Geophysical Research Abstracts
Vol. 18, EGU2016-14348, 2016
EGU General Assembly 2016

A gridded hourly rainfall dataset for the UK applied to a national physically-based modelling system

Elizabeth Lewis (1), Stephen Blenkinsop (1), Niall Quinn (2), Jim Freer (2), Gemma Coxon (2), Ross Woods (2), Paul Bates (2), and Hayley Fowler (1)

(1) Newcastle University, Newcastle Upon Tyne, United Kingdom (e.a.lewis@newcastle.ac.uk), (2) University of Bristol, Bristol, United Kingdom

An hourly gridded rainfall product has great potential for use in many hydrological applications that require high temporal resolution meteorological data. One important example of this is flood risk management, with flooding in the UK highly dependent on sub-daily rainfall intensities amongst other factors. Knowledge of sub-daily rainfall intensities is therefore critical to designing hydraulic structures or flood defences to appropriate levels of service. Sub-daily rainfall rates are also essential inputs for flood forecasting, allowing for estimates of peak flows and stage for flood warning and response. In addition, an hourly gridded rainfall dataset has significant potential for practical applications such as better representation of extremes and pluvial flash flooding, validation of high resolution climate models and improving the representation of sub-daily rainfall in weather generators.

A new 1km gridded hourly rainfall dataset for the UK has been created by disaggregating the daily Gridded Estimates of Areal Rainfall (CEH-GEAR) dataset using comprehensively quality-controlled hourly rain gauge data from over 1300 observation stations across the country. Quality control measures include identification of frequent tips, daily accumulations and dry spells, comparison of daily totals against the CEH-GEAR daily dataset, and nearest neighbour checks. The quality control procedure was validated against historic extreme rainfall events and the UKCP09 5km daily rainfall dataset.

General use of the dataset has been demonstrated by testing the sensitivity of a physically-based hydrological modelling system for Great Britain to the distribution and rates of rainfall and potential evapotranspiration. Of the sensitivity tests undertaken, the largest improvements in model performance were seen when an hourly gridded rainfall dataset was combined with potential evapotranspiration disaggregated to hourly intervals, with 61% of catchments showing an increase in NSE between observed and simulated streamflows as a result of more realistic sub-daily meteorological forcing.