

47th Session of the World Climate Research Programme  
**Joint Scientific Committee**



# CORDEX

## Coordinated Regional Climate Downscaling Experiment

**Co-Chairs:** Melissa Bukovsky  
Jose Manuel Gutiérrez  
Silvina Solman

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*Presented by:*  
*Melissa Bukovsky*  
*April 29, 2026*



# Key highlights for the JSC



*CORDEX SAT, FPS leads, and TF leads met in Hamburg and online in Nov. 2025*

- 1-year [Task Forces](#) transitioning to new Task Teams and Working Groups
- New Task Team on Protocol and Infrastructure for CORDEX-CMIP7 ([TTPI](#)) established
- New [Co-Chair](#), [Science Advisory Team](#) members, and domain [Points of Contact](#)
- Many workshops and activities in the domains!
  - E.g., Polar CORDEX meeting, CORDEX SEA and SEA cities workshop, CORDEX South Asia training, CORDEX South America FPS meeting, Urban FPS workshop
- New CORDEX Project Office being established

# Future plans and priorities

- 1-year [Task Forces](#) set direction, plans, and strategies for new scientific and technical challenges, and have been endorsed as **new Task Teams and Working Groups**

- Upcoming:

- CLIVAR & CORDEX Joint WG on Regional Ocean Climate Projections
- TT on Convection Permitting Modeling
- TT on Machine Learning
- TT on CORDEX-CORE

- New: Task Team on Protocol and Infrastructure for CORDEX-CMIP7 ([TTPI](#))

- Define experiment protocol and technical documentation
- Coordinate with ESGF
- Maintain and develop infrastructure for existing experiments

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# Future plans and priorities

- “15 years of CORDEX: achievements, progress and challenges” special issue ongoing (deadline June 30, 2026)
- New CORDEX Project Office being established @ ESA and Univ. of Cape Town
  - Director hiring process: April 2026

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# Future plans and priorities

- **CORDEX International Workshop on Coordinated Regional Projection Research and Synthesis**
  - Coordinate contributions to literature supporting **IPCC AR7 WG1**
  - Address gaps in regional climate info, extremes, uncertainty, while integrating new CORDEX-CMIP6 simulations and AI-based emulators
  - [May 2026 @ ICTP](#)
- **pan-RIfS Workshop on “Climate Research Frontiers for Regional Decision Contexts”**
  - [June 2026, Nanjing, China](#)



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# Future plans and priorities

- New CORDEX Science/Strategic Plan
- Refresh Terms of Reference for CORDEX Activities
- Schedule 2027 ICRC Conference

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# Suggestions, issues or challenges

- Governance and Visibility
  - Currently working on Terms of Reference with RfS
  - ToR for a joint co-chair role needs to be completed
    - needs clear terms and realistic expectations
- POC/Domain Coordination & Regional Capacity
  - Current model is overstretched and uneven across regions
- Data Infrastructure
  - Gaps in publication/hosting, ESGF participation, and archive continuity
- Strengthen cross-WCRP coordination
  - AI/ML, CPM, ocean/sea-ice, user guidance, etc.

