

46th Session of the WCRP Joint Scientific Committee (JSC)

Date: 12-16 May 2025

DEADLINE: 01 March 2025

Instructions

***Overarching content/goal:** To provide an update on progress made during the last year, and to identify issues etc. in advance of the JSC meeting. This will allow more discussion and less reporting at the JSC meeting itself. The outcomes from this report will also feed into a highlights brochure planned for the first quarter of the year. The Secretariat will arrange calls prior to the JSC meeting with JSC liaisons (as appropriate) to discuss the input and any issues to the JSC meeting itself. Please work with the WCRP secretariat responsible for your activity, in the preparation of the report.*

Please keep the information as focused as possible and provide links to websites where more details can be accessed.

Update report for the WCRP Joint Scientific Committee

Earth System Modelling and Observations (ESMO)

1. High-level publications

Governance-related publications

- ESMO SSG ToR (under review by JSC since Oct 2024)
- WGNE ToR (under review since November 2024, pending on clarification on parent bodies)
- WGCM ToR
- WGSIP ToR
- DCPD ToR

Approved ESMO ToRs are available in our [ESMO zenodo community portal](#).

WGNE Blue book 2024

The [WGNE publication “Research Activities in Earth System Modelling”](#), often referred to as the “WGNE Blue Book”, has been a longtime activity carried out by the WCRP Working Group on Numerical Experimentation (WGNE) since 1970.

Strategic publication

- Kumar, A., Scaife, A.A., **Merryfield, W.J.**, Coelho, C.A., Kolli, R.K., Fröhlich, K., Lim, E., He, Y., Honda, Y., Silva, J.A., Diouf, S., Okia, W.M., and Hovsepyan, A., 2024. World Meteorological Organization (WMO)-Accredited Infrastructure to Support Operational Climate Prediction. *Bulletin of the American Meteorological Society*, 105(11), pp.E2126-E2143, <https://doi.org/10.1175/BAMS-D-23-0284.1>.

This paper describes WMO positions stemming from the [Third WMO Workshop on Operational Climate Prediction \(OCP-3, 20-22 September 2022\)](#). Merryfield represented WGSIP.

- Sospedra-Alfonso, R., **Merryfield, W.J.**, Toohey, M., Timmreck, C., Vernier, J.P., **Bethke, I.**, Wang, Y., Bilbao, R., Donat, M.G., **Ortega, P.**, Cole, J., Lee, W.-S., Delworth, T.L., Paynter, D., Zeng, F., Zhang, L., Khodri, M., Mignot, J., **Swingedouw, D.**, Torres, O., Hu, S., Man, W., Zuo, M., **Hermanson, L.**, Smith,

D., Kataoka, T., and Tatebe, H. 2024. Decadal prediction centers prepare for a major volcanic eruption. *Bulletin of the American Meteorological Society*, 105(12), pp.E2496-E2524, <https://doi.org/10.1175/BAMS-D-23-0111.1>.

Summarizes a collaborative project with the APARC/VolRes activity.

- Bilbao et al., 2024: Impact of volcanic eruptions on CMIP6 decadal predictions: a multi-model analysis, *Earth System Dynamics*, 15, 501-525, doi:10.5194/esd-15-501-2024.

Presents results from the Decadal Climate Prediction Project component C (DCPP-C) that includes a protocol to investigate the impact of volcanic aerosols on the climate experienced.

2. Capacity Building/Education and Training Highlights

Joint CMIP-ESMO community training programmes

The CMIP and ESMO IPOs jointly developed two sets of training programmes to support capacity building in the community, delivered by an external partner, Stickydot:

- The Science Leadership and Facilitation course was designed to equip participants with the necessary skills to facilitate online meetings and workshops and lead international scientific committees. Specific techniques to ensure that participants feel comfortable to engage and work towards having equal voices in the discussion. This was targeted at panel and steering committee members, task team or working group co-leads across all career stages and where space available opened to the wider CMIP and ESMO communities.
- The Science Communication course focused on learning why and testing how to address the deeper societal relevance of our research topics, identify target audiences and stakeholders for science outreach, and tailor messages that resonate with them. This included the concept of storytelling and its impact on behaviour change.

