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eWaterCycle: Building an operational global Hydrological forecasting system based on standards and open source software

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At EGU 2015, the eWaterCycle project (www.ewatercycle.org) will launch an operational high-resolution Hydrological global model, including 14 day ensemble forecasts.

Within the eWaterCycle project we aim to use standards and open source software as much as possible. This ensures the sustainability of the software created, and the ability to swap out components as newer technologies and solutions become available. It also allows us to build the system much faster than would otherwise be the case.

At the heart of the eWaterCycle system is the PCRGLOB-WB Global Hydrological model (www.globalhydrology.nl) developed at Utrecht University. Version 2.0 of this model is implemented in Python, and models a wide range of Hydrological processes at 10 x 10km (and potentially higher) resolution.

To assimilate near-real time satellite data into the model, and run an ensemble forecast we use the OpenDA system (www.openda.org). This allows us to make use of different data assimilation techniques without the need to implement these from scratch. As a data assimilation technique we currently use (variant of) an Ensemble Kalman Filter, specifically optimized for High Performance Computing environments.

Coupling of the model with the DA is done with the Basic Model Interface (BMI), developed in the framework of the Community Surface Dynamics Modeling System (CSDMS) (csdms.colorado.edu). We have added support for BMI to PCRGLOB-WB, and developed a BMI adapter for OpenDA, allowing OpenDA to use any BMI compatible model. We currently use multiple different BMI models with OpenDA, already showing the benefits of using this standard.

Throughout the system, all file based input and output is done via NetCDF files. We use several standard tools to be used for pre- and post-processing data. Finally we use ncWMS, an NetCDF based implementation of the Web Map Service (WMS) protocol to serve the forecasting result. We have build a 3D web application based on Cesium.js to visualize the output.

In our demo we will show the different parts of the system, and how these form the final product.