Geophysical Research Abstracts
Vol. 18, EGU2016-18183, 2016
EGU General Assembly 2016

Fundamental statistical relationships between monthly and daily meteorological variables: Temporal downscaling of weather based on a global observational dataset

Philipp Sommer (1) and Jed Kaplan (2)

(1) University of Lausanne, Institute of Earth Surface Dynamics (IDYST), ARVE, Villeneuve, Switzerland (philipp.sommer@unil.ch), (2) University of Lausanne, Institute of Earth Surface Dynamics (IDYST), ARVE, Villeneuve, Switzerland (philipp.sommer@unil.ch)

Accurate modelling of large-scale vegetation dynamics, hydrology, and other environmental processes requires meteorological forcing on daily timescales. While meteorological data with high temporal resolution is becoming increasingly available, simulations for the future or distant past are limited by lack of data and poor performance of climate models, e.g., in simulating daily precipitation. To overcome these limitations, we may temporally downscale monthly summary data to a daily time step using a weather generator. Parameterization of such statistical models has traditionally been based on a limited number of observations. Recent developments in the archiving, distribution, and analysis of "big data" datasets provide new opportunities for the parameterization of a temporal downscaling model that is applicable over a wide range of climates. Here we parameterize a WGEN-type weather generator using more than 50 million individual daily meteorological observations, from over 10'000 stations covering all continents, based on the Global Historical Climatology Network (GHCN) and Synoptic Cloud Reports (EECRA) databases. Using the resulting "universal" parameterization and driven by monthly summaries, we downscale mean temperature (minimum and maximum), cloud cover, and total precipitation, to daily estimates. We apply a hybrid gamma-generalized Pareto distribution to calculate daily precipitation amounts, which overcomes much of the inability of earlier weather generators to simulate high amounts of daily precipitation. Our globally parameterized weather generator has numerous applications, including vegetation and crop modelling for paleoenvironmental studies.