Travel support to conference for Global South participants

ESMO provided travel funding to 8 ECRs to attend the 6th International Conference on Reanalysis in Tokyo (ICR6, Oct. 2024).

Initiate planning the Climate Prediction School (early 2026, Buenos Aires) - WGSIP/DCPP

WGSIP co-chair participation in:

- Climate Prediction Training organised by the International Livestock Research Institute. 9-11 Sep 2024. Botswana.
- Workshop Climate Services for Africa and Beyond. 28-29 Nov. BSC, Spain

obs4MIP: improved documentation, including how to contribute.

3. Linkages with other Core Projects, Lighthouse Activities, Academy etc.

ESMO general:

- CPs & LHAs invited to Kick-off meeting (Hamburg, March 2024)
- jointly coordinates the world-wide colocated [WCRPglobal km-scale hackathon](#) with Digital Earth LHA
- jointly coordinates the TCRE task team with the Safe Landing Climate LHA.
- currently discussing with GLASS (GEWEX) to potentially set up a joint activity on Process Study and Improvement of Model parametrization
- currently discussing setting up a WCRP-wide task team on coordination of activities around Carbon Cycle.

WGSIP:

- WGSIP has established reciprocal liaison relationships with each of the other Core Projects to survey, maintain awareness of, and explore collaborative opportunities with climate prediction-related activities elsewhere in WCRP - initial liaison reports for each CP were received at the WGSIP-25 (Nov. 2024).

DCPP:

- contributed to the development of CMIP7. In particular, engaging with the development of the AR7 Fast Track experiments, and the development of the CMIP7 data request.
- planning with EPESC a workshop on annual to multi-decadal predictions to take place in Bologna in November 2025.

WGCM:

- discussed with the CMIP Panel future direction and joint activities and endorsed the adoption of CMIP7 fast track. They participated in CMIP workshop on “Pathway to regular and sustained delivery of climate forcing datasets”, and endorsed the adoption of CMIP7 fast track.

WGNE:

- regular engagement with Digital Earths LHA, GEWEX-GASS, GEWEX-GLASS and CMIP
- participated in the Ocean initialisation review paper led by CLIVAR.

obs4MIPs:

- Strong link with the WGCM’s Infrastructure Panel (WIP) to ensure technical alignment with CMIP
- Collaborating with CMIP’s Benchmarking Task Team to identify and provide selected products

4. Partnerships with entities outside of WCRP

ESMO general:

- invited external activities to its Kick-off meeting in March 2024 such as SOLAS and GCOS.
- representation in the scientific organisation committee of the 6th International Conference on Reanalysis in Tokyo (ICR6, Oct. 2024)

WGSIP:

- Training activities in collaboration with CGIAR/CIAT Bioversity Alliance/International Livestock Research Institute/Norway Met Service
- collaboration with WWRP SAGE project to organise (i) the Climate Prediction School (Buenos Aires, early 2026), and (ii) the S2S component of the 3rd international conference on Subseasonal-to-Seasonal and Seasonal-to-Decadal (S2S2D) predictions (Reading, Sep. 2026)
- WGSIP is partnering with the APEC Climate Center (APCC) and WMO to migrate WGSIP’s Climate-System Historical Forecast Project (CHFP) archive of seasonal hindcasts over multiple generations of prediction systems from CIMA to APCC. In addition, CHFP will contribute to the WMO Lead Centre for for Long-Range Forecast Multi-Model Ensemble, thereby keeping CHFP up to date as a resource to support prediction/predictability research and tracking of changes in the performance of seasonal prediction systems over time.

