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Spatial downscaling of precipitation from AOGCMs for climate change projections using random cascades: a case study in Italy

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We present a Stochastic Space Random Cascade (SSRC) approach to downscale precipitation from a GCMs for the purpose of water resources projection under climate change scenarios for a meso-scale Italian Alpine watersheds, Oglio rivers (1600 km2). Snow fed Oglio river displays complex physiography and high environmental gradient, and statistical downscaling methods are required for climate change assessment, according to the Intergovernmental Panel on Climate Change (IPCC). The SSRC model is locally tuned upon Oglio river for spatial downscaling (approx. 1 km) of daily precipitation from NCAR_PCM, giving more accurate results for the area according to our preliminary findings. We use a 10 years (1990-1999) series of observed daily precipitation data from 25 rain gages. Scale Recursive Estimation coupled with Expectation Maximization algorithm is used for model estimation. Seasonal parameters of the multiplicative cascade are accommodated by statistical distributions conditioned upon climatic forcing, based on regression analysis. Main advantage of the SSRC is to reproduce spatial clustering, intermittency, self-similarity of precipitation fields and their spatial correlation structure, with relatively low computational burden. Projections of future downscaled precipitation scenarios (A2 scenario from NCAR_PCM) are given, necessary for water budget pending climate change, and some preliminary conclusions are drawn.

Key words: climate change; precipitation; AOGCMs; statistical downscaling.