

## REQUEST FOR A SPECIAL PROJECT 2017–2019

**MEMBER STATE:** NL

**Principal Investigator<sup>1</sup>:** Bart van den Hurk

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**Other researchers:**

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**Project Title:**

Climate change effects on land induced predictability

If this is a continuation of an existing project, please state the computer project account assigned previously.	<b>SP</b> _____
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>	2017
Would you accept support for 1 year only, if necessary?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>

<b>Computer resources required for 2017-2019:</b> <small>(To make changes to an existing project please submit an amended version of the original form.)</small>	<b>2017</b>	<b>2018</b>	<b>2019</b>
High Performance Computing Facility (SBU)	300000		
Accumulated data storage (total archive volume) <sup>2</sup> (GB)	2000		

**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):

10 June 2016

*Continue overleaf*

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<sup>1</sup> 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.

<sup>2</sup> If e.g. you archive x GB in year one and y GB in year two and don't delete anything you need to request x + y GB for the second project year.

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## Extended abstract

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In consultation with Gianpaolo Balsamo and Florian Pappenberger I propose to carry out a study addressing the change of surface-induced (potential) predictability of regional climate features at seasonal time scale due to climate change. Background climatologies of soil moisture, snow cover and sea ice fractions will change in a warming world, which has a yet unexplored effect on potential skill of seasonal forecasts in selected regions of the world. A limited nr of studies addressing changes in predictability are reported in literature (e.g. DelSole et al. 2013; Dirmeyer et al. 2013), but yet changes in predictability patterns are crucial for many climate services, including flood/drought risk assessment, disaster risk response, forecast based emergency financing (Coughlan de Perez et al. 2014) etc. In the upcoming Land Surface, Snow and Soil Moisture Model Intercomparison experiment (LS3MIP, van den Hurk et al. 2016), carried out in the context of CMIP6, an experimental protocol addressing this predictability subject is included but not yet well designed due to a lack of pioneering studies. In addition, new implementations of prognostic sea ice cover in ECMWF seasonal forecasting systems warrant an exploration of the effect of significant climate trends on its contribution to predictability.

It is aimed to set up a model experiment with a version of EC-Earth or the ECMWF seasonal forecasting system resembling EC-Earth (depending on practical considerations) that isolates the land surface and sea ice contributions from the overall climate trends in potential predictability. These experiments requires a considerable number of ensemble seasonal forecasting experiments, and will follow the design described by DelSole et al. (2013).

The work will be reported in a peer reviewed scientific paper with EC-Earth and ECMWF co-authors, and enter the LS3MIP protocol for later execution.

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Coughlan de Perez, E., B. van den Hurk, M. van Aalst, B. Jongman, T. Klose, and P. Suarez, 2014: Forecast-based financing: an approach for catalyzing humanitarian action based on extreme weather and climate forecasts. *Nat. Hazards Earth Syst. Sci. Discuss.*, **2**, 3193–3218, doi:10.5194/nhessd-2-3193-2014.

DelSole, T., X. Yan, P. A. Dirmeyer, M. Fennessy, and E. Altshuler, 2013: Changes in Seasonal Predictability due to Global Warming. *J. Clim.*, **27**, 300–311, doi:10.1175/JCLI-D-13-00026.1.

Dirmeyer, P. A., S. Kumar, M. J. Fennessy, E. L. Altshuler, T. DelSole, Z. Guo, B. A. Cash, and D. Straus, 2013: Model Estimates of Land-Driven Predictability in a Changing Climate from CCSM4. *J. Clim.*, **26**, 8495–8512, doi:10.1175/JCLI-D-13-00029.1.

van den Hurk, B., and Coauthors, 2016: The Land Surface, Snow and Soil moisture Model Intercomparison Program (LS3MIP): aims, set-up and expected outcome. *Geosci Model Dev Discuss*, **2016**, 1–41, doi:10.5194/gmd-2016-72.