

World Climate Research Programme JOINT SCIENTIFIC COMMITTEE (JSC) 41st online session

CORDEX Report (draft 1)

1. Highlights for JSC

Many new simulations and in particular the CORDEX-CORE (Coordinated Output for Regional Evaluations) set of experiments were finalized by the larger contributors and are now available on ESGF <https://esgf-data.dkrz.de/search/cordex-dkrz/>, XXX-22 domains (for instance AFR-22, CAM-22).

The fourth Pan-CORDEX, ICRC-CORDEX 2019, conference was held in Beijing, 14-18 October 2019. At the event a number of workshops and side events were organized, for instance on Future Risk/Future Earth in cooperation with MAIRS-FE, a meeting followed by two workshops planned for 2020 if the current situation allows for it.

Two new Flagship Pilot Studies (FPSs) were endorsed at the ICRC-CORDEX 2019: 'Modelling the Southeast African regional Climate' and 'High resolution climate modeling with a focus on convection and associated precipitation over the Third Pole region' (the latter also proposed by Core Project Joint Initiative as a pilot FOCI project).

A number of other CORDEX-related events were organized, including:

- Euro-CORDEX General Assembly, Hamburg, Germany, 28-30 January 2019, see report here <https://www.euro-cordex.net/>
- Training Workshop of Access and Utilization of Regional Climate Downscaled Data of ESGF/ SARCCIS of CORDEX Southeast Asia, 22 January 2019, Bangkok, Thailand
- Session 31: Climate Change Scenarios in CORDEX Domains. Scenarios Forum 2019: Forum on Scenarios for Climate and Societal Futures. Denver, USA, 11-13 March 2019
- Sessions at EGU; Regional climate modelling, including CORDEX (CL5.01), CORDEX FPS Convection splinter meeting, Convection permitting modelling (CL5.04), Vienna, Austria, 7-12 April 2019
- Paper-writing Workshop on the Analysis of CORDEX-CORE Climate Projections, Trieste, Italy, 8-12 Apr 2019
- Conference sessions focused on regional climate modelling highlighting CORDEX at the Australian Meteorological and Oceanographic Society (AMOS) annual conference in Darwin Australia 11-14 June 2019; AOGS Singapore 28 Jul – 2 Aug 2019
- Third Workshop of the Second Phase of the Southeast Asia Regional Climate Downscaling (SEACLID)/CORDEX Southeast Asia Project, Manila, Philippines, 10–11 July 2019
- EMS2019, Climate modelling (UP3.5), Copenhagen, Denmark, 9-13 September 2019
- FPS –LUCAS annual meeting, Hamburg, Germany, 25-26 September 2019
- Workshop of Access and Utilization of Regional Climate Downscaled Data of ESGF/ SARCCIS of CORDEX Southeast Asia, Bangkok, Thailand, 3 October 2019
- Annual Joint Polar CORDEX meeting with focus on surface mass balance of Greenland and Antarctic ice sheets, model evaluation and coupled modelling/high-resolution challenges and benefits, Copenhagen, Denmark, 7-9 October 2019
- FPS –CPS annual meeting, hosted by Meteo-FR, Toulouse, France, 26-28 November 2019

- The 6th Med-CORDEX workshop Toulouse, France, November 2019 The three Med-CORDEX related FPSs (convection, air-sea and aerosol) annual meeting during the 6th Med-CORDEX workshop allowing some cross-FPS fertilization
- International Congress on Modelling and Simulation (MODSIM2019) Canberra Australia 1-6 December 2019

Other activities include:

- For the Arctic Ocean, a multi-model intercomparison with the ACSE2014 campaign data has been accomplished and Arctic and Antarctic sea-ice lead data sets have been compiled
- Many new scientific publications, for instance two by CORDEX Africa VIA scientists and two published and three under review on the European Convection and LUCAS FPSs
- Several contributions to the IPCC special reports and to the coming AR6
- Tutorial on how to download CORDEX Africa data
- 5x5 km downscaling by CORDEX SEA scientists for a number of SEA subdomains
- Contributions to Australian Climate Projection Strategy
- Contributions to the Hindu Kush Himalaya Assessment. Springer, Cham, 2019, pp. 57-97, doi: https://doi.org/10.1007/978-3-319-92288-1_3 and other assessment reports
- MED CORDEX simulations:
 - The description of the simulations including 5 modelling pillars can be found in Somot et al. 2018b and on medcordex.eu/simulations-phase2.php
 - Baseline runs: 11 modelling groups are participating with fully-coupled Regional Climate System Models (RCSM), 10 RCSM are ready to be used, 6 evaluation runs have been performed for this phase as well as 6 historical/scenario runs
 - FPS-convection: 11 evaluation runs are completed over the alpine domain as well as 6 historical/scenario pairs (end of the 21st century, RCP8.5, 10-year time slices)
 - FPS-aerosol: simulations have been performed for the 5 defined protocols, in particular 6 pairs of runs are available for protocol 1B (scenario with aerosol climatologies) and 8 runs for protocol 2A (case study with interaction aerosols)
 - FPS-air-sea: various baseline runs have been performed and sensitivity tests to the sea representation and air-sea coupling representation are in preparation
 - Concerning the Free Modelling Zone runs, 15 modelling actions are listed with model outputs available on request
- FPS: Convective Phenomena over Europe and the Mediterranean completed over 22 evaluation time slices and 12 scenario simulations and continued to analyze the output from their simulations and delivered new insights, for example, a strong shift towards higher convective precipitation intensities in the future
- FPS: Extreme events over South America includes a collaborative effort with modeling groups from Spain, Brazil and Argentina. 3 RCM simulations driven by reanalyses at convective permitting resolution over southeastern South America for a 6-month period were completed for evaluation.

