Workshop – natESM strategy

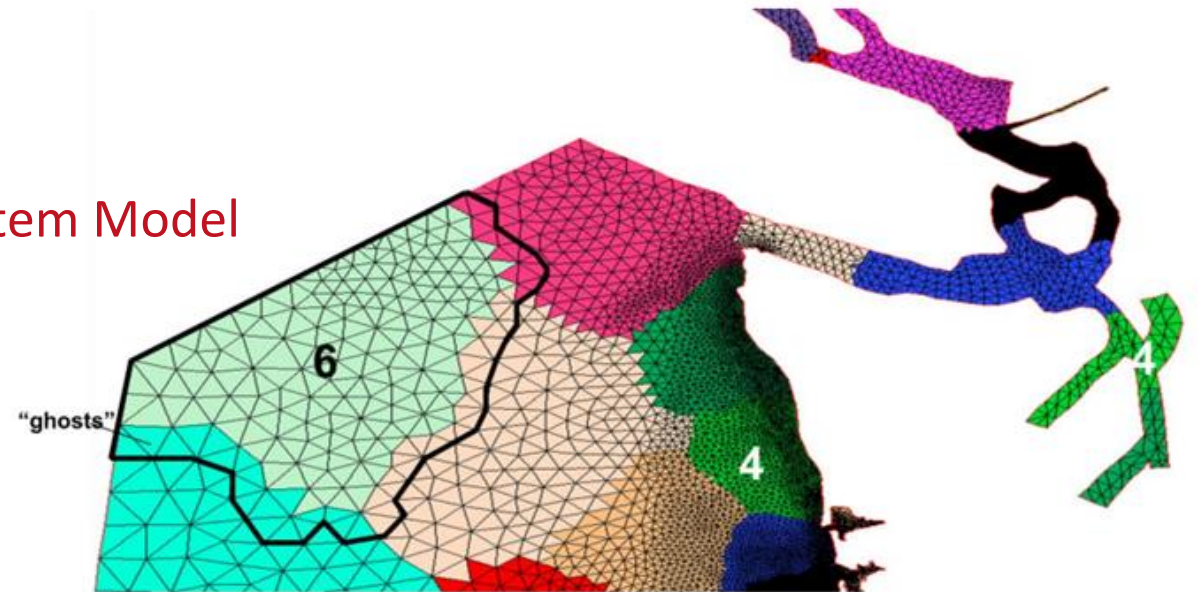21. February 2022, virtual meeting

Request for support sprint (advisory activities up to 4 weeks)

SCHISM
Semi-implicit Cross-scale Hydroscience Integrated System Model

Emil Stanev, Helmholtz-Zentrum Hereon, emil.stanev@hereon.de

with Benjamin Jacob, Joanna Staneva, Carsten Lemmen, Joseph Zhang

DKRZ
DEUTSCHES
KLIMARECHENZENTRUM

DKK Deutsches
Klima
Konsortium

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Brief Overview of Model/Software

- ESM field: Ocean&watersheds, linking to Couplers, Biogeochemistry, and Data assimilation

- User group: 30 Germany, ~400 international

- Targeted simulations: seamless local-to-global multi-annual/decadal, fully coupled (ATM-OCN-HYD-BGC)

- HPC usage national: Mistral, Strand -> Levante, Juwels

  (international 30 clusters, scales well up to 50k cores)

- Maintenance: International team stable and active (500 commits/year, 6 core devs), co-owned by community, institutional support by Hereon, VIMS, Apache 2.0 open source license

Zhang Y.J., F. Ye, E. V. Stanev, and S. Grashorn (2016) Seamless cross-scale modelling with SCHISM. Ocean Modelling 102, 64–81.

287 citations

Model/Software Application Field

Scientific highlights

- ❏ **Model polymorphism** unifies 1D/2DH/2DV/3D in a single model grid for application in very complex cross-scale settings, beyond the state-of-the-art
- ❏ **quality of model** hindcast and forecast superior than that from previous structured-grid models because cross-scale capabilities of SCHISM allow to accurately resolve processes at the locally relevant scales, e.g. the inter-basin exchange Black Sea/Med

Social relevance

- ❏ Operationally used for flood protection (certified by the American National Tsunami Hazard Program) and water quality issues (NOAA, USEPA). Cross-scale ability relevant for impact assessment of and on construction on wider sea areas (wind parks, compound floods, ...)

Plans for further use and dissemination

- ❏ Adheres to international coupling standards (ESMF), plug-and-play for integration of BGC (FABM). Operational use in CMEMS, research in KüNO

Description of Planned Work

Scope of Request: exploratory to assess work need for

- ❏ porting and **optimization** to new Levante system at DKRZ
- ❏ offloading of solver to **GPU** if appropriate
- ❏ **openACC** implementation (which can follow our openMP work closely)
- ❏ optimization of **tracer transport** algorithm to facilitate ecosystem simulations
- ❏ operationalization of the existing **PDAF** coupler for data assimililation
- ❏ operationalization of the existing **FABM** coupler for ecosystem simulations
- ❏ operationalization of **IO** online processing in existing ESMF framework

Criteria for fulfilment:

- ❏ Estimation of work required for each of the exploratory items
- ❏ recommendations for preparatory work before next sprint
- ❏ recommendations for integration with other natESM activities (ECOSMO, PDAF, …)

Expected scientific improvement:

- ❏ Ability for Integrated Global Coast simulations (detailed German coast) simulations, including hazard and risk assessment