

# Joint Working Group on Forecast Verification Research



## WGNE November 2024 annual report

**Barbara Casati (ECCC, Canada)**

**Caio Coelho (CPTEC/INPE, Brazil)**

1. JWGFVR Highlights of 2023-2024
2. Projects
3. JWGFVR and AI
4. Future plans

# Joint Working Group in Forecast Verification Research

<https://community.wmo.int/activity-areas/wwrp/wwrp-working-groups/wwrp-forecast-verification-research>



**Mission:** JWGFVR plans and facilitates the development and application of improved diagnostic verification methods to assess and enable improvement of the quality of weather forecasts, including forecasts from numerical weather and climate models. It also collaborates on forecast verification with WGNE and WCRP, and engages in the plans and implementation of the verification component of WWRP projects from their outset.

## Promote good verification practices:

- Verification web-page
- [Verification tutorials](#)
- Verification software
- WMO recommendation reports and [verification standards for operational centers](#) -> INFCOM

## Advance verification research:

- Spatial verification method intercomparisons
- [International verification methods workshops](#)
- Verification challenges
- [Special issues & publications](#)

## Support verification activities in [WWRP](#) and [WGNE/WCRP](#)

- [AvRDP2](#)
- [TC-PFP](#)
- [HIW](#)
- [Paris 2024](#)
- [URBAN](#)
- [SAGE](#)
- [WCRP: WGNE, WGSIP, WGCM](#)
- [PCAPS](#)
- [InRPHA](#)

# JWGFVR Highlights of 2023-2024



## Major activities:

1. Verification workshop -> MetApps special issue
2. Verification tutorial – focus on Africa (PEOPLE/ADVANCE/EW4all)
3. South America pilot project (EW4all+WGNE+INFCOM)
4. Contribution to INFCOM revision WIPPS verification standards (B.Casati)

## Other activities:

- Contribution to the verification component of the Implementation Plan of PCAPS (B.Casati), SAGE (C.Coelho), InPRHA (J.Bennett)
- Contribution to the verification component of AvRDP (R.deElia), TC-PFP (R.Ashrit), Paris 2024 and HIW (C.Marsigli)
- Contribution to SERCOM hydrology verif guidance (J.Bennett)



## 9<sup>th</sup> International Verification Methods Workshop and Tutorial



hosted by

Climate System Analysis Group - University of Cape Town

15-18 May 2024

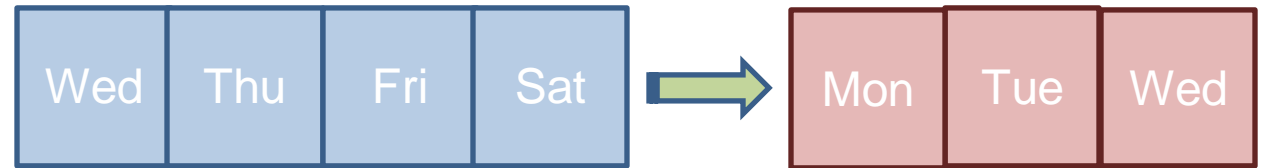
and

South African Weather Service - Protea Hotel Breakwater Lodge

20-22 May 2024

Cape Town, South Africa

May 2024, Cape Town, host SAWS: **9<sup>th</sup> International Verification Workshop (B.Casati) & Tutorials (C.Marsigli)** <https://ivmw2024.weathersa.co.za>

