TEMPORAL DISAGGREGATION OF RAINFALL DATA FOR CLIMATE CHANGE STUDIES

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The lack of high-resolution rainfall data is one of the most prominent limiting factors in hydrological, meteorological, environmental and agricultural calculations. However, such data are often not available, since their measurements are costly and time consuming. One alternative to obtain high-resolution data is to try to derive them from available low-resolution information through a disaggregation procedure. Climatic scenarios from either Global Circulation Models (GCMs) or simpler analogue models are frequently used as inputs to off-line hydrological simulations in order to assess the hydrological impacts of climate change. While observed climatology and GCM output is generally available on a monthly or daily time step, most hydrological model requires hourly time step or smaller according to the need of study e.g. fine timescale rainfall data of at least 30 min is required where soil erosion is an issue.

This study evaluates a generation of high-resolution rainfall data at a point location. The procedure involves three steps: (1) calculating the Bartlett-Lewis Rectangular Pulse Parameter (BLRP) from historical data , (2) disaggregate the future statistically downscale data (WETTREG Model) using historical BLRP parameters and Hyetos disaggregation model (disaggregate from daily to hourly); and (3) further disaggregation of hourly data in to sub-hourly up to 5 min using Cascade model. This scheme preserves the daily properties of rainfall occurrence and amount.
For this research we have selected 11 stations from Sachsen-Anhalt and Thüringn states ranging from low lands Seehausen (21m) to high mountains Schmuecke (937m) and with different amount of total yearly precipitation ranging from 471 mm to 1288 mm to cover all the dynamics of rainfall pattern. We have found that the temporal disaggregation of rainfall is dependent on number of dry days and the magnitude of the rainfall. Therefore we divide the rainfall into three different categories according to their magnitude, and calculate BLRP parameters of each category.
We have applied these BLRP parameters according to magnitude in the statistically downscaled data by WETTREG Model on the basis of global climate simulation with ECHAM5/MPI-OM T63L31 from 2010 to 2100 and disaggregate daily data into hourly using Hyetos model and then up to 5 min of temporal resolution using cascade approach.