Geophysical Research Abstracts
Vol. 17, EGU2015-3018, 2015
EGU General Assembly 2015

eWaterCycle: A global operational hydrological forecasting model

Nick van de Giesen (1), Marc Bierkens (2,3), Gennadii Donchyts (3,1), Niels Drost (4), Rolf Hut (1), and Edwin Sutanudjaja (2)

(1) Delft University of Technology, Netherlands, (2) Utrecht University, Netherlands, (3) Deltares, Netherlands, (4) Netherlands eScienceCenter

Development of an operational hyper-resolution hydrological global model is a central goal of the eWaterCycle project (www.ewatercycle.org). This operational model includes ensemble forecasts (14 days) to predict water related stress around the globe. Assimilation of near-real time satellite data is part of the intended product that will be launched at EGU 2015.

The challenges come from several directions. First, there are challenges that are mainly computer science oriented but have direct practical hydrological implications. For example, we aim to make use as much as possible of existing standards and open-source software. For example, different parts of our system are coupled through the Basic Model Interface (BMI) developed in the framework of the Community Surface Dynamics Modeling System (CSDMS).

The PCR-GLOBWB model, built by Utrecht University, is the basic hydrological model that is the engine of the eWaterCycle project. Re-engineering of parts of the software was needed for it to run efficiently in a High Performance Computing (HPC) environment, and to be able to interface using BMI, and run on multiple compute nodes in parallel.

The final aim is to have a spatial resolution of 1km x 1km, which is currently 10 x 10km. This high resolution is computationally not too demanding but very memory intensive. The memory bottleneck becomes especially apparent for data assimilation, for which we use OpenDA. OpenDa allows for different data assimilation techniques without the need to build these from scratch. We have developed a BMI adaptor for OpenDA, allowing OpenDA to use any BMI compatible model. To circumvent memory shortages which would result from standard applications of the Ensemble Kalman Filter, we have developed a variant that does not need to keep all ensemble members in working memory. At EGU, we will present this variant and how it fits well in HPC environments.

An important step in the eWaterCycle project was the coupling between the hydrological and hydrodynamic models. The hydrological model will run operationally for the whole globe. Once special situations are predicted, such as floods, navigation hindrances, or water shortages, a detailed local hydraulic model will start to predict the exact local consequences.

In Vienna, we will show for the first time the operational global eWaterCycle model, including high resolution forecasts, our new data assimilation technique, and coupled hydrological/hydraulic models.