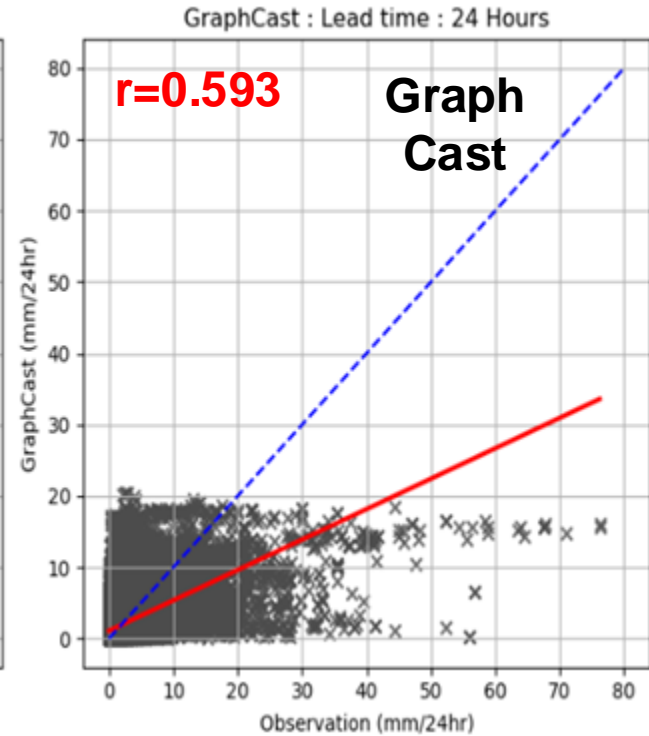
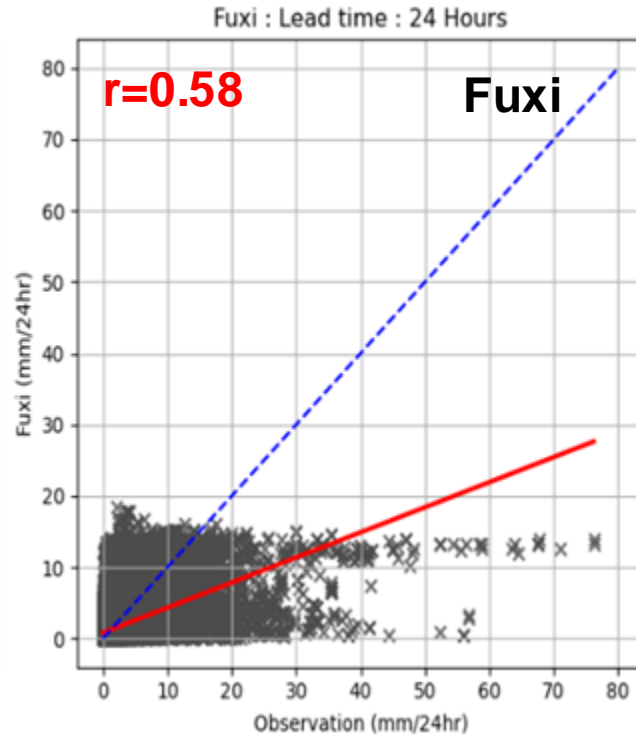
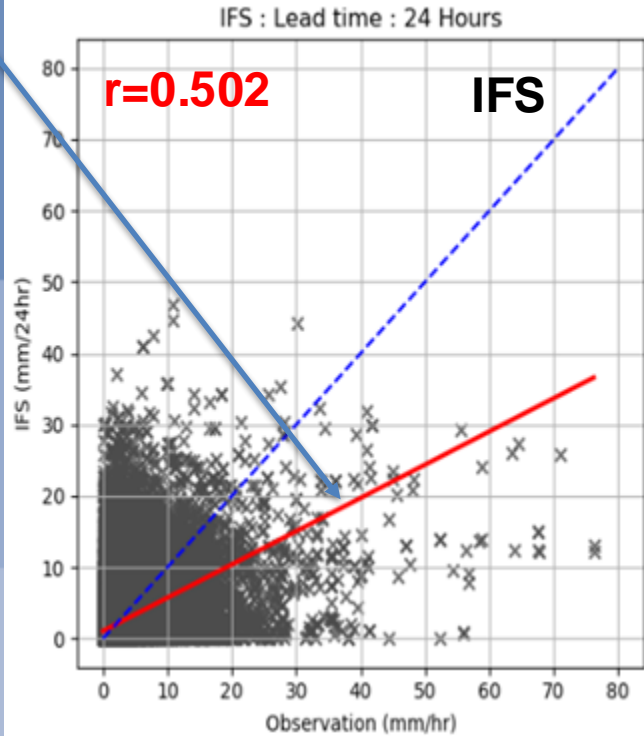


**15<sup>th</sup> – 18<sup>th</sup> May**  
**Verification Tutorials**  
consist of theoretical lectures and practical assignments.

**20<sup>th</sup> – 22<sup>rd</sup> May**  
**Scientific workshop**  
include keynotes, along with contributed oral and poster presentations.

