Geophysical Research Abstracts
Vol. 16, EGU2014-6014, 2014
EGU General Assembly 2014

A method for reducing climate variation influence on the study of the urbanization impact assessment over 200 watersheds stream flow in USA

Bahar Salavati (1), Ludovic Oudin (1), Carina Furusho (2), and Pierre Ribstein (1)

(1) University Pierre and Marie Curie, UMR-METIS 7619, Paris, France (bahar.salavati@upmc.fr), (2) IRSTEA, the Hydrology research group, Paris, France

Urbanization and people concentration are suspected to have multiple impacts on the catchments hydrological response. Hydrologically-relevant metric of land-use change and climate variability identification still remain an open scientific question. Besides, at the catchment-scale, urbanization impacts on flow are not easy to quantify and previous studies results appear quite disparate when assessing these impacts. In this study, about 200 urban and non-urban catchments in the United States were selected based on neighbor paired catchments analysis. Streamflow and rainfall data were collected in periods of 30 to 70 years. Three hydrodynamic properties were particularly analyzed: runoff coefficient, baseflow index and the 2-year return period flood peak. Land use maps from National Land Cover Database (NLCD) and unit housing density maps over the 1940-2006 time period were used as a proxy of impervious area and urbanization . Two approaches were followed to assess the impact of urbanization on flow: a classical approach using observed flow time series and an alternative approach involving a hydrological model that allows cope and diminish climate variability. To this aim, the GR4J model, a conceptual daily 4-parameter hydrological model, was used to simulate discharge. Ensemble of parameter sets were calibrated for a sequence of sub-periods and with each set of parameter a simulation is performed using the entire record period. Then, the trends on hydrodynamic properties are analyzed using the Mann-Kendall test. Our results showed that a majority of the catchments presented no significant trend over the record period for the hydrodynamic properties analysed on the studied period. Supposing that the hydrological model succeeds in reducing climate variability impacts by using exactly the same data of precipitation and evapotranspiration, we could expect that hydrodynamic properties trends calculated using observed and simulated discharges would depend on urbanization extend and that the trend over simulated flows reflected mainly land-use changes.