WGCM 2021 Status Germany

Deutsches Zentrum für Luft- und Raumfahrt, Oberpfaffenhofen

Alfred Wegener Institut für Polar und Meeresforschung, Bremerhaven

Max Planck Institut für Meteorologie, Hamburg

Deutscher Wetterdienst, Offenbach

Deutsches Klima Rechenzentrum, Hamburg

contact: johann.jungclaus@mpimet.mpg.de
ICON-Seamless

ICON-Seamless = Model and Data Assimilation for

✓ Numerical Weather Prediction (NWP)
✓ Climate Prediction (Seasonal, Decadal)
✓ Climate Projections

- One consistent model including Atmosphere (ICON-NWP), Ocean (ICON-O), Land (ICON-Land), ICON-ART
- Configurations for different application scenarios well balanced and compatible

Time Line / Milestones

ICON-Seamless experimental versions by 2022

Seasonal and Decadal Prediction pre-operational by 2024

Unified ICON-Land for NWP and climate time scales experimental version in 2025

CMIP7
AWI-CM/ESM in CMIP7

- Pushing the boundaries for coupled atmosphere-land-ocean-sea ice modeling (AWI-CM3: OpenIFS FESOM2) regarding resolution
- Pushing the boundaries for earth system modeling (AWI-ESM) regarding components: ice shelf cavities, ice sheets, ocean biogeochemistry, high resolution focused on polar regions
- AWI-CM-HR: DECK, ScenarioMIP, PAMIP
- AWI-ESM-MR: DECK, ScenarioMIP, PMIP

Envisaged CMIP7 ocean resolution AWI-CM-HR:
13 Mio. surface nodes;
atmosphere resolution: 30 km
5 SYPD possible
Ongoing CMIP6 activities

EMAC

coupled atmosphere – ocean system with interactive atmospheric chemistry & aerosol

- major update of the radiation infrastructure
- new PSrad scheme
- improvement in CH₄ forcing
- retuning
- redo CMIP6 simulations with improved model

CMIP7

Development of an EMAC successor based on the ICON/MeSSy system

New ERC synergy grant (V. Eyring, M. Reichstein): Physics-aware machine learning based Earth system modelling

https://www.usmile-erc.eu/
EU H2020 NextGEMS

- two prototype storm-resolving ESMs (ICON-A/O, FESOM, and IFS from ECMWF)
- produce multi-decadal projections of future climate change.

AWI-CM-XR: OpenIFS/FESOM: globally 3-4 km atm./ocean
ICON-ESM: ICON-A/ICON-O: globally 2.5-5 km atm./ocean

ICON @ 80km and 5km
EU H2020 ESM2025

- Improving processes realism in ESMs (ICON-ESM)
- Enabling and exploring new couplings between Earth system components
- Connecting with IAMs
- Applications: e.g., operationalisation of the Paris Agreement