Workshop – natESM strategy

21. February 2022, virtual meeting

Request for support sprint

Second Category (6 months)
HAMOCC-ICON

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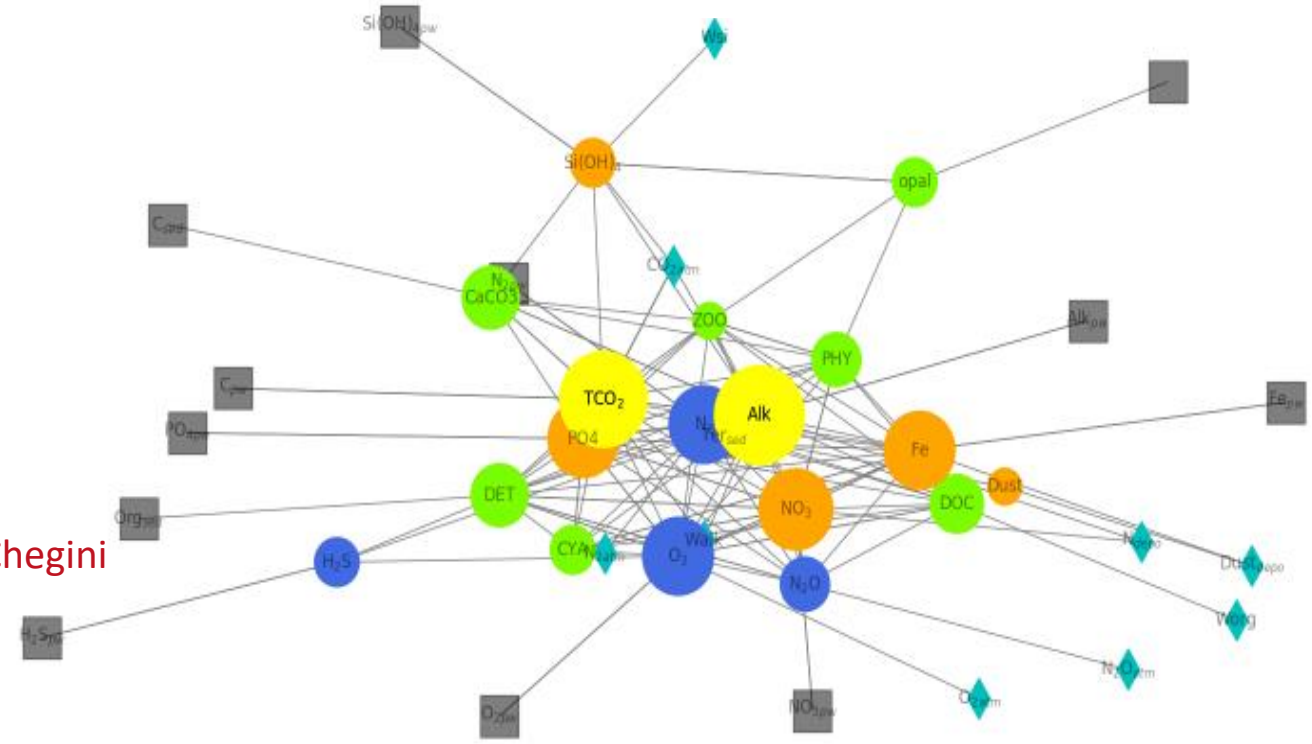
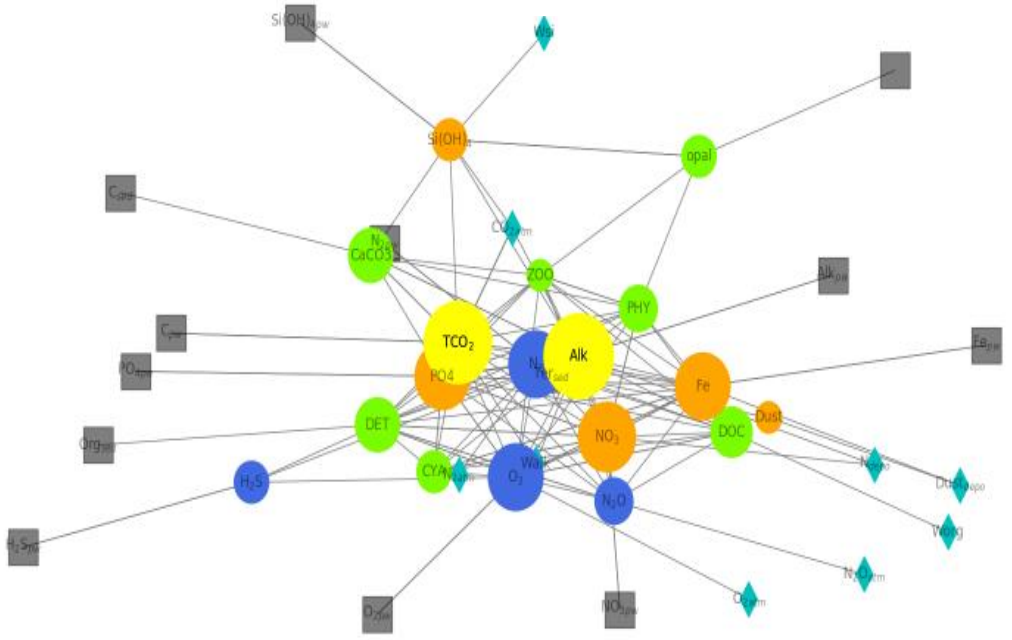


