

A method for estimating precipitation values and associated uncertainties is provided. In an embodiment, precipitation records that indicate the occurrence and intensity of precipitation at specific locations are received by a weather computing system. The weather computing system uses the gauge information to separately create multiple realizations of precipitation occurrence fields and precipitation intensity fields. The weather computing system may model the occurrence of precipitation by proposing a value for each point independently and using the proposed value to update all prior proposals. The weather computing system may model the intensity of precipitation by modeling the spatial correlation of precipitation intensity and sampling from distributions at each location to determine the intensity of precipitation at each location. The weather computing system may then combine the precipitation intensity and occurrence fields into one or more final estimate fields.