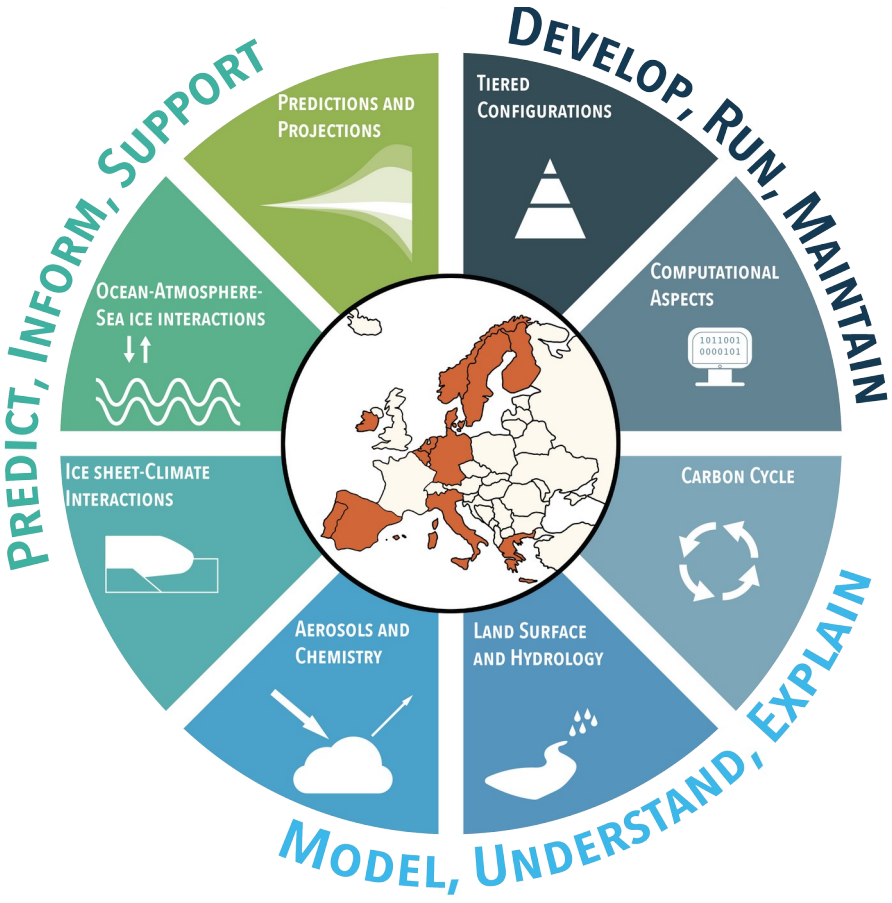
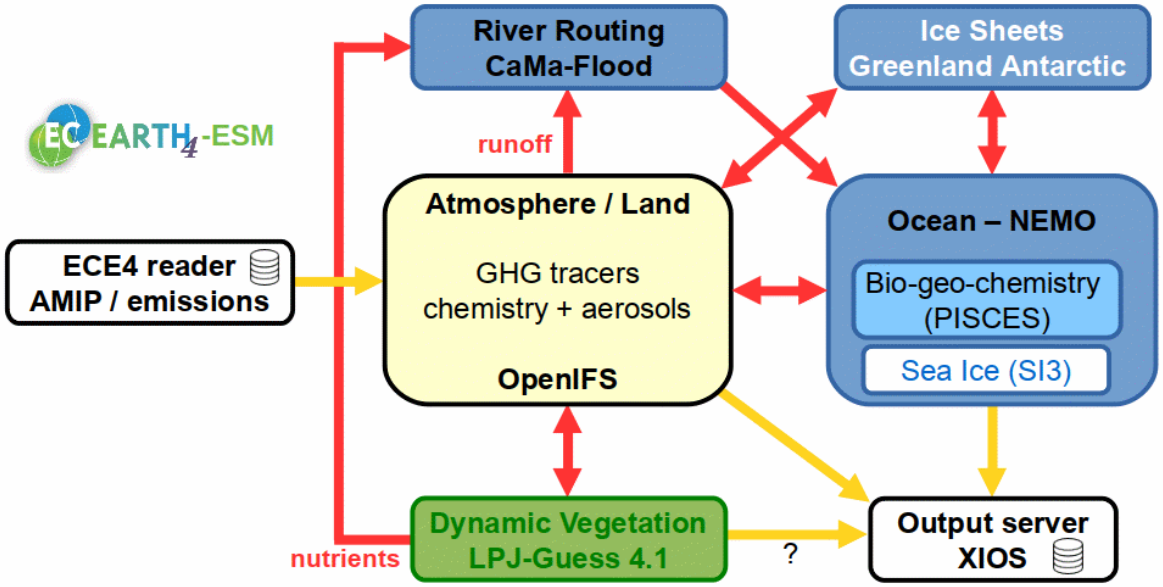
EC EARTH 4 Community ESM



Model development since CMIP6 and towards EC-Earth4 (for CMIP7)

- **Improved physics** (updated versions of OpenIFS, NEMO and SI3)
- Enhanced **resolution** options: ATM: 31-25 km, OCE: 0.25 deg.
- Fully coupled **carbon cycle with option for reduced complexity** ocean biogeochemistry
- **Ice sheets** for Antarctica and Greenland
- Options for both **prescribed and interactive aerosols**
- **Coupled assimilation** for climate prediction
- **Code**: portable, modular, progress on performance, reproducibility, configuration management, end-to-end work flow.