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# Thank You

# CORDEX

# Additional Slides:

## Highlights and Updates from This Year's CORDEX Activities

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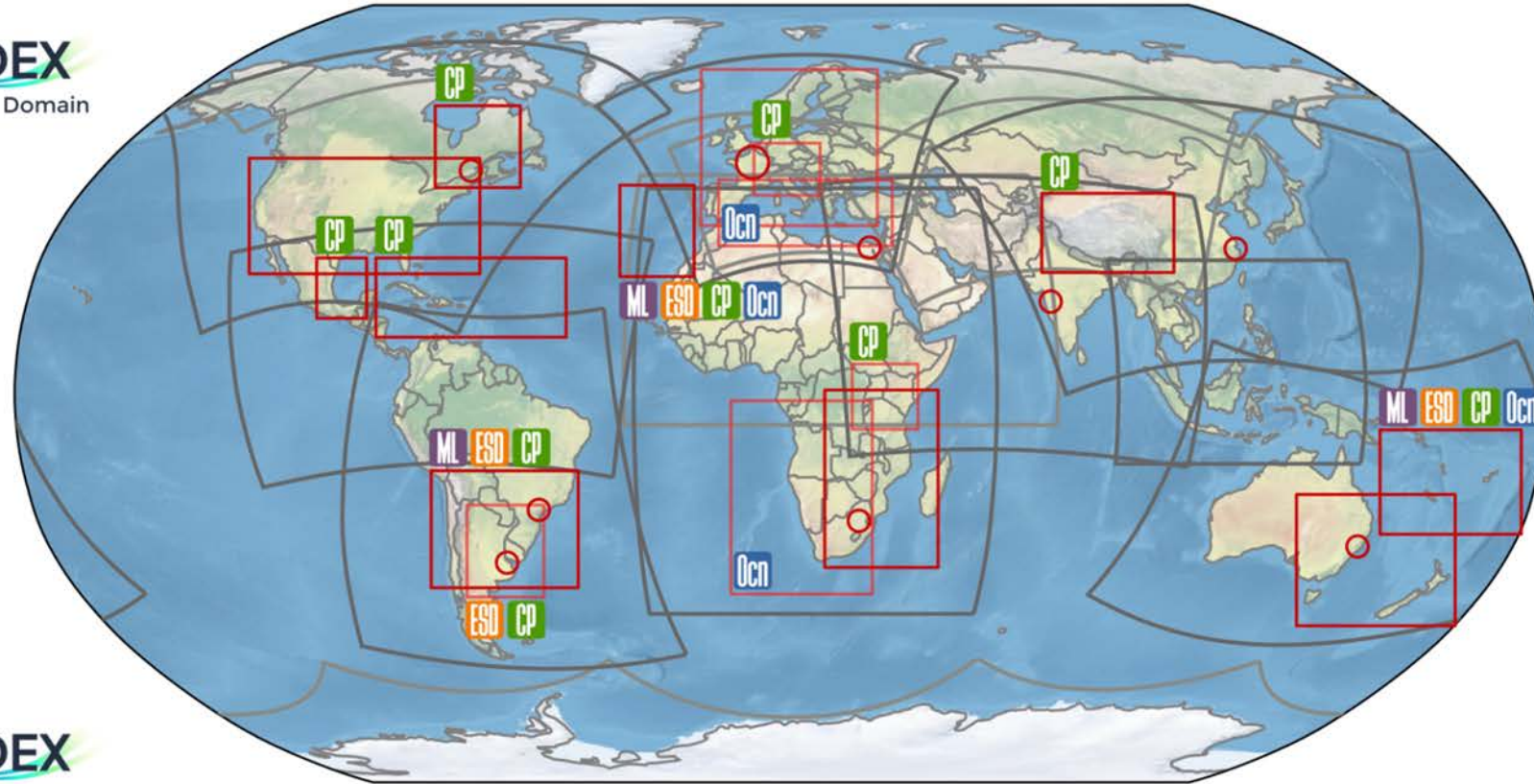
**CORDEX**



# CORDEX Activities

**CORDEX**  
Domain

- SAM
- CAM
- NAM
- EUR
- MED
- MENA
- AFR
- WAS
- CAS
- EAS
- SEA
- AUS
- ARC
- ANT



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Task Forces

- TF on Regional ocean modeling and climate projections **Ocn**
- TF on Convection permitting modelling **CP**
- TF on Machine learning **ML ESO**
- TF on CORDEX-CORE CMIP6
- TF on CORDEX-CMIP7

All TF transitioning to TT/JWG

- JWG on Regional Ocean Climate Projections **Ocn**
- TT on Convection-Permitting Modelling
- TT on Machine Learning
- TT on CORDEX-CORE
- TT on CORDEX-CMIP7 Protocol and Infrastructure (TTPI)

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Flagship Pilot Studies

- FPS-SHEP
- FPS-I-Mac
- FPS-IC-Pac
- FPS-TC-Car
- FPS-SSA-ML
- FPS-URB-RCC
- FPS-NA-Hydro
- FPS-NA-Storyline
- FPS-SEAfrica
- FPS-CPTP
- FPS-ELVIC
- FPS-SWAfrica
- FPS-SESA
- FPS-CONV
- FPS-LUCAS
- FPS-Aerosol
- FPS-AirSea

