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A High resolution dataset of reference evaporation based on the WFDEI forcing

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With global hydrological models being applied at ever higher spatial resolution, correspondingly high resolution global meteorological forcing data are needed. Such high resolution observations are sometimes available from satellite remote sensing, but these need to be merged with station data to remove inevitable biases and the developed datasets may in some cases suffer from remaining artefacts. Alternatively, higher resolution forcing data may be available for certain nations or regions but cannot be merged with global data sets because they are conceptually inconsistent or because of license restrictions. Importantly such data are also not available for long-term (i.e. >10 years) applications as baseline water resources assessment and global hydrological change analysis. These applications are limited to the 0.5º or coarser grid resolution of climate station analysis and model reanalysis data.

Until higher resolution climate re-analysis become available, additional processing is needed to downscale the data. Simple oversampling of such coarse data can introduce large and systematic biases, particularly in areas with strong relief. By using a high resolution DEM, the main variables for determining reference evaporation can already be down-scaled and improved considerably for the complete period of the reanalysis based meteorological forcing.

As part of the eartH_2Observe project, we produced Penman-Monteith, Priestley-Taylor and Hargreaves reference evaporation estimates by down-scaling WFDEI climate forcing data to 10x10 km resolution using elevation data. Down-scaling was performed by applying a lapse rate on temperature, an altitude correction on air pressure and incoming radiation and by taking the effect of aspect, slope and local shading on illumination into account. We analysed the impact of the individual down-scaling methods on calculated reference evaporation and discuss the impacts on related hydrological processes. The data and tools are made available through the eartH_2Observe data portal at http://wci.earth2observe.eu.