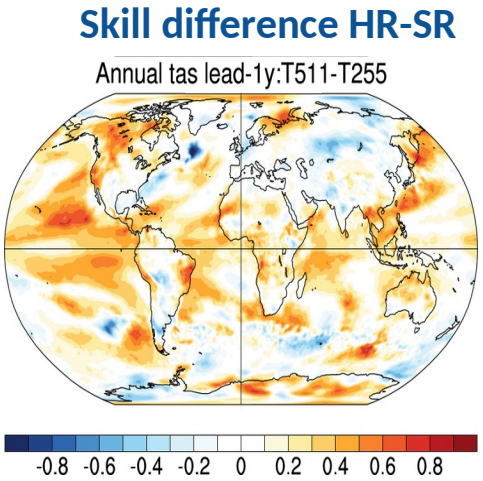
Post-CMIP6 applications

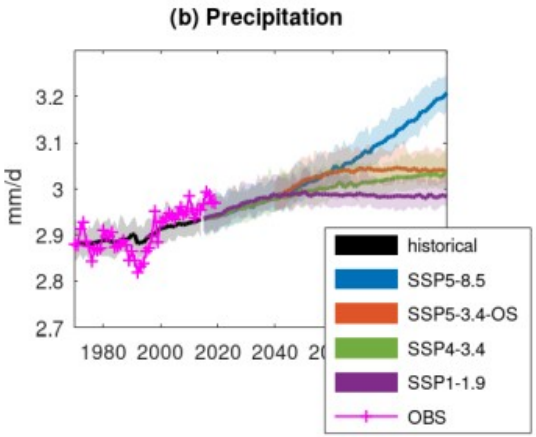
examples

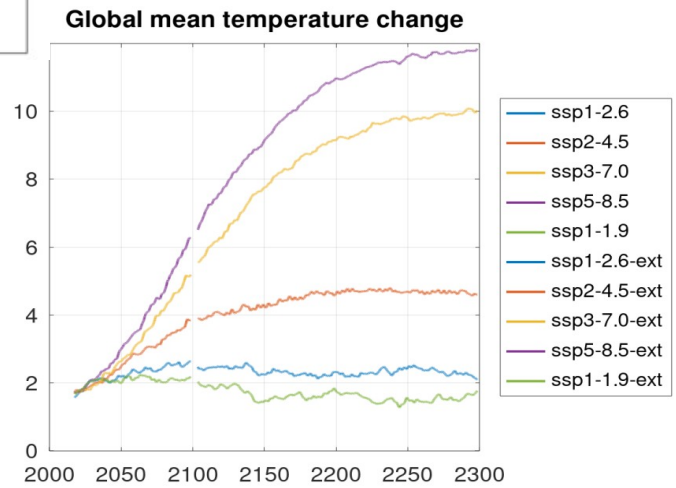
- Progress in climate **prediction**

- A 50-member **large ensemble** (SMHI-LENS), with links to regional climate by event downscaling on km scale

- ScenarioMIP **extension** to 2300







Post-CMIP6 directions

examples

- Extend climate prediction to **prediction of carbon uptake**
- **Improved land** processes
  - Land surface hydrology coupling
- Resolution vs ESM complexity
  - Low res and high res configurations
  - What is a suitable compromise?
  - Increased **resolution where most necessary** e.g. in the physical parts
  - Feedbacks and tipping points

Suggestions for CMIP7

- **Reduce the data request**
  - Is there a way to quantify the impact output data volume vs climate science-understanding and climate communication? Is there an optimum?
  - Consider distinguishing “data request” from different levels of “upload request”
- **More relevant future scenarios**
  - The current SSPs are still oriented towards the RCPs that were designed decades ago.
  - The high-end scenarios are widely used because they show a strong warming signal yet they are not very likely.
  - NDCs and climate negotiations since the Paris Agreement are not reflected in the scenarios.
  - We will need society-relevant **scenarios** that are **based on current emission trends**, and assumptions about **current and future climate politics** (best case/worst case)
- More **transparent process for generation of forcing data** coming from IAMs
  - Share IAMs and driving data to IAMs, open source
  - Document process of connecting certain IAMs with certain SSPs. Consider a multi-model procedure.
- **Keep existing CMIP6 procedures and for of requests as much as possible** to minimize new investments before CMIP7
- Enable **multi-model analysis in CMIP7**.
  - Support for ESGF supernodes or similar