REQUEST FOR A SPECIAL PROJECT 2013–2015

MEMBER STATE: …United Kingdom…

Principal Investigator[1]: …Dr. Hannah Cloke……

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Other researchers: Adrian Champion……

Project Title:

IFS water cycle verification using river discharge observations
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If this is a continuation of an existing project, please state the computer project account assigned previously.	**SP**GBCLOK	
Starting year: (Each project will have a well defined duration, up to a maximum of 3 years, agreed at the beginning of the project. For projects started before 2009, please state 2009 as the start year.)	2012	
Would you accept support for 1 year only, if necessary?	YES	

Computer resources required for 2013-2015: (The maximum project duration is 3 years, therefore a continuation project cannot request resources for 2015.)	**2013**	**2014**	**2015**
High Performance Computing Facility (units)	250000	250000	
Data storage capacity (total archive volume) (gigabytes)	6000	9000	

*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):
……6th March 2012…

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.

Principal Investigator: …Dr. Hannah Cloke

Project Title: *IFS water cycle verification using river discharge observations*

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Extended abstract

It is expected that Special Projects requesting large amounts of computing resources (500,000 SBU or more) should provide a more detailed abstract/project description (3-5 pages) including a scientific plan, a justification of the computer resources requested and the technical characteristics of the code to be used. The Scientific Advisory Committee and the Technical Advisory Committee review the scientific and technical aspects of each Special Project application. The review process takes into account the resources available, the quality of the scientific and technical proposals, the use of ECMWF software and data infrastructure, and their relevance to ECMWF's objectives. - Descriptions of all accepted projects will be published on the ECMWF website.

An integral part of many numerical weather prediction (NWP) systems is the calculation of land surface hydrology. Such schemes produce predictions of runoff at the global or continental scale, with the main aim of closing the terrestrial water budget to feed back to the atmosphere and ocean. It would be wrong to assume that river discharge is a variable which is 'separated' from other components of the system. It is directly influenced by surface and sub-surface runoff and influences fresh water influxes into the ocean. Balsamo et al. (2011) demonstrated that river discharge must be considered as part of a global daily hydro-meteorological chain and Pappenberger et al (2010) have underlined the importance of global routing to these predictions. It has been shown that the evaluation of river discharges can:

1. help to identify where to improve your model, in particular the Land Surface Scheme, and benchmark various land surface schemes and NWP systems :
2. evaluate performance integrated over multiple forecast fields (e.g. temperature, precipitation, evaporation) taking account of co-variances and spatio-temporal correlations in an end user value oriented framework :
3. support the goal of improving extreme weather predictions

ECMWF is now producing ERACLIM which will be the latest ECMWF global atmospheric reanalysis of the period 1900 to present. The purpose of this project is to run a global discharge model and analyse the outputs with respect to observations. Observations will be taken from the Global River Data Centre (GRDC). As part of the methodology, various aspects of the sensitivity of HTessel and the river routing scheme will be investigated, partially based on the multimodel global sensitivity analysis methods (Cloke et al., 2008) and the impact of this stochastic physics on seasonal predictions will be evaluated. In general there are 3 ways to include the stochastic aspects in the physics:

i. External level: perturbation to initial conditions
ii. Timestep level: perturbation to the model tendencies
iii. Embedded level: Analyse the stochastic nature of the process and then design a parameterization that reproduces the PDFs of the process.

Option (i) is already explored at ECMWF. This work will contribute point (ii) and (iii) and establish future useful directions for model development.

References:

Balsamo, G., Pappenberger, F., Dutra, E., Viterbo, P. and van den Hurk, B.(2011 – early view). A revised land hydrology in the ECMWF model: A step towards daily water flux prediction in a fully-closed water cycle. Hydrological Processes

Cloke, H.L., Pappenberger, F. and Renaud, J-P, (2008), Multi-Method Global Sensitivity Analysis (MMGSA) for Modelling Floodplain Hydrological Processes. Hydrological Processes, 22(11): 1660-167

Pappenberger, F. **,** Cloke, H.L., Balsamo, G. Oki, P., Ngo-Duc, T., (2010) Global routing of surface and subsurface runoff produced by the hydrological component of the ECMWF NWP system, *International Journal of Climatology* , 30(4), 2155-2174,