- **First IVMW hosted in the African continent:** underscoring the WMO's commitment to broadening outreach, facilitating technology transfer and scientific exchange, enhancing capacity building for the new generation of verification experts, and fostering meaningful partnerships across borders
- Several tutorial attendees were from **national weather services in the African continent** sponsored by the Climate Risk and Early Warning Systems (CREWS) project -> **EW4all**

The tutorials consist in **lectures** and **project time**: the students are assigned group projects with real operational data which they have to verify, applying different methods, and **present at the workshop** the week following the tutorial.



Presentation of the verification project comparing AI models to IFS by Ramses Bell Epipe, Department of National Meteorology of Cameroon



# Special Issues Call for Papers in Meteorological Applications

Chief Editors: Cristina Charlton-Perez and Dino Zardi

## Call for Papers - Recent advancements in forecast verification research

### Guest Editors:

**Dr. Barbara Casati**, Environment and Climate Change Canada (ECCC), Canada

**Dr. Caio Coelho**, Instituto Nacional de Pesquisas Espaciais (INPE), Brazil

**Submission Deadline: 31<sup>st</sup> December 2024**

### Rational:

**Meteorological Applications** is calling for submissions of original studies for a special issue on novel methodological developments and innovative applications of existing methods for assessing the quality of weather and climate forecasts. The participants of the International Methods Verification Workshop, held in Cape Town, South Africa, 20-22 May 2024 (<https://ivmw2024.weathersa.co.za/>) are cordially invited to submit papers of the work presented in this workshop. Moreover, the special issue also welcomes submissions on verification research from scientists not attending this workshop.

**Topics of interest include (but are not limited to):** physical process diagnostics; error tracking methods; spatial verification methods; verification of high impact weather and extremes; unconventional observations (data from citizen science, social media etc.) for verification; verification of probabilistic and ensemble forecasts; inference and properties of verification methods (meta-verification studies); representativeness and observation uncertainty in verification practices; user-oriented verification and estimation of forecast value (assessment of the whole forecast-quality to user-value chain); verification tools and software; verification practices in operational environments; verification of AI-ML-based forecasts.

Contributions on novel development and innovative application of verification methods from WMO WWRP and WCRP core and endorsed projects are particularly encouraged. Examples include, but are not limited to: verification for Early Warnings for all; verification in polar regions; urban modelling verification; verification of hydrological models; verification of aviation forecasts; sub-seasonal to seasonal forecast verification for applications in agriculture and environment: [://rmets.onlinelibrary.wiley.com/hub/journal/14698080/call-for-papers/si-2024-2024-000249](https://rmets.onlinelibrary.wiley.com/hub/journal/14698080/call-for-papers/si-2024-2024-000249)

[Submit Now](#)



