

LATE REQUEST FOR A SPECIAL PROJECT 2014–2016

MEMBER STATE: Germany.....

Principal Investigator¹: Stefan Kollet.....

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 Klaus Görger, Jülich Supercomputing Centre, Germany
 Florian Pappenberger, ECMWF.....

Project Title: Integrated Simulations of the Terrestrial System over the European
 CORDEX Domain

If this is a continuation of an existing project, please state the computer project account assigned previously.	SP _____
Starting year: <small>(Each project will have a well defined duration, up to a maximum of 3 years, agreed at the beginning of the project.)</small>	2015
Would you accept support for 1 year only, if necessary?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>

Computer resources required for 2015-2017: <small>(The maximum project duration is 3 years, therefore a continuation project cannot request resources for 2017.)</small>	2015	2016	2017
High Performance Computing Facility (units)	500,000		
Data storage capacity (total archive volume) (gigabytes)	4,000		

*An electronic copy of this form **must be sent** via e-mail to: *special_projects@ecmwf.int**

Electronic copy of the form sent on (please specify date):

Continue overleaf

¹ The Principal Investigator will act as contact person for this Special Project and, in particular, will be asked to register the project, provide an annual progress report of the project's activities, etc.

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Extended abstract

The objective of this study is to perform high-resolution fully coupled aquifer-to-atmosphere simulations over the European CORDEX domain. The simulations will be performed with the integrated Terrestrial Systems Modeling Platform, TerrSysMP, consisting of the three-dimensional surface-subsurface model ParFlow, the Community Land Model CLM3.5 and the numerical weather prediction model COSMO of the German Weather Service (Shrestha et al., 2014, Gasper et al., 2014). At the ECMWF, the system will be set up with an initial spatial resolution of 0.11° (12.5km), which will be increased to 3km over the course of the project. The simulations will be used to interrogate the two-way feedbacks of groundwater and soil moisture dynamics with essential climate variables, such as air temperature and precipitation, at continental scales. Additionally, since TerrSysMP provides simulation results of *all* hydrologic states and fluxes, the potential for a fresh water monitoring system including e.g., stream discharge and groundwater storages will be assessed with observations. In the beginning, it is planned to perform event-based simulations, focusing on the floods in the early summer of 2013 and 2014, and the heat wave in 2003. These simulations will be followed by time slice simulations covering multiple decades between 1986 to 2005 for validation, and near-term and far-term scenario simulations between 2041 to 2060 and 2081 to 2100, respectively. It is important to note that extensive preliminary work has been performed i.e the TerrSysMP model over the European CORDEX domain has been implemented and tested at the aforementioned resolutions. Figure 1 shows a snapshot of soil moisture and cloud liquid and ice water content at the beginning of June 2013.

References

- Gasper, F., K. Goergen, P. Shrestha, M. Sulis, J. Rihani, M. Geimer and S.J. Kollet, 2014, Implementation and scaling of the fully coupled Terrestrial Systems Modeling Platform (TerrSysMP v1.0) in a massively parallel supercomputing environment – a case study on JUQUEEN (IBM Blue Gene/Q), *Geosci. Model Dev.*, 7, 2531-2543.
- Shrestha, P., M. Sulis, M. Masbou, S.J. Kollet, C. Simmer, 2014, A scale-consistent Terrestrial Systems Modeling Platform based on COSMO, CLM and ParFlow, *Monthly Weather Review*, 142, 3466–3483.

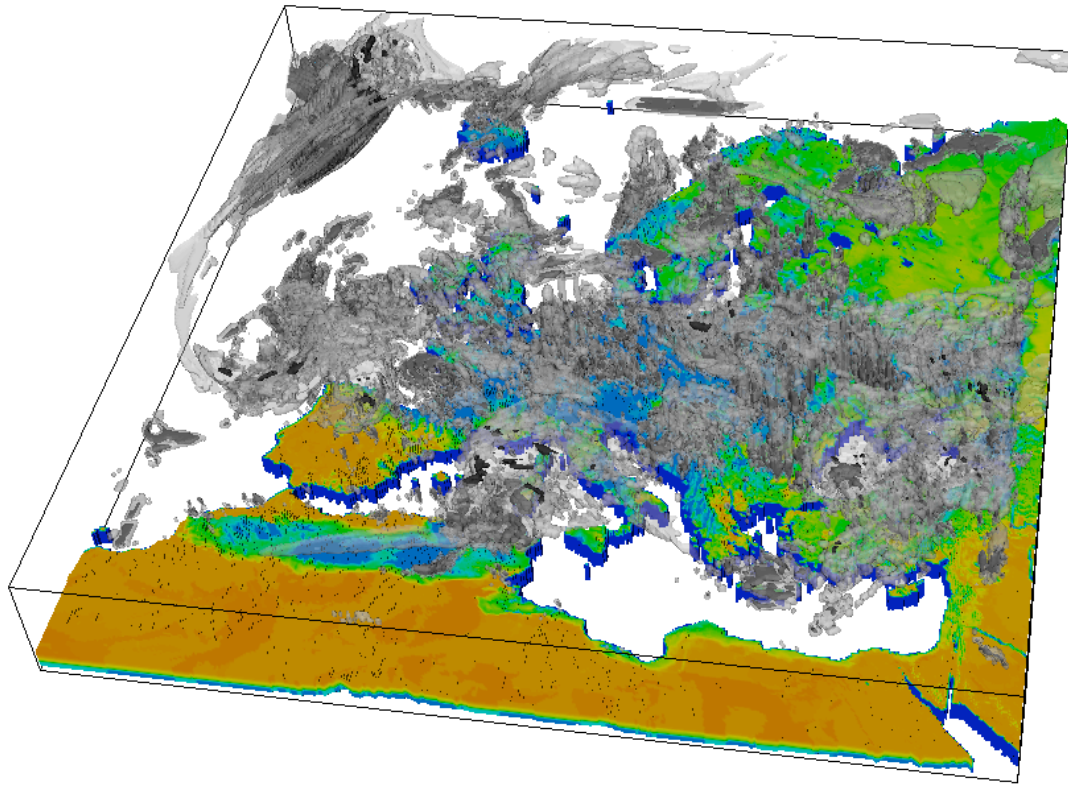


Figure 1. Snapshot of fully coupled simulations with TerrSysMP of 3D groundwater and soil moisture (orange: dry; blue: wet) and liquid/ice cloud water content in the summer of 2013 over the European CORDEX domain at 12 km lateral resolution (courtesy of Jessica Keune, Forschungszentrum Jülich and Meteorological Institute, Bonn University)