
Stochastic rainfall generation over complex topography

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Abstract

Orographic precipitation is ubiquitous on tropical islands with high elevation topography where it generates spatially heterogeneous rainfall patterns. As an example, the mean annual rainfall ranges from 200 mm/year to more than 7000 mm/year on the Island of Hawai'i (10432 km²).

Strong orographic effects break down the stationarity of rain statistics and require non-stationary stochastic rainfall models. In this presentation I will therefore introduce a stochastic model specially designed for non-stationary daily rainfall fields. The model is based on a fully non-stationary trans-Gaussian approach, and allows all model parameters to be location-dependent. This results in a very flexible spatial model for daily rainfall, in which both rainfall intensity and rainfall spatial dependencies can be non-stationary.

The model is tested on the Island of Hawai'i and shows good performance in generating stochastic rainfall fields honoring rainfall statistics observed by a network of 79 rain gauges. A particular emphasis is put on spatial statistics, and on the ability of the model to simulate realistic spatial patterns of daily rainfall.

Keywords: Nonstationary spatial model, daily rainfall, orographic precipitation

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