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Modeling Floods under Climate Change Condition in Otava River, Czech Republic: A Time Scale Issue

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While modeling of climate change (CC) impact on low flow and water balance is commonly done using daily time series of Global Circulation models (GCM) outputs, assessing CC impact on rare events as floods demands for special methodology. Paper demonstrates methodology, results and its sensitivity to the length of simulation in meso-scale basin.

Multiple regional projection of temperature and precipitation under A2, A1B a B1 scenarios for 2040-2069 were evaluated in study of Czech Hydrometeorological Institute and Charles University (Pretel et al. 2008) for the Czech Republic. Daily time series of length of 30 years and 100 years (precipitation, Tmax, Tmin) were generated using LARS-WG (Semenov, 2008) based on expected monthly change of temperature and precipitation amount and variability for upper Otava river basin in mountainous region in SW Bohemia. Daily precipitation data were distributed into 6h time step using three step random generator. Spatial distribution of precipitation was based on random sampling of relevant historical analogues while temperature was distributed using simple vertical gradient rule.

Derived time series of A2, A1B, B1 and recent climate (RC) scenarios inputted calibrated hydrological modeling system AquaLog (using SAC-SMA for rainfall-runoff modeling). Correction of SAC-SMA parameter defining potential evapotranspiration for changed climate was applied. Evaluation was made for Susice profile (534.5 km2), representing the mountainous part of the basin, and downstream Katovice profile (1133.4 km2).

Results proved expected decrease of annual flow by 5-10 % (10-15 % in summer, 0-5 % in winter) for all modeled CC scenarios (for period 2040-2069) compared to recent climate. Design flows were computed based on yearly peaks using standard methodology. Decrease in design flow curves was observed for Katovice while no change (A1B, B1) or increase (A2) was found for Susice in 100 years time series. Estimates of 100y floods based on 30 or 100 years simulation differed by 10 to 36 % for different simulated scenarios including RC conditions. That supports the requirement of specific approach if assessing occurrence of rare events of return period longer than simulated period.

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