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Calibration and evaluation of WRF-Hydro performance at two drainage basins in the region of Attica, Greece

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Floods are among the most common natural disasters, which are related to deaths, destruction and economic loss. Worldwide, 500.000 deaths due to floods have been reported from 1980 to 2009, while more than 2.8 billion people have been affected. The improvement of flood warning systems requires advanced forecasting models that are based on the coupling of hydrological and atmospheric processes. Among the coupled atmospheric-hydrological models used for such purposes is the WRF-Hydro model, which is an enhanced version of the Weather Research and Forecasting (WRF) model complemented with the feedback of terrestrial hydrology on the atmosphere and land interaction.

In the frame of this work, the development, application and calibration of a flood forecasting suite based on WRF-Hydro model over two drainage basins in the area of Attica (Greece) is presented. The WRF model setup comprises the definition of four nested grids with the finest grid covering the area of Attica with a spatial resolution of 667 m. WRF-Hydro was configured within the finest resolution grid in a coupled manner with physics options of surface and sub-surface flow, and channel routing activated. The surface and subsurface runoff were computed at a fine resolution grid of 95 m. Eight events that produced flooding in the studied drainage basins in Attica were selected. The calibration process was performed for one event per basin and it was based in the manual stepwise method by defining four parameters, which influence the total water volume and the shape of the hydrograph. The rest of the selected events were used to evaluate the performance of the calibrated system. Results showed that, after the calibration process, WRF-Hydro is capable to accurately forecast the observed discharges at the studied basins.