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Cross validation of relative homogenisation algorithms using a monthly precipitation station network in Ireland

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During the long period of climatic observations, station location, instrumentation and other aspects of observations may change, resulting in non-climatic temporal variation in the observed data. Such non-climatic changes affect the accuracy of observed data for application to the detection of climate change and climate variability. The aim of homogenisation techniques (i.e. procedures combining detection and correction) is the removal or reduction of any spurious non-climatic signal introducing inhomogeneities to the time series being investigated.

Although statistical homogenisation has a century long history, the theory and development of multiple break homogenisation appeared only in the 1990s. One early representative of such multiple break methods was PRODIGE (Caussinus and Mestre 2004). During the European project COST ES0601 (known as 'HOME', 2007–2011) two new multiple break methods were created based on PRODIGE: one is Homogenisation software in R (HOMER, Mestre et al., 2013), the interactive homogenisation method officially recommended by HOME and the other is the fully automatic ACMANT (Adapted Caussinus–Mestre Algorithm for homogenising Networks of Temperature series, Domonkos, 2011) extended later to precipitation homogenisation (Domonkos, 2015).

Relative homogenisation is more robust than absolute methods provided station records are sufficiently correlated, and ideally where reliable metadata and station histories to account for breaks and potential outliers are available. Both HOMER and ACMANT provide additional functionality compared to the parent method PRODIGE, and they are assumed to be the most efficient relative homogenisation methods currently available.

The new product of the Global Precipitation Climatology Center - HOMPRA Europe (HOMogenized PRecipitation Analysis of European in situ data) is a bias-corrected monthly rainfall data set with 1° spatial resolution. The data set consists of 5373 carefully selected precipitation time series held by the GPCC, which have been quality controlled and homogenised. The time series cover the period 1951-2005 with less than 10% of missing values, and as with HOMER and ACMANT, the HOMPRA algorithm is based on the Caussinus and Mestre (2004) method. However, since the HOMPRA algorithm is automated, its validation is essential. Ongoing work has analysed many of the available precipitation records for the island of Ireland using HOMER and ACMANT. Here we present some preliminary work using results from HOMER and ACMANT to compare and validate results for a sub-set of Irish stations selected from the wider European domain homogenised by HOMPRA to date.

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