Geophysical Research Abstracts
Vol. 20, EGU2018-7631, 2018
EGU General Assembly 2018

A temperature scaling approach for projecting changes in extreme rainfall

Aashish Bhardwaj (1), Ruben Dahm (1), Gerald Corzo (2), and Laurens Bouwer (1)

(1) Deltares, Delft, Netherlands (laurens.bouwer@deltares.nl), (2) IHE Delft Institute for Water Education, Delft, The Netherlands

During the late 20th century, a worldwide increase is observed in extreme precipitation due to anthropogenic global warming. This change is expected to lead to changes in urban flood impacts and for that reason it is of vital importance to assess future precipitation extremes. The conventional approach is based on General Circulation Models (GCM) or Regional Climate Models (RCM) precipitation projections with known limitations of representing convective rainfall types. Convective storms often result in the most intense rainfall types and GCMs/RCMs have limited representation of these events, which could lead to an underestimate of design criteria based on precipitation extremes. This is the case for instance when deriving intensity-duration-frequency (IDF) curves as applied in urban drainage design and flood hazard assessments. Therefore, an alternative approach is applied to study the climate change impact on future precipitation extremes in the Netherlands. In this approach, a relationship between dew point temperature (Td) and hourly precipitation was constructed from observed data. This relationship helped to use Td as a proxy for precipitation and was then used to predict precipitation values from GCM Td projections for the future. Climate projections from the European Earth system model (EC-Earth) assuming the RCP8.5 emission scenario was used for projections of future Td and precipitation. The period from 1981-2010 and 2071-2100 were considered as current and future period respectively. Pooling of the 16 member ensemble was done in order to be able to establish sufficient data for low-probability events. The results of this approach were compared with the Advanced Delta Change Method (ADCM), which is frequently used for empirical downscaling. Based on the projections from both approaches, IDF curves were determined. The results show a large difference in future precipitation extremes when the Td approach is used instead of GCM precipitation directly. The shift in IDF curves shows that a 100 year event in present climate could possibly become a 75 year event according to GCM precipitation downscaling, but could become as frequent as a 35 year event under the Td approach. The results show the Td scaling approach can be used as an alternative method to project future precipitation extremes, and for estimating future flood risks.