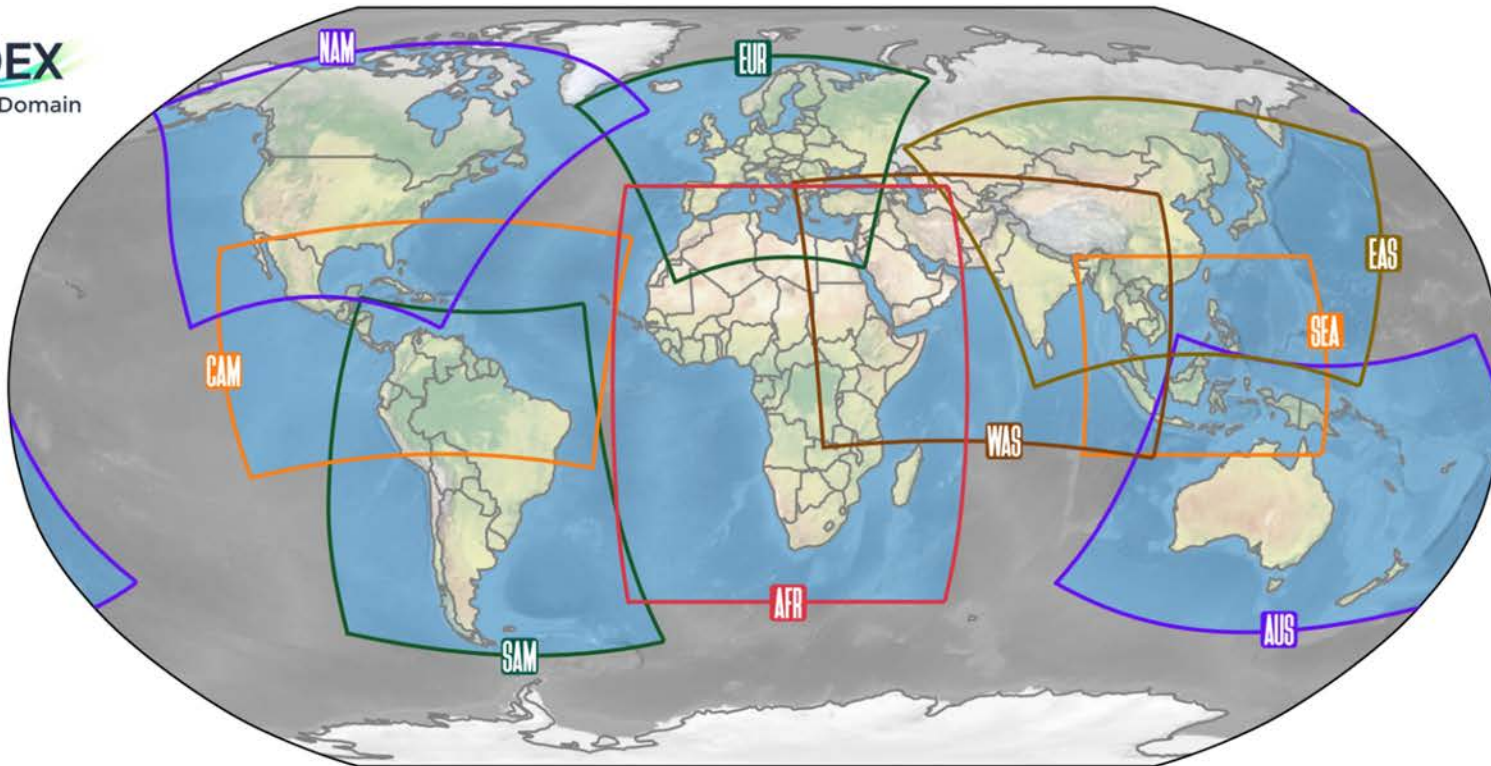
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Task Teams



# CORDEX-CORE-CMIP6 Experiment, TF/TT

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Domain

SAM  
CAM  
NAM  
EUR  
MED  
MENA  
AFR  
WAS  
CAS  
EAS  
SEA  
AUS  
ARC  
ANT



3 driving GCMs

- EC-Earth3-Veg
- MPI-ESM2-1-HR
- NorESM2-MM

4 RCMs

- HadREM3
- RegCM5
- REMO-2020
- WRF4

1 scenario

- SSP3-7.0

12 km resolution

**CORDEX-CORE** (Coordinated Output for Regional Evaluation) is a **cross-Domain experiment** aiming at a balanced, homogeneous ensemble of global projections