DCPP:

- collaboration with WWRP SAGE project to organise the S2D component of the 3rd international conference on Subseasonal-to-Seasonal and Seasonal-to-Decadal (S2S2D) predictions (Reading, Sep. 2026)
- DCP has many links to the WMO lead-centre activity on Annual to Decadal Climate Prediction (LC-ADCP). Many groups represented in DCP contributed to the 2024 exchange of decadal predictions under the Lead Centre for Annual-to-Decadal Climate Prediction (LC-A2DP). Additionally,

DCPP successfully advocated for the inclusion of biogeochemistry variables in the exchange of variables undertaken under the WMO. We continue to liaise with LC-ADCP in the development of the CMIP7 protocol which we hope will underpin LC-A2DP predictions over the CMIP7 cycle.

WGNE engaged with:

- WMO-Research Board: AI task team, digital strategy, review of emerging technologies & HPC use & R2O processes
- WWRP-WGNE Joint Working Group on Forecast Verification Research ([JWGFVR](#)): South America Pilot project on forecast verification & extreme events
- WWRP WG on Predictability, Dynamics and Ensemble Forecasting ([PDEF](#)): Model uncertainty intercomparison project
- WMO-GAW Scientific Advisory Group on Applications ([SAG-Apps](#)): Evaluating impact of Aerosol on NWP and S2S
- [WIPPS](#): Review of systematic errors and forecast skill with a special focus on Extremes, AI-inclusive MIP pilot project and WGNE EW4All survey

Besides, WGNE also has regular engagement with WWRP in [High Impact Weather Project](#) (closed), [DAOS](#) and [WGTMR](#).

obs4MIPS:

- interactions with numerous data providers and centres.

5. Future Science Directions for JSC consideration

WGSIP:

- At WGSIP-25 (Nov 2024), discussions focused on formulating research priorities for the next five years. Key areas included ML/AI for forecasting, sources of predictability, ensemble information across timescales, and a project or sub-panel on the sub-seasonal timescale. Concept notes and initial plans are being drafted.

WGNE:

- **7th WGNE workshop on systematic errors in weather & climate models planned for 2026**: A community-building workshop aiming to advance the understanding of the root causes of systematic model errors across time scales and highlight progress made in diagnosing and addressing these errors since the previous workshop. The event will promote collaboration among scientists from diverse institutions, strengthen knowledge exchange, and establish a solid foundation for future scientific directions in Earth System Model development. This workshop is essential for measuring scientific impact and planning future strategies. **Outcome: Publication of a BAMS paper.**
- **40th WGNE anniversary - Scientific legacy and celebration**: A biennial WGNE in-person meeting in China. This event will serve as an opportunity to reflect on the group's significant contributions to climate modeling and numerical systems while outlining strategic plans for the future. The meeting will foster deep, collaborative discussions on the next steps in modeling, engaging global scientific leaders and strengthening international collaboration. It will also highlight the group's enduring role as one of the WCRP/WMO's key pillars in numerical model development. Hosting the event in China, a country with growing influence in climate science and technological development, will underscore the global nature of scientific collaboration and open new opportunities to engage a broader network of scientists and institutions. **Outcome: A special report may be produced summarizing the legacy and strategic directions of WGNE.**
- **WCRP Summer School on Climate Model Development** (timeline under discussion, likely 2027): WGNE endorsement and leadership in organizing the summer school, which will focus on climate model development, a critical area for advancing climate science and Earth system modeling. The

primary goal is to promote the career development of Early Career Scientists (ECS) by providing opportunities to enhance their scientific and technical skills in model development and actively involve them in shaping the future of Earth system modeling. The school will also serve as a connection to the WCRP Academy. (<http://eventos.cptec.inpe.br/wcrpsummerschool/>). **Outcome:** Enhanced ECS capacity-building and stronger links between WGNE and the WCRP Academy.

WGORC: priorities list is being considered in the frame of the scoping.

obs4MIPS:

- Possibility to include in-situ data products via obs4MIPs
- Increasing focus on high resolution process relevant products.
- By providing multiple datasets for a given quantity, obs4MIPs can facilitate data assessment and intercomparison efforts (e.g., GDAP), and thus be considered a mechanism that can be leveraged for other WCRP activities.