The natESM support team is located at DKRZ and JSC. Based on a DKK initiative of the German Earth System Modelling Community, the overall goal is to build a national ESM strategy for the future.

DKRZ Deutsches Klimarechenzentrum
DKK Deutsches Klima Konsortium
Sponsored by the Federal Ministry of Education and Research

Brief Overview of Model/Software

- **ESM field:** Ocean Biogeochemistry (Carbon Cycle)
- **User group:** active users (directly using HAMOCC)=12, many more users at MPI-M who run ESM including HAMOCC, plus external users (e.g. Uni. Bergen, etc.)
- **Targeted simulations**: Coupled high resolution (mesoscale) runs on GPU/CPU
- **HPC usage:** Mistral/Levante
- **Maintenance:** HAMOCC is part of the ocean component of ICON, maintained and developed constantly by at least 6 scientists and 1 scientific programmer



Model/Software Application Field

- **Scientific highlights:** ongoing ocean-only mesoscale simulations (CLICCS), interactive carbon cycle in ICON-ESM, paleo scales (projects PalMod, TERSANE), future climate change projections within CMIP5 and CMIP6 and decadal predictions (projects MiKlip and EU H2020 4C), detection & attribution of carbon dioxide removal (EU H2020 COMFORT, SPP Climate Engineering).
- **Social relevance:** climate-carbon feedbacks, anthropogenic C uptake by the ocean, responses to decarbonization policies, remaining carbon budgets, ocean BGC extreme events, BGC hazards.
- **Plans for further use and dissemination**: decadal variability of ocean C uptake, interactive carbon cycle simulations, extended Nitrogen cycle effects on the fluxes of GHG N2O (EU H2020 project ESM2025), investigate the role of mesoscale and submesoscale processes on anthropogenic carbon uptake (CLICCS), evaluation of bgc conditions for mass extinction events (TERSANE)

Description of Planned Work

- **Scope of Request**: 6 months
  - optimize code and I/O for current HPC system
  - prepare code for porting to GPUs by restructuring the memory layout
- **Criteria for fulfilment:** Optimized code/Restructured memory layout for GPUs
- **Expected scientific and/or performance improvements**: Possibility to run ICON-ESM in a mesoscale/submesoscale resolving configuration (10-5 km globally)/ investigate the role of mesoscale and submesoscale processes on anthropogenic carbon uptake, evaluation of decarbonization policies