# TF/TT on Machine Learning

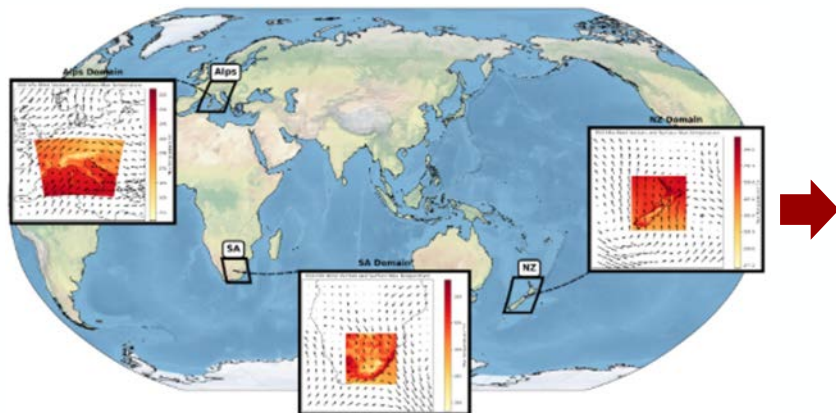
20 members, N. Rampal and J.M. Gutiérrez as leaders

## Objectives:

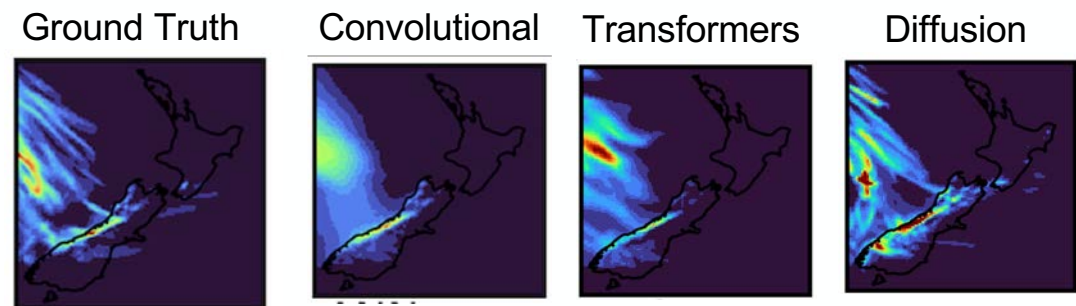
- Coordinate **ML-based climate downscaling** within CORDEX and with relevant initiatives.
- Coordinate intercomparison experiments (**benchmarks**) to assess scientific challenges.
- Coordinate contribution to regional climate change projections (e.g. emulators in CORDEX-CMIP6).
- Build a **community of practice (open tools)**.

## Highlights in 2026:

- Submit a **position paper** (Gutiérrez et al., PlosClimate).
- Launch first benchmark experiments covering three regional domains with over 40 contributing ML models (three papers in progress).
- Contribute to CORDEX-CMIP6 regional climate change projections.



## Benchmarking RCM downscaling emulators:



Further information at <https://github.com/WCRP-CORDEX/ml-benchmark>

# TF/TT on Convection-Permitting Modelling

**Mission:** to transition CPRCM from *ad-hoc* experimentation to a coordinated strategy, building on the success of the CPM CORDEX FPS

Recomendations come in two tiers:

- **Tier 1 · Science strategy:** increased model complexity, ML-integrated ensembles, tackle inequities, link to the global km-scale community
- **Tier 2 · Technical developments:** align with general CORDEX protocols and extend for CP, coordination of static geospatial datasets, move toward larger domains

Creation of dedicated Task Team to implement a coordinated strategy and protocols

Collecting CPRCM simulation inventory (within and beyond CORDEX)

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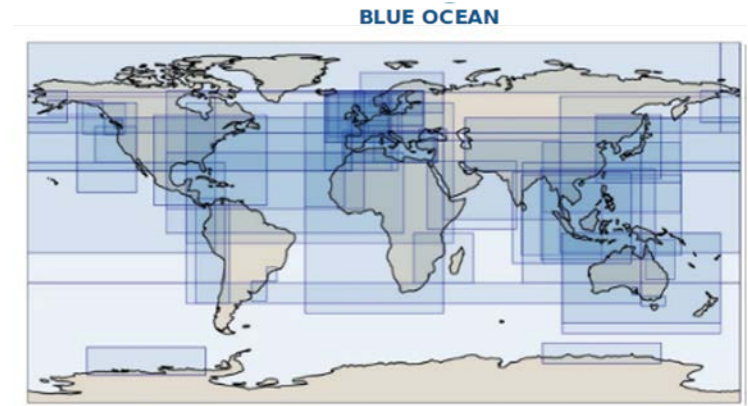
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# JWG on Regional Ocean Climate Projections