## Meteorological Applications

Science and Technology for Weather and Climate



Chief Editors

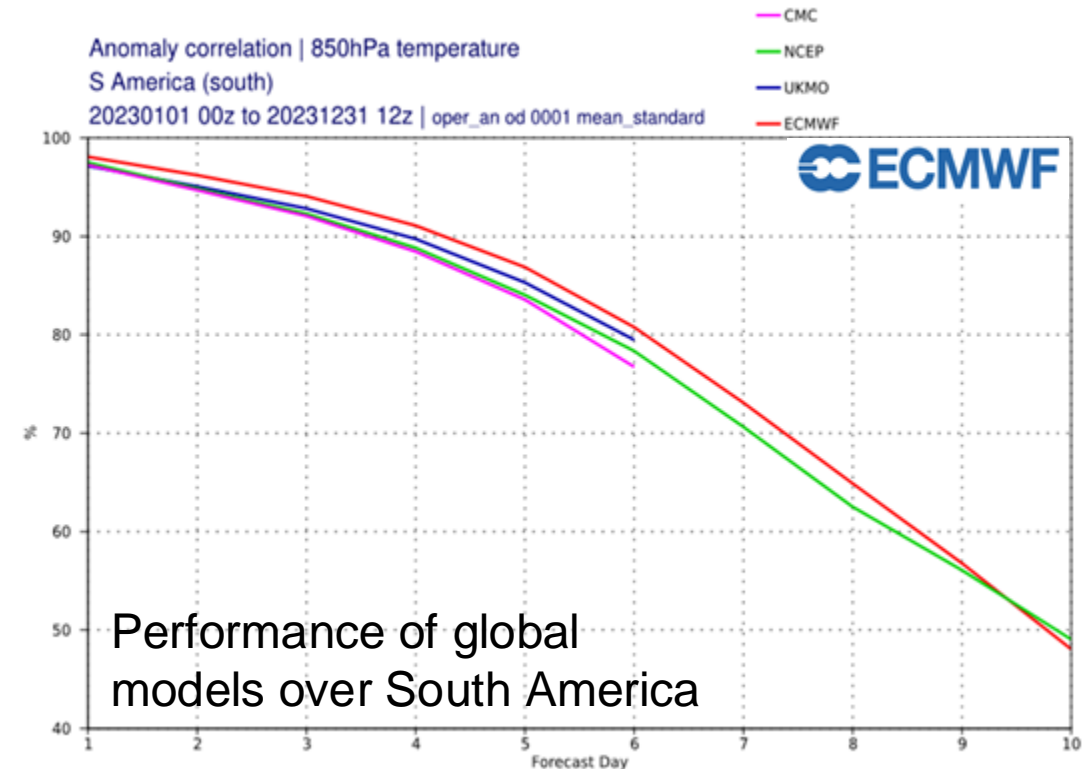
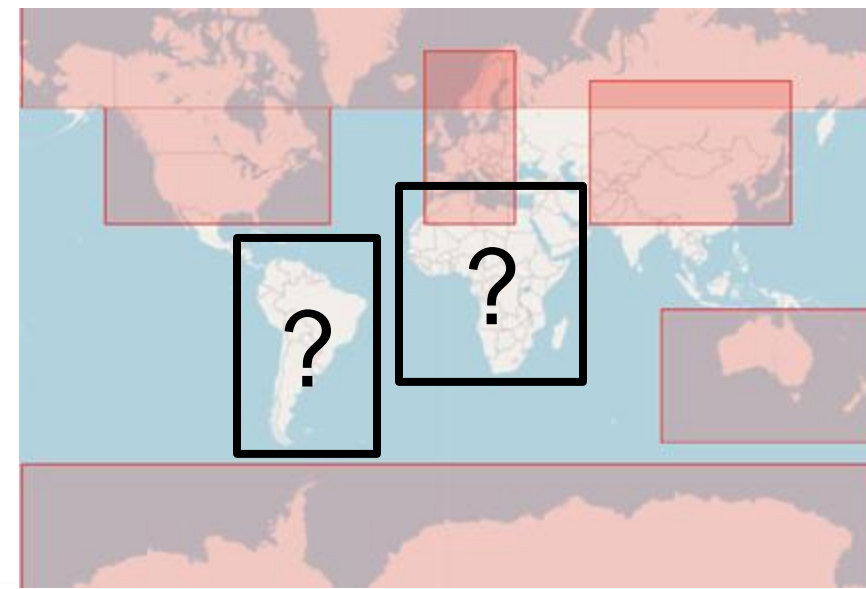
Cristina Charlton-Perez and Dino Zardi

# Pilot project for forecast verification over South America

- Leading institutions: SMN = Servicio Meteorologico Nacional of Argentina (Ramon deElia, JWGFVR) and ECMWF (Nils Wedi, WGNE): mutual interest targetting South American regions for verification
- Triggered during the joint WGNE-JWGFVR meeting in Nov. 2023 (Brazil). Monthly meetings since January 2024. Presentations and meeting notes are available at: <https://wgne.net/activities/on-going-activities/>
- Links WGNE, JWGFVR, TT-NWPSV, HIW, EW4All

