-day heat wave January 2024

By Lucia Castro, Alejandro Godoy



Weekly mean 2 meter temperature Extreme Forecast Index (EFI) for the target week initialized one day (right panel) or eight days (left panel) prior the beginning of the event. The red contour line indicates areas with values greater than 0.5. Note that these EFIs are obtained from the extended range ensemble. b) Observed stations that meet the criteria of heatwave event during that week. Only stations with 3 or more days in heatwave condition are considered.

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