12 members: A. Melet, S. Somot as leaders

## Objectives:

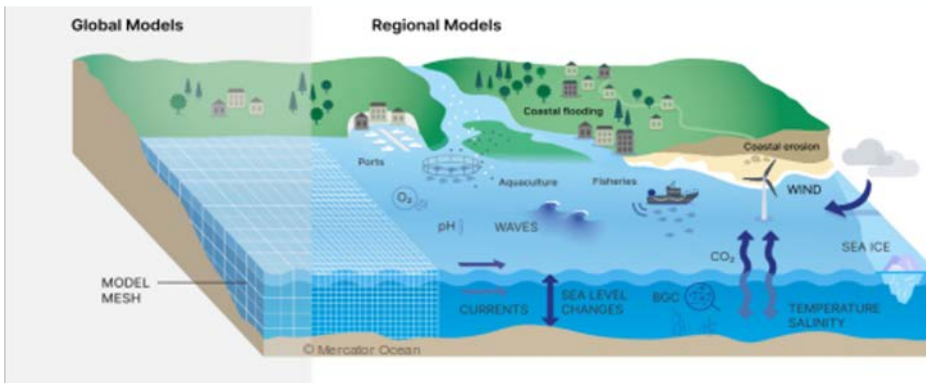
- **Coordinate regional ocean climate projections** (physics incl. wind-waves, biogeochemistry, sea-ice) worldwide
- Explore the potential of **data-driven machine-learning** approaches
- **Advance the science** of regional ocean climate projections
- Engage a **large community** of regional ocean modelers and model users
- Serve the **climate impact and adaptation** needs
- Contribute to **expert assessment reports**



*Existing regional ocean climate projections*

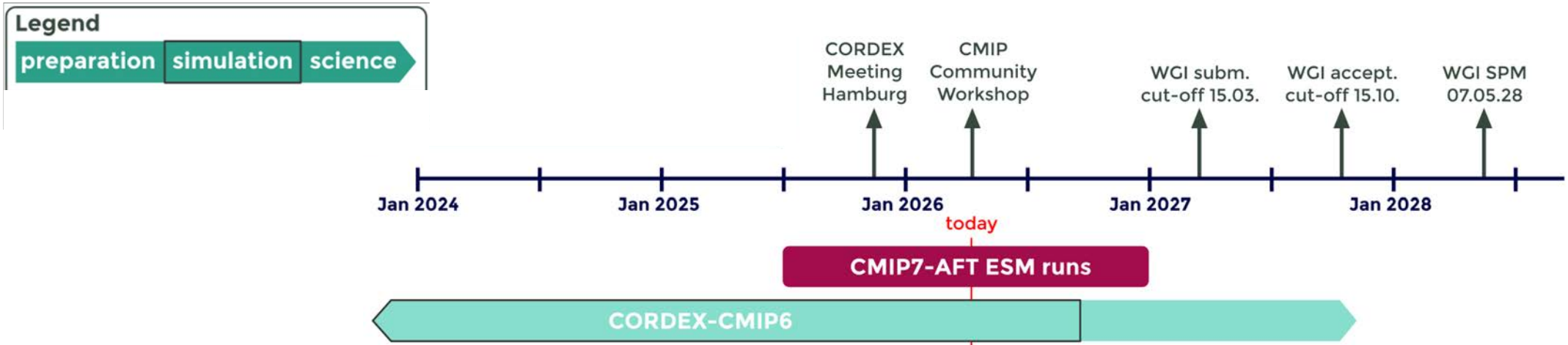
## Highlights in 2026:

- Move to the long-term **CORDEX-CLIVAR Joint Working Group on Regional Ocean Climate Projections**
- Submit a **position paper** (Melet et al., PlosClimate)
- Launch **multi-model multi-domain scientific studies** based on a minimal standardization of the existing simulations
- **Contribute to IPCC-AR7**: revision of the reference ocean regions, anticipate AR7 Interactive Atlas data requests



