

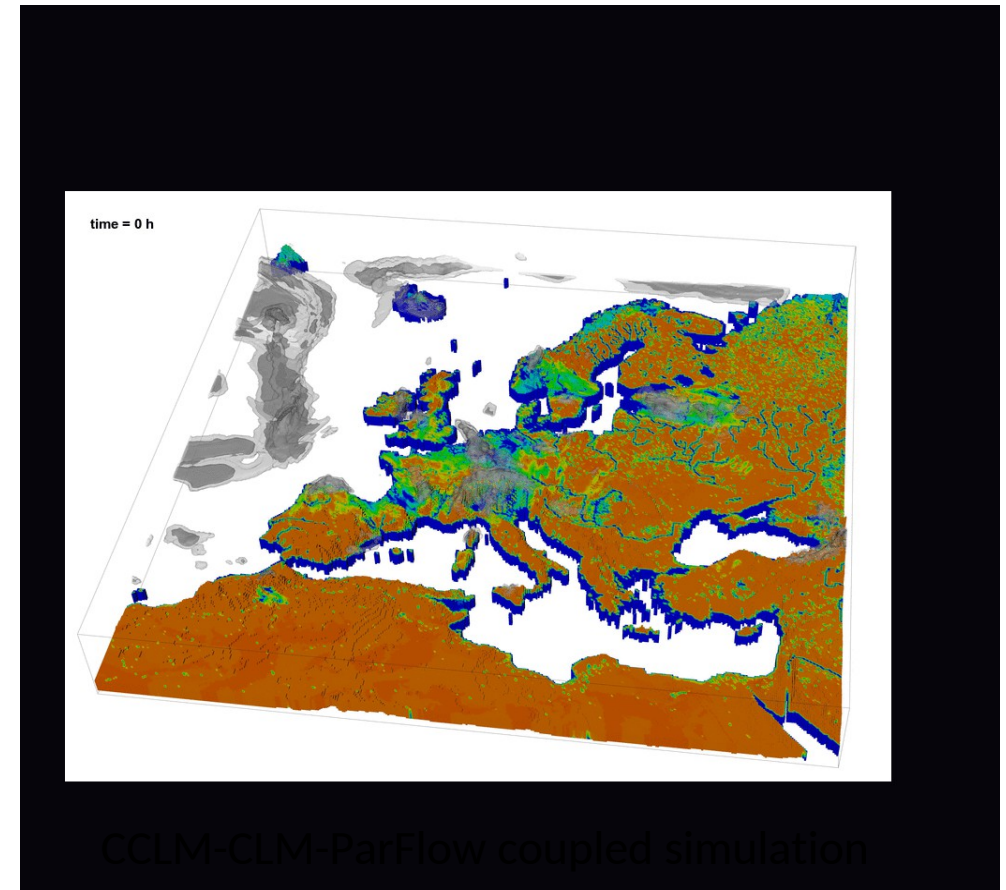
Workshop – natESM strategy

21. February 2022, virtual meeting

Request for support sprint

Development Sprint ParFlow

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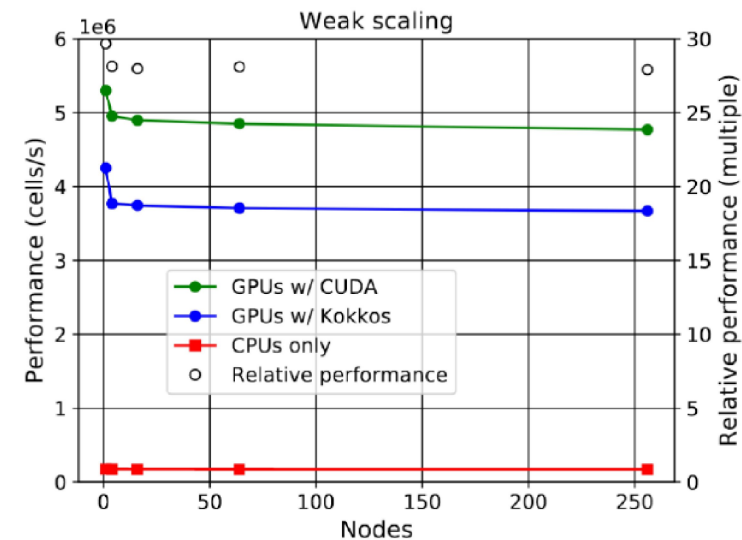
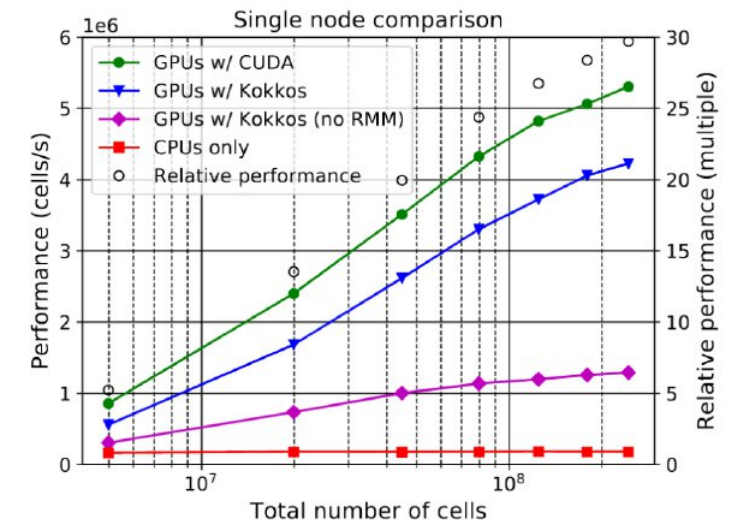
The natESM support team is located at DKRZ and JSC. Based on a DKK initiative of the German Earth System Modelling Community, the overall goal is to build a national ESM strategy for the future.

Brief Overview of Model/Software

- ESM field: Land (surface/subsurface)
- User group: >100 (currently)
- Targeted simulations: integrated hydrologic simulations (3D variably saturated groundwater and 2D surface water) at the global scale; $O(10^2\text{m})$ resolution
- HPC usage: CPU/GPU (NVIDIA)
- Maintenance: collaborative development project; active developer base >10 scientist/engineers; software development and sustainability plan; OpenSource licence model: GNU LGPL

Model/Software Application Field

- Scientific highlights: coupling with the atmosphere: impact of human water use on the redistribution of water resource at the continental scale; development of a eDSL concept for performance portability
- Social relevance: ParFlow provides essential *Water Information* from the deep subsurface (e.g. groundwater) across the land surface (soil and surface water) in a continuum approach, which is relevant for stakeholders across all water sectors
- Plans for further use and dissemination: possible fit with national ESM strategy: ParFlow will be implemented with the community ICON-Land model and is disseminated freely (github.com/parflow/parflow)



Description of Planned Work

- **Scope of Request:** duration: 5 months; methods to be used: eDSL Kokkos backend, HIP, RAPIDS Memory Manager; targeted systems: CPU-GPU (AMD)
- **Criteria for fulfilment:** performance portability demonstrated on AMD GPUs; performance analyses; proof-of-concept simulation at the global scale
- **Expected scientific and/or performance improvements:** application of (pre-)exascale next-generation HPC hardware to performe integrated hydrologic simulations at the hydrologic support scale globally; provide essential *Water Information* at resolutions relevant for stakeholders (agricultural plot, neighborhood)