



Determining the accuracy of gridded daily rainfall amounts

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The Met Office National Climate Information Centre regularly produces estimates of mean monthly values of weather parameters over the UK. These are based on daily observations at a network of sites, and produced by interpolation to a 5km x 5km grid. Monthly series of gridded temperature and rainfall have been produced back to 1910, and of sunshine back to 1929. Daily gridded series commence in 1960 for temperature and rainfall variables. The gridding process effectively adds information, due to knowledge of orography, exposure etc. even in areas devoid of observing stations.

These gridded values, however, are subject to error. I have already performed a detailed analysis of the error estimates of monthly gridded values of temperature, rainfall and sunshine, and their dependence on station-network density. This presentation examines uncertainties in daily measurements of rainfall as estimated by the same gridding process. Daily rainfall is important, for example, in fields such as hydrological modelling, and knowledge of the uncertainties in daily rainfall grids will be beneficial in such contexts as these.

We quantify the mean errors in gridded values of rainfall, by omitting a well-spaced sub-set of 20 stations and then estimating the daily rainfall amount at these locations from a grid generated from the remaining stations in the network. Estimates at these 20 points from the grid are compared with the true rainfall amounts to determine an average error. We also examine differences between actual observations and grid estimates at 50 specific locations by performing a series of 'leave-one-out' experiments, on dates with various rainfall patterns across the UK. It is found that error estimates are roughly proportional to actual rainfall amounts; the errors can be related to location, orography, underlying rainfall distribution etc. There is some tendency for similarly-situated stations (e.g. those in valleys or in exposed/upwind locations) to have similar errors.

Of the total error, that due to station-network limitations is only a part. Rainfall is not straightforward because of the skew nature of the distribution, which is even more apparent for daily statistics than for monthly. Typical point-value root-mean-square error estimates for monthly rainfall were found to be around 10% of the actual rainfall amount, and larger in magnitude for wet months and in wetter locations. Daily uncertainties are around 15% of the amount itself. Errors in precipitation amounts are best determined as a proportion of the rainfall amount itself: for example if a given location was estimated as 20mm then the error might be 3mm whereas rainfall at the same place on a very wet day estimated with 70mm may have an error bar of 10mm.