*Potential added-value of ORCM*

# Task Team on Protocol and Infrastructure for CORDEX-CMIP7

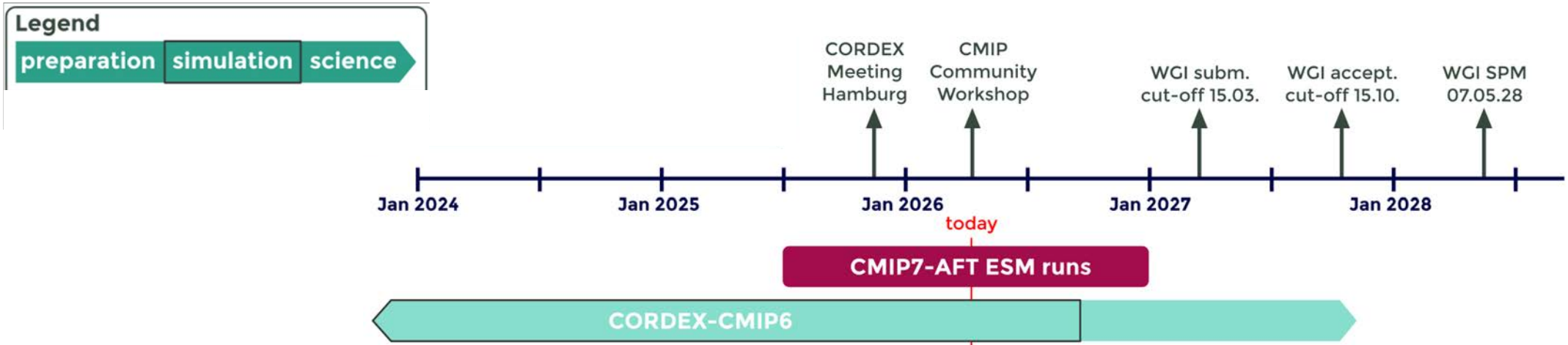


**CORDEX-CMIP6 is still ongoing** and key steps are still pending:

- Quality Assurance (scientific & technical)
- ESGF-NG publication
- Model documentation & guidance (currently domain-dep.)
- Errata (currently domain-dependent)

A recent survey was completed to assess the readiness of the data to be published (QA, amount of data, available ESGF-NG data node, etc).

# Task Team on Protocol and Infrastructure for CORDEX-CMIP7



Given the tight AR7 deadlines, no dramatic changes to the CORDEX-CMIP6 protocols are possible; thus **2 streams** are planned:

**CORDEX-CMIP7-AFT** will feature minimally adapted protocols to provide some CMIP7-based info for AR7. ML emulators (if ready) will expand this stream.

**CORDEX-CMIP7** will be a standard stream, over a longer time frame, including new approaches, new model and climate forcing developments, representing a next generation downscaling.

# Task Team on Protocol and Infrastructure for CORDEX-CMIP7

## *Recommendations for CORDEX-CMIP7*

- Two streams **CORDEX-CMIP7-AFT and CORDEX-CMIP7** with differentiated protocols.
- Adopt (even more) **FAIR practices** for CORDEX data, metadata and protocols.
- **Integrate CORDEX-CORE** (e.g. GCM selection) from the beginning and not as gap-filling
- **Community workshops**: REP scenario selection, GCM selection, ...
- **Centralize more tools and documents** (model documentation, guidelines, errata, science monitoring) and let regional **communities adapt them to their needs**, managed by the POCs or specific regional teams
- Have a **CORDEX Task Team** to develop and maintain the infrastructure (time-demanding, technical skill-demanding) ➡ Ongoing (TTPI) since Jan 2026