## Two main verification streams:

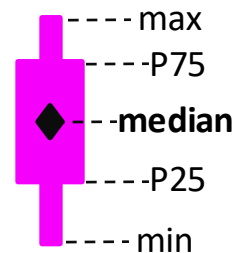
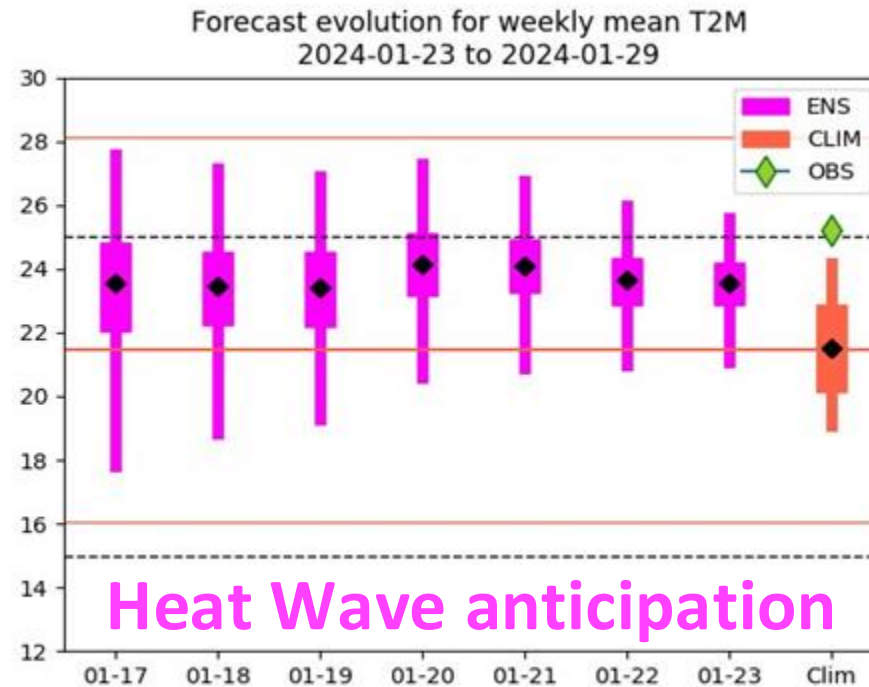
1. Summary statistical verification over the South America domain -> TT-NWPSV addition of South America (and Africa, and more ... ) domains
2. Focussed analysis of extreme events over South America (SMN-ECMWF) (next slide)



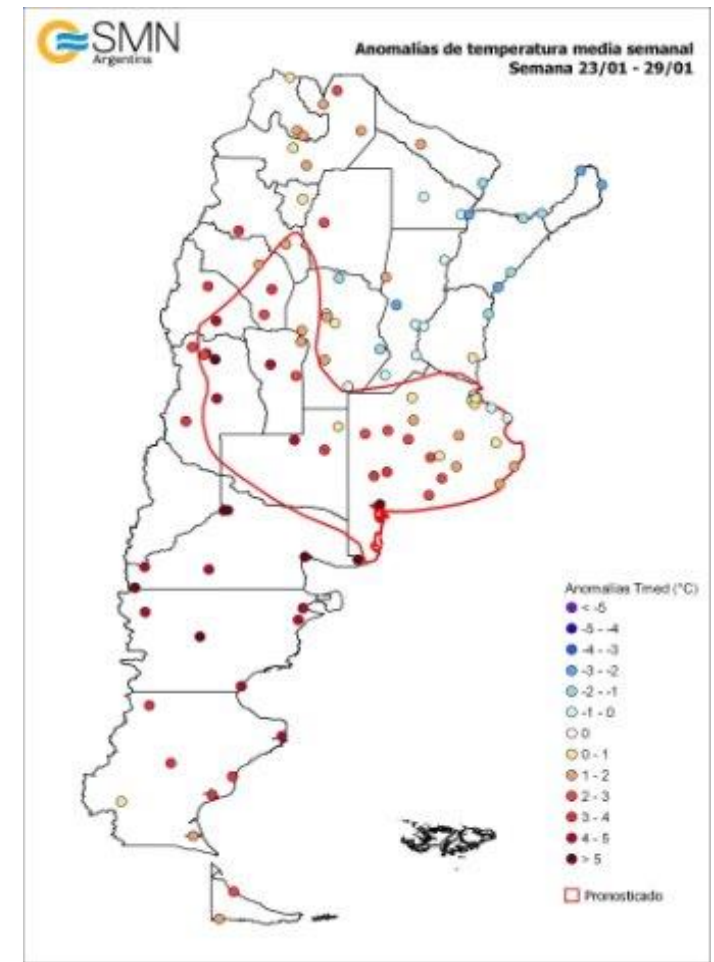
# HIW case studies over South America

Cases chosen because of the hazards to population, and considering different challenges for the global and regional models:

- Large case event: Jan 2024 severe and long heat-wave
- Destructive wind+convective event (combined large and small-scales)
- Violent Foehn, Zonda wind event (triggered by the sharp Andes topo)
- ... and more are being added ...



