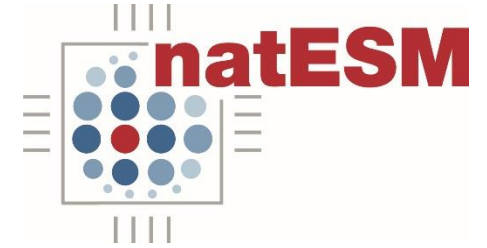


Workshop – natESM strategy

21. February 2022, virtual meeting



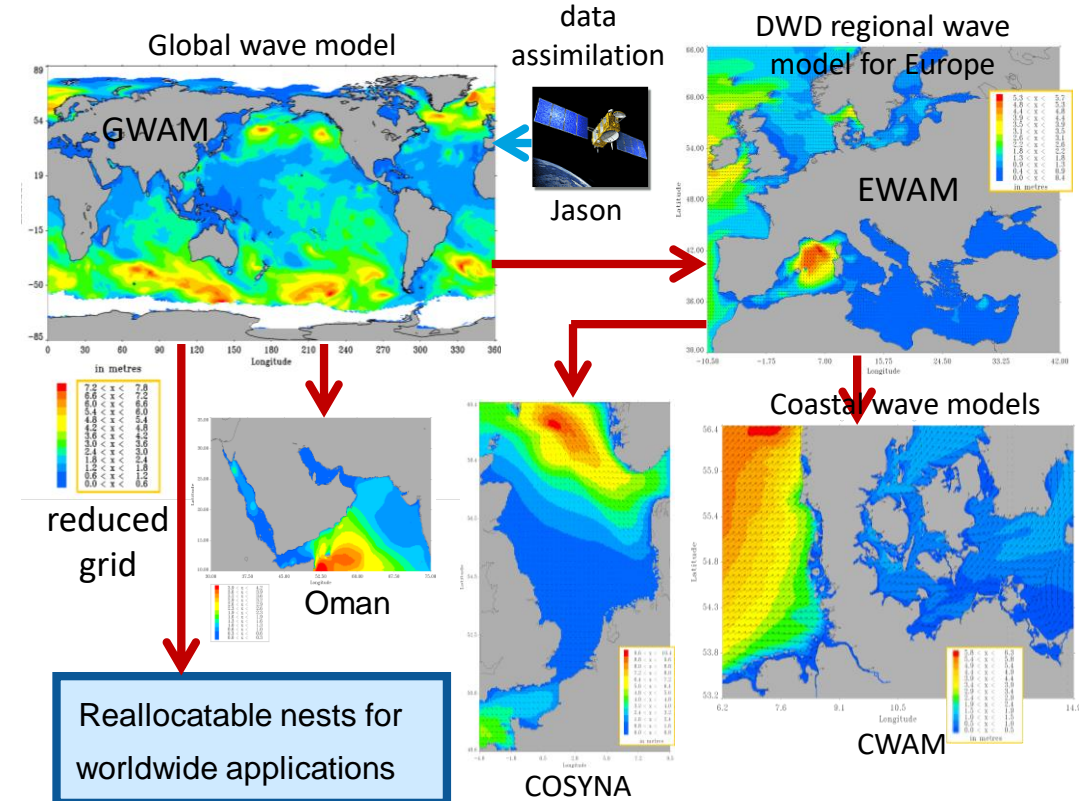
Request for support sprint

Model optimisation (I/O, HPC, coding, coupling) of the wind-wave model WAM

Helmholtz-Zentrum Hereon

Lead of WAM development: Dr. Joanna Staneva (joanna.staneva@hereon.de)

by Marcel Ricker



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.

Brief Overview of Model/Software

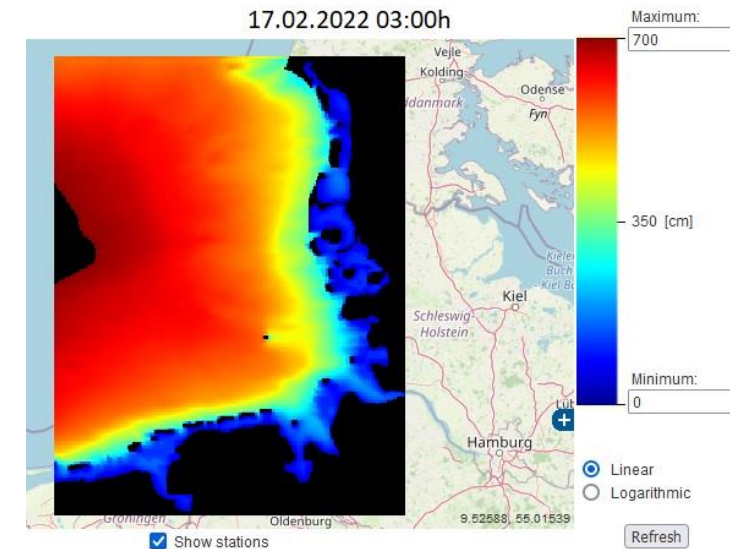
ESM fields: Atmosphere-ocean, climate research, forecasting