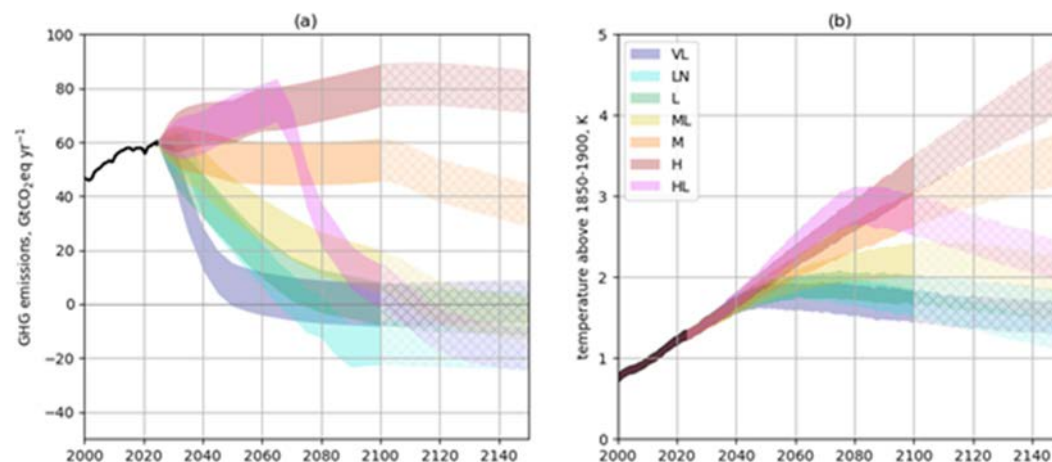
# CMIP7 Scenario Prioritization

During the Open CORDEX SAT in Nov 2025, it was decided to prioritize:

1. **High overshoot scenario (concentration-driven)**
2. **High overshoot scenario (emission-driven)**
3. **High scenario (concentration- or emission-driven)**

These are complementary (1, 2) or contributing (3) to the concurrent CORDEX-CMIP6 release and focus on the overshoot scenario, as one of the main novelties in AR7

Few RCMs are emissions-ready, so GCM concentrations will mostly be used



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Source: Adapted from van Vuuren et al. (2017)

# Open Development of Protocols and Infrastructure in GitHub

Some repositories

- <https://github.com/WCRP-CORDEX/experiment-design>
- <https://github.com/WCRP-CORDEX/archive-specifications>
- <https://github.com/WCRP-CORDEX/data-request-table>
- <https://github.com/WCRP-CORDEX/cordex-cmip6-cmor-tables>
- <https://github.com/WCRP-CORDEX/cordex-cmip6-cv>
- <https://github.com/WCRP-CORDEX/simulation-status>
- <https://github.com/WCRP-CORDEX/cmip6-for-cordex>

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# Monitoring the Science

## Tracking the CORDEX scientific output and the science enabled by CORDEX

This includes scientific publications, but also scientific projects and other science outputs (more informal analyses, applications in different platforms).

Publication tracking is currently scattered in the different communities and with different criteria of what a “CORDEX publication” is. The central collection at [cordex.org](https://cordex.org) is not classified.

- Use a central bibliographic tool (Zotero)
- Let the regional communities (POCs) curate the content
- Track science beyond standard publications (e.g. [project collection form](#))

<https://www.zotero.org/groups/5816477/wcrp-cordex/library>

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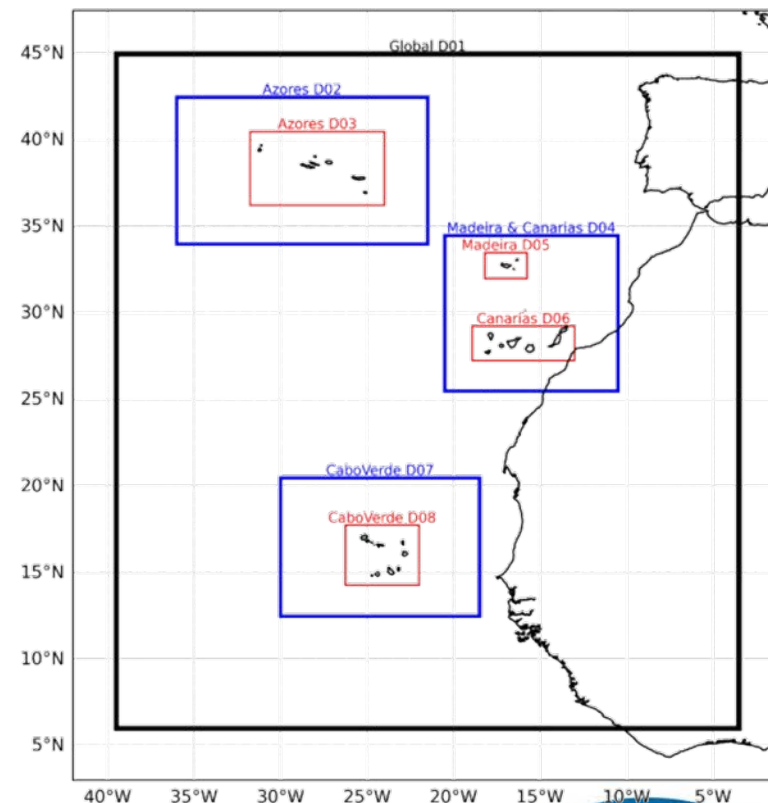
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# FPS: Macaronesian Islands

