



A study on the dynamic interaction of the atmospheric and hydrologic environment in the drainage basin of Sperchios River, Greece

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The interaction between the atmosphere and inland waters affects the water cycle of the planet and trigger mechanisms that change the water budget, the climate and the land cover. In this study, a fully coupled atmospheric-hydrologic modeling system, WRF-Hydro, is used to study the interaction between the atmosphere and the hydrologic environment as a unified system. The test bed was the drainage basin of the Sperchios River, in which there is a dense network of monitoring. The system was configured on a very fine horizontal resolution using multiple nests and utilizing GIS platform to accurately build the drainage basin of the river. Its hydrological component was also calibrated using runoff measurements along Sperchios River. Two simulations based on the offline and the two-way coupled modes of the system were performed in a case study of a flash flood event. The two-way fully coupled mode of the modeling system was able to resolve the momentum and energy fluxes from the soil surface towards the atmosphere as well as the induced changes in the evapotranspiration, the precipitation, the air temperature and humidity. The thermodynamic condition of the drainage basin modified the characteristics of atmospheric boundary layer changing the stability conditions, the condensation level and the wind profile in the local atmospheric environment. The outputs from both simulations were evaluated using measurements of precipitation and runoff at various places in the basin. Preliminary results indicate slight improvement on the spatiotemporal distribution of the precipitation and the runoff simulated by the two-way fully coupled mode of the system.