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From AWE-GEN to AWE-GEN-2d: a high spatial and temporal resolution weather generator

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A new weather generator, AWE-GEN-2d (Advanced WEather GENerator for 2-Dimension grid) is developed following the philosophy of combining physical and stochastic approaches to simulate meteorological variables at high spatial and temporal resolution (e.g. 2 km x 2 km and 5 min for precipitation and cloud cover and 100 m x 100 m and 1 h for other variables variable (temperature, solar radiation, vapor pressure, atmospheric pressure and near-surface wind). The model is suitable to investigate the impacts of climate variability, temporal and spatial resolutions of forcing on hydrological, ecological, agricultural and geomorphological impacts studies. Using appropriate parameterization the model can be used in the context of climate change.
Here we present the model technical structure of AWE-GEN-2d, which is a substantial evolution of four preceding models (i) the hourly-point scale Advanced WEather GENerator (AWE-GEN) presented by Fatichi et al. (2011, Adv. Water Resour.) (ii) the Space-Time Realizations of Areal Precipitation (STREAP) model introduced by Paschalis et al. (2013, Water Resour. Res.), (iii) the High-Resolution Synoptically conditioned Weather Generator developed by Peleg and Morin (2014, Water Resour. Res.), and (iv) the Wind-field Interpolation by Non Divergent Schemes presented by Burlando et al. (2007, Boundary-Layer Meteorol.). The AWE-GEN-2d is relatively parsimonious in terms of computational demand and allows generating many stochastic realizations of current and projected climates in an efficient way. An example of model application and testing is presented with reference to a case study in the Wallis region, a complex orography terrain in the Swiss Alps.