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GLEAM v3: updated land evaporation and root-zone soil moisture datasets

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Evaporation determines the availability of surface water resources and the requirements for irrigation. In addition, through its impacts 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 of extreme events. However, the global-scale magnitude and variability of the flux, and the sensitivity of the underlying physical process to changes in environmental factors, are still poorly understood due to the limited global coverage of in situ measurements. Remote sensing techniques can help to overcome the lack of ground data. However, evaporation is not directly observable from satellite systems. As a result, recent efforts have focussed on combining the observable drivers of evaporation within process-based models.

The Global Land Evaporation Amsterdam Model (GLEAM, www.gleam.eu) estimates terrestrial evaporation based on daily satellite observations of meteorological drivers of terrestrial evaporation, vegetation characteristics and soil moisture. Since the publication of the first version of the model in 2011, GLEAM has been widely applied for the study of trends in the water cycle, interactions between land and atmosphere and hydrometeorological extreme events. A third version of the GLEAM global datasets will be available from the beginning of 2016 and will be distributed using www.gleam.eu as gateway. The updated datasets include separate estimates for the different components of the evaporative flux (i.e. transpiration, bare-soil evaporation, interception loss, open-water evaporation and snow sublimation), as well as variables like the evaporative stress, potential evaporation, root-zone soil moisture and surface soil moisture. A new dataset using SMOS-based input data of surface soil moisture and vegetation optical depth will also be distributed.

The most important updates in GLEAM include the revision of the soil moisture data assimilation system, the evaporative stress functions and the infiltration of rainfall. In this presentation, we will highlight the changes of the methodology and present the new datasets, their validation against in situ observations and the comparisons against alternative datasets of terrestrial evaporation, such as GLDAS-Noah, ERA-Interim and previous GLEAM datasets. Preliminary results indicate that the magnitude and the spatio-temporal variability of the evaporation estimates have been slightly improved upon previous versions of the datasets.