Plinius Conference Abstracts
Vol. 14, Plinius14-10, 2012
14th EGU Plinius Conference on Mediterranean Storms
and MEDEX Final Conference

Estimation of antecedent wetness conditions for flood modeling in Northern Morocco

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n northern Morocco are located most of the dams and reservoirs of the country, while this region is affected by rainfall events causing severe floods. To improve the management of the water regulation structures, there is a need to develop rainfall-runoff models to both maximize the storage capacity and reduce the risks caused by floods. In regions with limited data availability, event-based approaches are more suitable than continuous ones; however there is a need to define the catchment antecedent wetness conditions prior to the flood events. In this study, a model is developed to reproduce the flood events for a 655 km^2 catchment located upstream of the 6th largest dam of Morocco. Constrained by data availability, a standard event-based model, combining a SCS-CN loss model and a Clark unit hydrograph, was developed for hourly discharge estimation using 16 flood events that occurred between 1984 and 2008. The model was found satisfactory to reproduce the runoff and the temporal evolution of floods even with limited rainfall data, with a mean Nash efficiency coefficient of 0.81. Several antecedent wetness conditions estimators for the catchment were compared with the initial condition of the model. These estimators include: an antecedent discharge index, an antecedent precipitation index and a continuous daily soil moisture accounting model (SMA), based on precipitation and evapotranspiration. The SMA model performed the best to estimate the initial conditions, with R^2=0.9 between its output and the initial condition of the hydrological model. The daily output of the SMA model has been compared with ASCAT and AMSR-E remote sensing data of soil moisture, both were able to reproduce with accuracy the daily soil moisture dynamics at the catchment scale. The same approach could be implemented in other catchments for operational purposes. The results of this study indicate the potential usefulness of remote sensing data to estimate the soil moisture conditions in the case of ungauged catchments in Northern Africa.