Only gridded points closest to the stations




Aligns with the “Warning Value Chain” approach / group within the HIW project – wish to contribute to HIW Data Base



# INFCOM: Task Team NWP Standard Verification (TT-NWPSV)

The TT-NWPSV is tasked to review the WIPPS verification standards (previous CBS, WMO manual n. 485) for monthly score exchange between national weather services. It includes several JWGFVR members (Thomas Haiden = lead, Barbara Casati, Beth Ebert, Chiara Marsigli, ... )

## Main proposed changes:

- **Global models and regional models**, for surface variables (station score exchange)
- **Revision and addition of verification domains**
- Some recommended variables become mandatory 
- Addition of **new variables**. Testing for consideration:
  - wind gusts?
  - Solid precipitation? PPP outcome recomm.
  - **sea-ice?** PCAPS verification Task Team
- Revision of scores – eg vector RMSE for wind

## Proposed surface variable for verification:

### Mandatory

- 2-m temperature
- 10-m wind speed
- 10-m wind direction
- 24-h precipitation
- 2-m dewpoint (before it was recommended)
- 6-h precipitation (before it was recommended)

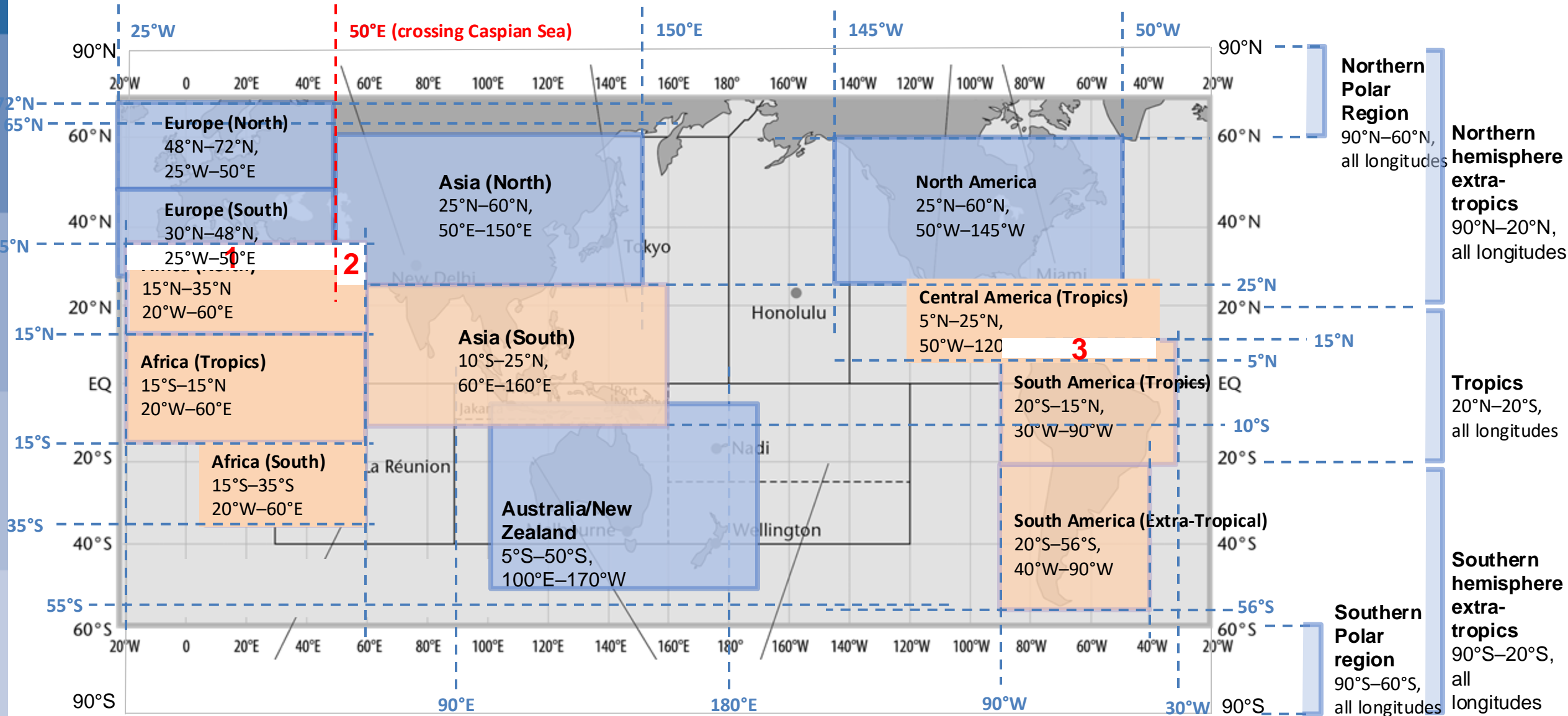
### Recommended

- Total cloud cover
- 2-m relative humidity
- 2-m max and min temperature (3-h?)\*
- CAPE (against analysis only)\*
- Precipitable water (against analysis only)\*