Islands are highly vulnerable to climate change, including sea-level rise and extreme events. The **FPS-I-Mac** study focuses on **Macaronesia** (Azores, Madeira, Canaries, Cape Verde), using high-resolution regional models and multi-scale analysis to support adaptation strategies.

## Objectives/Highlights:

- Improve climate modeling via multiscale process analysis.
- Assess SST roles in regional climate.
- Evaluate high-resolution simulations and downscaling.
- Foster science-user collaboration.
- Generate projections for key sectors.
- Provide reliable extreme indices for small islands.



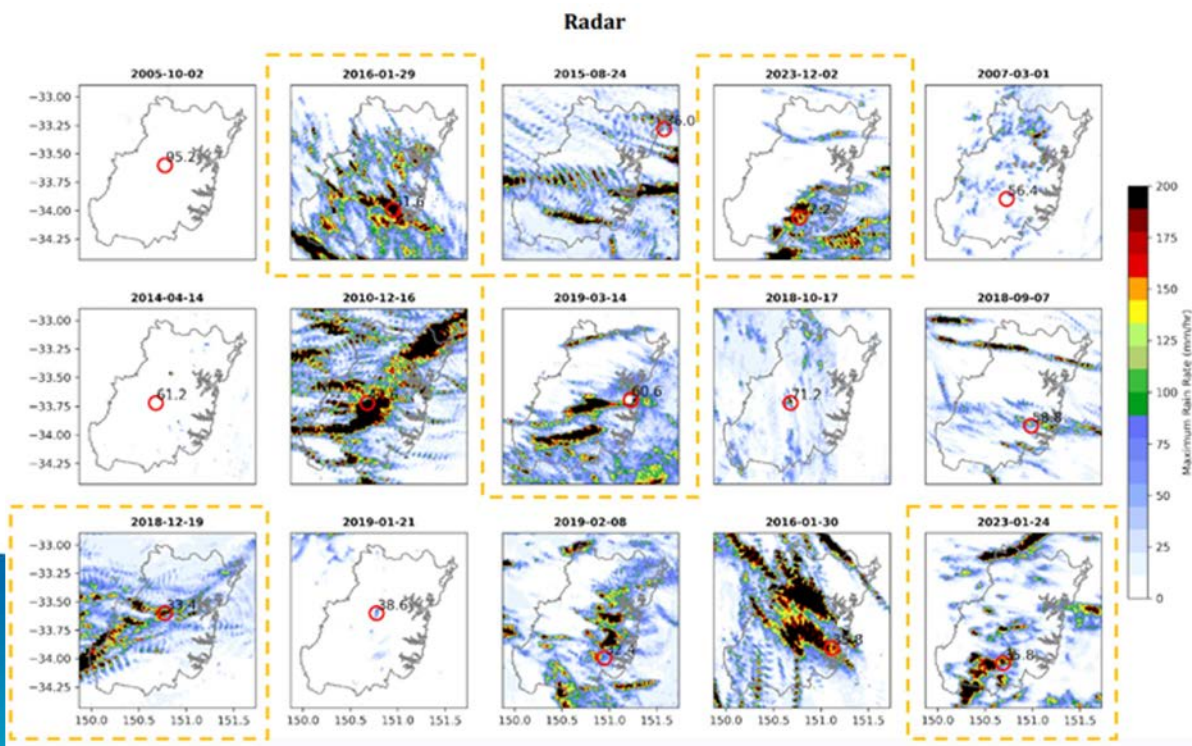
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# FPS: Extreme sub-hourly precipitation

Example of case study selection for Canberra Australia, based on reanalysis (shown) weather stations (shown) and radar (not shown)



## Objectives/Highlights:

- Extreme rainfall case studies used for stage-1 evaluation, including radar, reanalysis and station.
- Stage-1 simulations are currently underway.
- Early results indicate that models are fit-for-purpose for stage-2 projections.
- Further information at <https://shep-fps.org/>

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