6. New Activities

ESMO general:

- establishment of a new Working Group WGORC. Open call is currently running (DL 31 March).
- co-coordination of the TCRE Task team with Safe Landing Climate LHA.
- scoping activities or task teams on the following topics:
 - climate emulators
 - carbon cycle
- putting together a catalogue of important datasets of climate records, including model outputs, observational records as well as reanalysis data.

WGSIP:

- discussing the continuation of targeted S2S research within WCRP, to complement the WWRP SAGE project (either as a WGSIP sub-panel, or as an activity).

DCPP:

- started a task team focusing on developing idealised experiments that will form part of the protocol for DCPD in CMIP7. This allows DCPD to be more flexible in designing and testing experiments by bringing in additional members who are not on the main DCPD panel.
- plan to pivot to coordinating analysis plans once the DCPD protocol has been agreed.

WGNE:

- in collaboration with RB AI Task Team: set up a paper collection database for community use under the ESMO Website. Goal: develop and maintain a comprehensive database of papers or references related to model development and artificial intelligence (AI). This database will serve as a valuable resource for the community, offering easy access to key publications that can support research, collaboration, and innovation in these fields.
- Review of systematic errors and forecast skill with a special focus on Extremes. The WGNE EW4All survey will help to identify where WIPPS can be extended to meet the prediction needs for the EW4All priority hazards, and where additional model development would be needed. Outcomes: a report/paper
- AI-inclusive MIP pilot project: priority is to provide guidance to users on the use of AI-based forecasts (joint with WIPPS) and verification (joint with JWGFVR). Intercomparison of data-driven models and comparison of strengths and weaknesses compared to traditional NWP models. Outcome: white paper (follow-up from DIMOSIC)

- South America Pilot project on forecast verification & extreme events to improve our knowledge of global forecast performance over South America. Outcomes: 2 papers in preparation; ECMWF report; feed events to the high impact database. Long term (2026-2027) outcomes (if funds come): Develop delivery of weather forecast and warnings with value-chain concept; ECMWF scientist visiting SA (split between Argentina and Brazil); visiting / exchanges within SA. Short visit to ECMWF (or other relevant institutions) by SA scientists.
- Evaluating impact of Aerosol on NWP and S2S paper preparation

WGCM:

- recruiting new members, aiming to improve the balance in terms of geographical representation and scientific expertise.

WGORC:

- Sessions proposed at AMS conference on satellite meteorology and oceanography, EGU and [LPS](#)
- Membership of WG to be confirmed over the Spring and kick off meeting to be held in Boston in the late Summer or in Autumn 2025, alongside the ESMO-SSG#2 meeting.

obs4MIPS:

- Technical – the management of codes and metadata via an obs4MIPs Github repository will be modernized in accordance with the advancing CMIP7 infrastructure.

7. General

Highlights:

- ESMO new working Group [WGORC](#).
- [WGNE Blue Book 2024](#)

Challenges:

ESMO general:

- Difficulties in getting our ToRs approved. There were no guidelines at all. Substantial work has been dedicated to frame our ToRs, meant to be transparent and consistent across **all** our panels (incl. SSG and CMIP). After several rounds of reviews, they are now all approved, except for the SSG ones and the WGNE ones, stuck in bureaucratic hurdles. This is unfortunate and it feels a bit like a waste of time for everyone involved in drafting and reviewing these documents.
- We really value the support provided by the secretariat, and it would be very beneficial to clarify the role of the secretariat vs. the IPOs, define roles, responsibilities and workflow to lighten the workload from both sides, increase efficiency and prevent duplication.

WGNE:

- South America Pilot Project on Forecast Verification & Extreme Events: score exchange domains have been defined, and score exchanges are being conducted within the WIPPS score exchange standards. Funding possibilities were provided by WWRP, and a detailed list of activities to be implemented, including the dates of deliverables, was developed. However, a Letter of Agreement (LoA) required by WWRP could not be finalized due to bureaucratic issues, which prevented both Brazil and Argentina from receiving the funding. Is there any other way to secure funding (e.g., air tickets provided by WMO, per diem, instead of transfer of funding)?

obs4MIPS:

- Hurdles remain with regards to data delivery via ESGF that are being addressed across multiple panels.