
Stochastic daily rainfall generation in tropical islands

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Résumé

Stochastic rainfall generators (SRGs) are probabilistic tools aiming at simulating synthetic rains that mimic as closely as possible the space-time statistical signature of rain observations. As for most conceptual models in Earth Sciences, the performance of SRGs strongly relies on their adjustment to the rain process at hand. In tropical islands, orographic rain enhancement (i.e. more frequent and intense rains over mountains) challenges most existing SRGs because it creates localized rains and strong spatial gradients. To allow for stochastic rainfall modeling in tropical islands, I propose in this contribution a new daily SRG especially dedicated to areas with strong orographic effects. The proposed model relies on a preliminary classification of daily rainfall patterns based on rain space-intensity statistics, and therefore sheds a new light on the main modes of rainfall variability at the island-scale. When applied to stochastic rainfall simulation in two major islands of the tropical Pacific (O'ahu in the state of Hawai'i, USA and Tahiti in French Polynesia), it demonstrates good skills in simulating: (1) site specific rain occurrence, persistence, intensity and seasonality, (2) spatial patterns of rain occurrence and intensity, and (3) areal rain statistics at the island scale (e.g. wet fraction, areal mean intensity).

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