User group: Scientific/academic, off-shore wind industry, federal agencies, navigation, marine pollutants, decision makers (in Germany e.g., DWD, BSH, GeoInfo, BAW, DLR, universities, private sector; ~150 institutes worldwide e.g., Copernicus, many European Meteo Centres, universities, private sector)

Targeted simulations: Regional/global, hindcast/forecast, short-term/climate projections

HPC usage: 2-D MPI decomposition allows for a high number of CPUs; tested on many HPCs worldwide (in Germany e.g., DKRZ, DWD, JUWELS, Hereon)

Maintenance: Developed and maintained at Hereon (owner); implementation of state-of-the-art physics, parameterisations, coupling, data assimilation, and configurations; user support; GNU General Public License (open source)



from COSYNA (<http://codm.hzg.de/codm>)

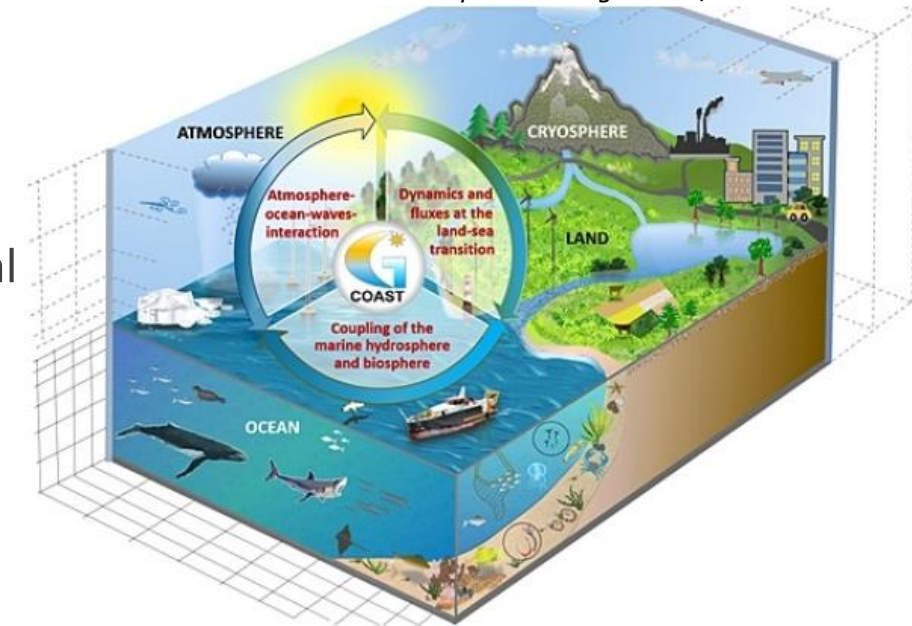
Model/Software Application Field

Scientific highlights: State-of-the-art physics and coupling interfaces implemented; ocean-atmosphere-ice-coupled (OASIS, ICON); data assimilation; highly flexible in space and time; flexible nesting; clear code structure

Social relevance: Wave and sea level forecasts, assessment of climate maritime operations (search and rescue, marine resources, marine/coastal protection), tourism, renewable energy

Plans for further use and dissemination: Hereon as an owner of WAM continuously develops, maintains, and disseminates WAM and supports the community. WAM integrated into ESM (coupled to ICON, NEMO, CCLM) because atmosphere-ocean coupling through active waves interfaces are crucial for ESM for closing the balances. In ESM waves also interact with ice, biogeochemistry, bottom, oil spill, marine pollutants, etc.; preparation of exascale production; Digital Twin; <https://github.com/mywave/WAM>

Graphic: Ha Hagemann / Hereon



The GCOAST modelling system

Description of Planned Work

Scope of Request:

1. Implementation of parallel output and output interfaces (e.g. XIOS)
2. Model optimisation with respect to specific HPCs; optimisation of the source code; ESM coupling development (YAC)/consistent coupling interfaces; evaluation for implementation of GPU use

Criteria for fulfilment: Improved model speed with high nr. of CPUs (~250) (general and/or HPC specific) by keeping the simple compilation

Expected scientific and/or performance improvements: High resolution (time and space) climate projections; ensemble simulations; hybrid ESM modelling (AI); Digital Twin