REQUEST FOR ADDITIONAL RESOURCES IN THE CURRENT YEAR FOR AN EXISTING SPECIAL PROJECT

MEMBER STATE: United Kingdom

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Project title: Incorporating land-surface model uncertainty into the IFS

Project account: **SPGBWEIS**

Additional computer resources requested for	Current Year
High Performance Computing Facility (units)	3,000,000 SBU
Data storage capacity (total) (Gbytes)	

Continue overleaf

[1] The Principal Investigator is the contact person for this Special Project

Technical reasons and scientific justifications why additional resources are needed

In our project we are developing schemes to represent model uncertainty in the ECMWF land surface scheme. Focussing primarily on seasonal timescales, we had proposed to perform a series of test experiments with the coupled seasonal forecasting system in order to study the effect of different perturbation strategies to either some key land surface model parameters (van Genuchten α and hydraulic conductivity) or to the overall physical soil moisture and soil temperature tendencies. As discussed in our original application for the special project, in the first phase of the project we analyse previous perturbed parameter experiments carried out at ECMWF a few years ago by A. Weisheimer, F. Pappenberger and H. Cloke (see Cloke et al, 2011).

Recently our analyses of these existing simulations and comparison with System 4 have uncovered a problem that we were not aware of before: The perturbed parameter experiments were initialised with ERA-Interim in the atmosphere and also in the land surface. System 4, however, uses the stand-alone land surface analysis driven by calibrated ERA-Interim fields (called ERA-Interim land) as initial conditions for the land surface variables. Because of the differences between the ERA-Interim and ERA-Interim land surface analysis, the forecasts experiments from our old perturbed parameter experiment are not directly comparable to System 4. The inconsistency between the two initialisation methods occurred because at the time of running the perturbed parameter experiment a complete land surface analysis was not yet available. ERA-Interim land was only provided later on and was subsequently used for the production of the S4 hindcasts.

We have found that the different land surface initialisations introduce a large discrepancy in the land surface fields, with a particularly large impact on soil temperature level 1 in the first month of the forecast. Figure 1 show the difference in the soil temperature in level 1 during the first month of an example integration (May 1989) between the ERA-Interim land initialised System 4 hindcast and a comparable hindcast initialised by just ERA-Interim. Large biases of up to 10K occur in the high latitudes.

Because we use System 4 as a reference for all our developments, we will have to re-run the perturbed parameter experiments using a consistent initialisation of the land surface fields based on ERA-Interim land. Our special project application for this year did not account for these unexpected additional computations and we thus would like to apply for additional computing resources. We currently have just under half of our remaining resource allocation for 2014 remaining (4M SBU), however these will be used as originally planned to run new experiments to test new methodologies for stochastic perturbations during the summer 2014.

For consistency between model simulations it would be very favourable for us to run these experiments on the IBM c2a before it will eventually be switched off in September. We have set up our experimental design and would be ready to start the simulations immediately if we were to be allocated the additional billing units.

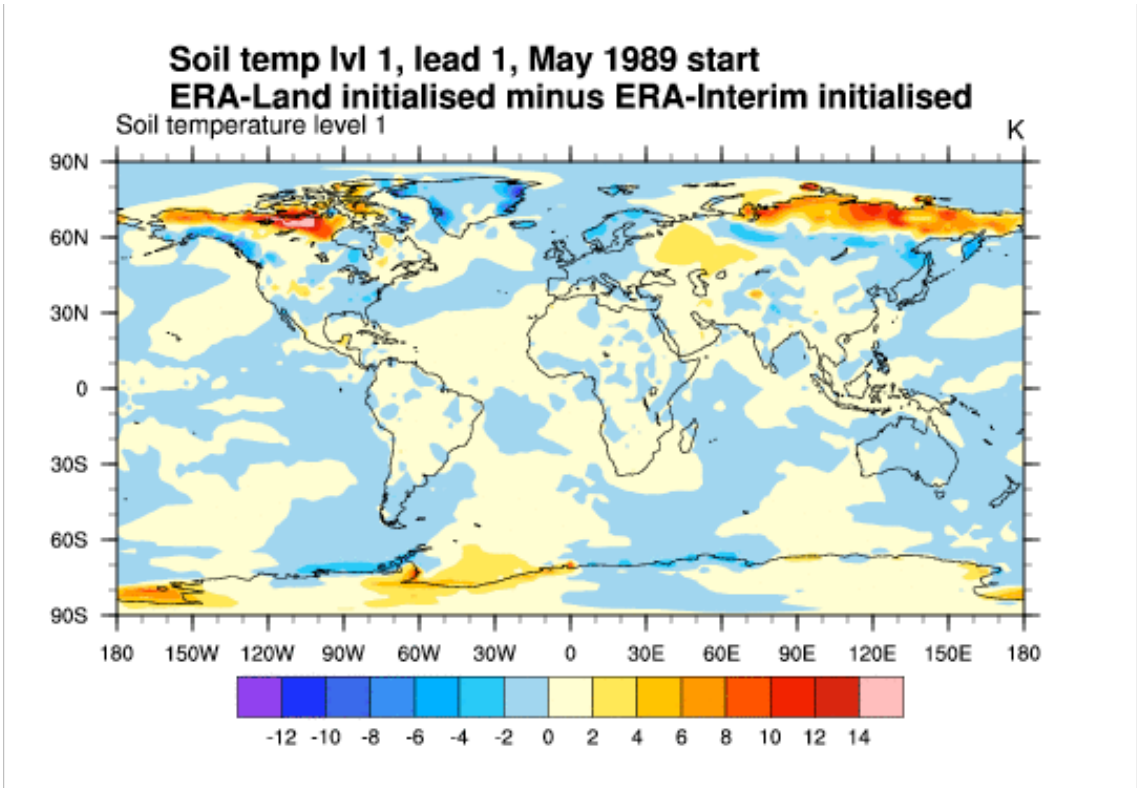

Figure 1: Difference in May monthly mean soil temperature level 1 for coupled seasonal forecasts initialised at the 1st May 1989 using ERA-Interim land and ERA-Interim as initial conditions for the land surface.

Reference:

Cloke, H., Weisheimer, A. and Pappenberger, F. Representing uncertainty in land surface hydrology: fully coupled simulations with the ECMWF land surface scheme, 2011, ECMWF Workshop proceedings (online)