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High Resolution Gridded Datasets of Hydro-Climate Indices for Ireland

Christopher Werner (1), Paul Nolan (1), Owen Naughton (2), Ray McGrath (3), and Jason Flanagan (1)
(1) Ireland's Centre For High End Computing, Grand Canal Dock, Dublin, Ireland, (2) Department of Civil, Structural and Environmental Engineering, Trinity College Dublin, Dublin, Ireland, (3) Meteorology and Climate Centre, School of Mathematics and Statistics, University College Dublin, Ireland.

There is a growing demand from industry, research and governmental sectors for high quality, long-term gridded climate datasets with high spatial and temporal resolution for conducting climate research. The need for spatially represented hydro-climatic variables is a prerequisite for many aspects of hydrological and ecological assessments. Estimates of evapotranspiration and soil moisture conditions are crucial for applications such as water sustainability, agronomic management, and the management of flood and drought risk. However, with the exception of temperature and precipitation, spatially and temporally homogeneous, multi-decadal, gridded observational climate datasets are not readily available for hydro-climatic research applications in Ireland. The lack of such datasets represents a major knowledge gap in Irish meteorology.

Researchers at the Irish Centre for High-End Computing (ICHEC) have recently completed two high-resolution downscaled simulations of the current Irish climate. This was achieved by downscaling ECMWF ERA-Interim data for the period 1981-Present using the numerical weather prediction (NWP) models, COSMO-CLM5 and WRF v3.7.1 at maximum spatial resolutions of 1.5km and 2km, respectively. Additionally, the Irish Meteorological Service, Met Éireann, has recently completed a 2.5km resolution reanalysis (MÉRA) for the same period using the ALADIN-HIRLAM numerical weather prediction system with a data assimilation component included. The datasets produced contain both hourly and daily outputs for an array of sub-surface, surface and atmospheric fields. The benefits of such datasets include providing the best estimate of the four-dimensional atmospheric state, not only of the observed variables, but also the Essential Climate Variables (ECVs) and parameters which are not routinely monitored by observations.

The output of the models are validated by comparing with Met Éireann observational data. Preliminary validations show that the relative skill of the NWPs is dependent on the field under analysis. The evapotranspiration estimates are derived using the international best practice FAO Penman-Monteith equation and current Met Éireann standard procedures. Validation results will be presented showing the relative skill at various scales for a number of the climate variables and derived products (e.g. evapotranspiration and soil moisture deficits) in each simulation dataset with uncertainty estimates assigned to each. In addition, an overview of the methods used to estimate evapotranspiration and soil moisture deficits will be presented. The climate data, together with uncertainty estimates, will be made publicly available so that researchers, policy makers, industry and the general public can utilise the datasets.