changes in blue, \* indicates new parameters

# INFCOM: Task Team NWP Standard Verification (TT-NWPSV)

## Proposed revised and new domains – overlapping area



Has the JWGFVR been involved in any AI/ML topics in the past year, or do you plan any AI/ML activities in the coming year?



Answer: Unavoidable!

### Operational Verification of AI-forecasts:

- **How? As we verify traditional NWP forecast.** However, **future research towards developing methods for verifying the physical coherence / relationship between variables**
- This year finally there has been a switch, from verif. against analysis to **verif. against obs (recommended)**
- **Governing guidelines for collaborations with AI private sector?**

### Some JWGFVR publications/research:

- **Ben Bouallègue et al (2024):** "[The rise of data-driven weather forecasting](#)", BAMS.
- **N.Acharya (2024)** "Process-oriented dynamical model evaluation through the lens of causal network" [presentation at the 9thIVMW](#)

# JWGFVR members – in alignment with WWRP priorities/projects



**Co-chair: Barbara Casati (ECCC, Canada) – PPP/YOPP and PCAPS**

**Co-chair: Caio Coelho (CPTEC/INPE, Brazil) – S2S and SAGE**

Raghu Ashrit (NCMRWF, India) – tropical cyclones

Stephanie Landman (SAWS, South Africa) - AvRDP

Chiara Marsigli (DWD, Germany) – HIW and Paris 2024

Eric Gilleland (NCAR, USA) – spatial verif

**2<sup>nd</sup> year:** James Bennett (CSIRO, Australia) – hydrology/InPRHA

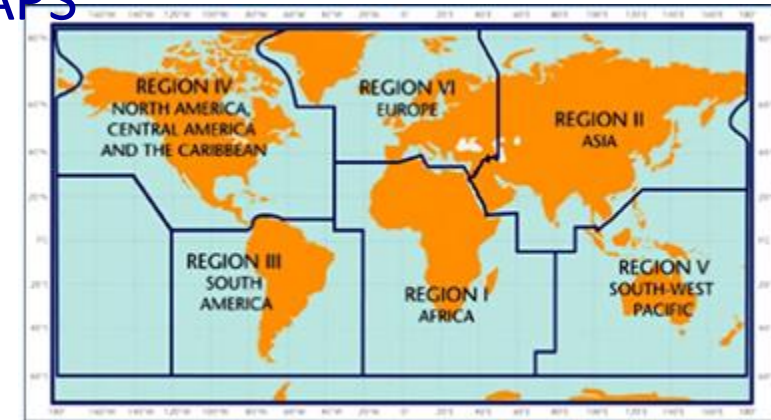
**1<sup>st</sup> year:** Angie Pendergrass (Cornell University, USA) – **climate precip (WCRP/WGCM)**

**1<sup>st</sup> year:** Ramon de Elia (SMN, Argentina) – AvRDP & EW4all + SouthAm pilot project

**1<sup>st</sup> year:** Javier Garcia-Serrano (University of Barcelona, Spain) – **decadal (WCRP/WGSIP)**

**New:** Zied Ben Bouallegue (ECMWF) – AI, ensembles, rep.ness, URBAN

**New:** Alfred Kondowe (Tanzania Met. Authority) – PEOPLE, EW4all, ADVANCE



We are currently nominating 3 new (**female**) members to replace rotating off members

# Future Plans (2024-2025, and beyond)



- 2024-2025: Coordinate the **MetApps Verification Special Issue**
- 2024-2025: Unify all **web resources** developed by the group in the past 20 years, as reference and legacy (renew the Forecast Verification FAQ web-page)
- Start planning for next **workshop** (online) + **tutorial** (target region/community?)
- Keep supporting verification research activities in **WWRP projects and WG**, as well as within **WGNE/WCRP**. Keep supporting **INFCOM+SERC** for verification practices.

**Thank you!**  
**Questions?**