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## Downscaling rainfields in space and time, using the String of Beads model in time series mode

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**Abstract.** The String of Beads model is a space-time model of rainfields measured by weather radar. It is here driven by two auto-regressive time series models, one at the image scale, the other at the pixel scale, to model the temporal correlation structure of the wet-period process. The marginal distribution of the pixel scale intensities on a given radar-rainfall image is described by a log-normal distribution. The spatial dependence structure of each image is defined by a power spectrum approximated by a power law function with a negative exponent. It is demonstrated that this stochastic modelling approach is valid because the images sampled are effectively stationary above a scale of 30 km, which is less than a quarter of the image width. By advecting a simulated sequence of images along the same cumulative advection vector as the observed event and matching the image-scale statistics of each simulated image with those of the corresponding observed image, a simulated sequence of plausible images is generated which mimics (has the same space-time statistics as) the observed event but differs from it in detail. Aggregating the pixel scale intensities in each sequence over a number of time and space intervals and then comparing their spatial and temporal statistics, demonstrates that the model captures the intermediate scale behaviour well, showing satisfactorily its ability to downscale rainfall in space and time. The model thus has potential as an operational space-time model of rainfields.

**Keywords:** Space-time, rainfield modelling, weather radar, multifractals, Gaussian random fields

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