CLIMWAT - properties and interpolation approach of the new global FAO Reference Evapotranspiration dataset

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Evaporation of water from the earth surface into the atmosphere forces the global water cycle. Reference evapotranspiration (ETO) depends only on meteorological parameters and provides the evapotranspiration of standard grass surface. Actual evapotranspiration of other land covers can be derived directly from ETO.

The general knowledge of the spatial distribution of reference evapotranspiration (ETO) is still sketchy despite its importance for global ecosystem research. One reason is that ETO is difficult to observe directly as it depends on several meteorological parameters which are observed only at major stations. The most accurate method to estimate ETO is the Penman-Monteith equation which allows estimating ETO if maximum and minimum temperature, humidity, wind speed and sunshine fraction are known. Many approximations are available if only part of the necessary information is available and gridded datasets of those approximations can easily be found in the internet. However, datasets based on these approximations which are validated only for certain regions and climates are of questionable quality.

Here we introduce a new global station data set of homogenous Penman-Monteith ETO for over 5000 stations worldwide compiled by FAO and published as CLIMWAT 2.0 for CROPWAT. We describe the software for the extraction of the full set of data (all necessary input variables, ETO and precipitation) and discuss its basic properties.

The data set provides not only the basis for the comparison of water balances at different locations in all known climates. It also provides a basis for further research on the approximation and spatial interpolation of ETO. We discuss the altitude dependence

of ETO which allows calculating monthly high-resolution gridded data. An interpolation procedure is introduced based on optimal delineation of regional linear altitudinal gradient and selected results are presented.