Geophysical Research Abstracts,
Vol. 11, EGU2009-5319, 2009
EGU General Assembly 2009

Characterisation of Runoff – Storage Relationships by Satellite-Gravimetry

J. Riegger
University of Stuttgart, Institute of Hydraulic Engineering, Stuttgart, Germany (johannes.riegger@iws.uni-stuttgart.de)

In hydrological modelling approaches runoff is often conceptualized by a linear relationship with storages of different types (surface, interflow, baseflow) and the related time constants. This approach is motivated by the exponential decrease in runoff for time periods with no input to storage. As the inputs and transfer functions are often variing in space and time due to the heterogenueous structure of the local water balance and the conducting units (snow/ice, surface, soil, aquifer), this leads to a non exponential response for runoff with the consequence, that a linear relationship cannot be verified by the temporal characteristics. As there also is a superposition of processes and related water fluxes between the different storage compartments (with even unknown components like actual evapotranspiration), there is no analytical way to conclude from the observed water fluxes to specific storages.

For a direct investigation of runoff - storage relationships the main problem consists in the very limited accessibility to information on water storage in the different compartments. Ground based measurements are point measurements and very scarce compared to heterogeneity of the respective compartments and thus do not allow for a reasonable determination on larger scales. Remote sensing data are so far limited to surface storage (vegetation, soil, open water) and are of limited use with respect to accuracy and coverage due to methodological constraints.

GRACE observations of the time-variable gravity field provide a direct measure for the state of total water storage (in terms of mass deviations) on the land masses. This allows for the first time a direct investigation of the runoff - storage relationship and competing processes. On this basis representative catchments are characterized with respect to their hydraulic and hydrologic response on climatic conditions, hydraulic properties and the contributions of different storage compartments.