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## Disaggregation of spatial rainfall fields for hydrological modelling

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**Abstract.** Meteorological models generate fields of precipitation and other climatological variables as spatial averages at the scale of the grid used for numerical solution. The grid-scale can be large, particularly for GCMs, and disaggregation is required, for example to generate appropriate spatial-temporal properties of rainfall for coupling with surface-boundary conditions or more general hydrological applications. A method is presented here which considers the generation of the wet areas and the simulation of rainfall intensities separately. For the first task, a nearest-neighbour Markov scheme, based upon a Bayesian technique used in image processing, is implemented so as to preserve the structural features of the observed rainfall. Essentially, the large-scale field and the previously disaggregated field are used as evidence in an iterative procedure which aims at selecting a realisation according to the joint posterior probability distribution. In the second task the morphological characteristics of the field of rainfall intensities are reproduced through a random sampling of intensities according to a beta distribution and their allocation to pixels chosen so that the higher intensities are more likely to be further from the dry areas. The components of the scheme are assessed for Arkansas-Red River basin radar rainfall (hourly averages) by disaggregating from 40 km x 40 km to 8 km x 8 km. The wet/dry scheme provides a good reproduction both of the number of correctly classified pixels and the coverage, while the intensity scheme generates fields with an adequate variance within the grid-squares, so that this scheme provides the hydrologist with a useful tool for the downscaling of meteorological model outputs.

**Keywords:** Rainfall, disaggregation, General Circulation Model, Bayesian analysis

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