



Design, operation and validation of the ERA5-land Global Gridded Stochastic Weather Generator

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The ERA5-land Global Gridded Stochastic Weather Generator (EGGS-WG) model was released to the public last year as an open source and freely accessible stochastic weather generator. The purpose of this model is to provide an easy to use, low resource and modern Stochastic Weather Generator that can produce rainfall, air temperature and dew point temperature. This model offers several advancements over existing freely available stochastic weather generators, including the ability to simulate any terrestrial region of the planet, moving from a single site simulation approach to an entire gridded domain and increasing the temporal resolution of temperature simulation from daily to hourly.

Validation case studies have been performed over a range of different regions that represent substantially different climates. In general, EGGS-WG shows a strong ability to recreate the statistical behaviour seen in the ERA5-Land dataset. Precipitation occurrence rates and daily rainfall amounts are shown to be reproduced accurately by the model. Several different aspects of these variables are validated, including seasonality, spatial correlations and rainfall spells. While the general quality of the simulation is high, there are some clear issues in the simulation of the most extreme precipitation values, as well as some unique issues in consistently wet climates. Analysis of the air temperature and dew point temperature simulations shows stronger agreement. In particular, the spatial distributions and diurnal cycles of temperature are shown to be well simulated.

Many future developments have been planned that build on the released software package. Most prominent amongst these is the expansion of the simulated variables to include winds and radiation, which introduces a unique set of challenges due to the strong diurnal patterns and spatial organisation. Additionally, integrated support for CMIP6 driven future warming simulation is a high priority. These extensions are in various stages of development and are likely to be released over the coming year.