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On the application of the Global Land Evaporation Amsterdam Model (GLEAM) at hyper-resolution

Brecht Martens (1), Diego Miralles (1,2), Robin van der Schalie (3), Hanneke Schuurmans (4), Fons Nelen (5), Niko Verhoest (1), and Richard de Jeu (3)

(1) Ghent University, Laboratory of Hydrology and Water Management, Ghent, Belgium, (2) Vrije Universiteit Amsterdam, Department of Earth Sciences, Amsterdam, the Netherlands, (3) Space Technology Center, Vandersat B.V., Noordwijk, the Netherlands, (4) Royal Haskoning DHV, Amersfoort, the Netherlands, (5) Nelen & Schuurmans, Utrecht, the Netherlands

Evaporation determines the availability of surface water resources and the requirements for irrigation. In addition, through its impact on the water, carbon and energy budgets, evaporation influences the occurrence of rainfall and the dynamics of air temperature. Therefore, reliable estimates of this flux at regional to global scales are of major importance for water management and meteorological forecasting. The Global Land Evaporation Amsterdam Model (GLEAM) was developed in 2011 (and subsequently revised in 2014 and 2016) with the aim of retrieving estimates of terrestrial evaporation from remotely-sensed meteorological observations at the global scale. Ever since, the model has been widely applied to study trends in the global water cycle, interactions between land and atmosphere, and the occurrence of extreme hydrometeorological events. The recently-released third version (v3) includes three dedicated datasets of global terrestrial evaporation at a 0.25° spatial resolution. These datasets are publicly available through www.gleam.eu.

In this presentation, we will highlight the most recent developments in GLEAM, and present the performance of the model at high spatial resolution. First, we present results from a validation study against an extensive dataset of in situ evaporation to show the ability of the new model version to retrieve estimates of evaporation. However, because of the relatively coarse spatial resolution (0.25°) of the official GLEAM datasets, the value of these datasets for regional-scale water management is limited. Therefore, we also show for the first time the results of forcing GLEAM with high-resolution (∼250 m) meteorological datasets to retrieve fine-scale estimates of terrestrial evaporation over The Netherlands. Given this high spatial resolution, the applicability of the latter dataset for local- and regional-scale water management is promising: preliminary results of a validation against measurements from a number of eddy-covariance towers in The Netherlands indicate that the magnitude and the temporal variability are better captured by the hyper-resolution dataset. Future activities will concentrate on extending these analyses to continental scales.