2. Primary science issues (looking ahead, 3 to 5 years)

CORDEX White Paper developed by the SAT, to be circulated for comments in CORDEX community, highlights challenges and possibilities such as:

- Smaller domains with finer resolution; a common setup for convection permitting resolution domains will be proposed by the CORDEX-SAT, within the established CORDEX domains.

- Increasing complexity; as RCMs move towards Earth System Models (ESM) a compromise must be made between resolution and domain size.
- Increasing resolution; as GCMs/HighResMIP are moving towards RCM resolutions. In this context, CORDEX is focusing on specific regional/local climate change challenges and proposes to add value in providing a wider matrix for exploring uncertainty
- Exascale computing; RCMs have to be adapted to the new generation of high-performance computers.

3. Issues and challenges

- To increase the cooperation with other WCRP CORE Projects, HighResMIP and CORA is essential (with reference to for instance the challenge of smaller domains and higher resolution).
- The CORDEX community is continuously growing and the demand on CORDEX products/information is steadily increasing which is both encouraging and challenging as it puts pressure on performance/delivery.
- The CORDEX community are working with impact-, risk-, adaptation scientists as well as with decision makers and other users such as energy industry or agriculture, through projects, workshops, paper writing etc.
- The demand for interdisciplinary science and cooperation increases and CORDEX can help with the bridging between climate science and climate services through cooperation with groups such as Working Group on Information for Regions (WGIR), FOCI (see the first page, third paragraph), GFCS, Future Earth (MAIRS-FE), CORDEX workshops and African demonstrator.
- It is increasingly difficult and that is a big concern but none the less it is essential to attract both internal and external funding for fundamental science and the maintenance and growth of the data storage capacity (due to the increase of new simulations and higher resolutions). Thus the need for enhanced communication with funders and society increases with accelerating global focus on climate and climate change and with tougher competition for funding.

4. Early success and/or planned activities in 2020 if possible due to COVID-19 (this bullet point has been added but can be removed if not needed)

- Capacity building across regions through the following planned activities, whenever they are possible in the current context:
 - Regional training workshop, Kathmandu, Nepal, 29 June-3 July 2020.
 - 4th CORDEX Southeast Asia Workshop on Coordinated 5km Simulations, Quy Nhon, Vietnam, early October 2020
 - Final CORDEX Southeast Asia Workshop on Coordinated 5km Simulations, Bangkok, Thailand, end of 2020
 - Joint workshop for Southwestern African countries with focus on building the VIA community in the initiative as well as strengthen the already well developed climate science community and Regional workshop CORDEX southeast Africa FPS, Cape Town, South Africa, end of 2020
 - 2nd Regional training Workshop/CORDEX for the South/Central American domains, Sao Paulo, Brazil, fall 2020
 - Joint meeting CORDEX - MAIRS FE, Beijing, China
 - Conference on Regional Climate Modelling and Extreme Events over South America: Results from the CORDEX-Flagship Pilot Study / Lab training activity on how to use, interpret and compare the GCM/RCMs/ESD simulations, Buenos Aires, Argentina, 16 Nov 2020 - 20 Nov 2020
 - South East Asia; Coordinated Regional Climate Downscaling of 5 km x 5 km resolution by the five modelling groups continues
- Polar CORDEX workshop, Utrecht, Netherlands, 5-7 October 2020
- CORDEX-Australasia, conference session at AMOS, Fremantle, Australia, 10-14 February 2020

- MED-CORDEX; Completion and publication of the planned simulations for the evaluation runs (Baseline runs, FPS) and availability of large ensemble of scenario simulations (Baseline runs, FPS)
 - EURO-CORDEX paper "Regional climate downscaling over Europe: perspectives from the EURO-CORDEX community" accepted for publication in Regional Environmental Change
 - The downscaling of CMIP6 will be initiated
 - Completion of CORDEX White Paper
 - Completion of IPOC Communication Plan
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