Geophysical Research Abstracts,
Vol. 11, EGU2009-10216, 2009
EGU General Assembly 2009

Stochastic and dynamical downscaling of ensemble precipitation forecasts

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Forecasting hydrogeological risk in small basins requires quantitative forecasts and an estimate of the probability of occurrence of severe, localized precipitation events at spatial scales of the order of tens of kilometers or less, significantly smaller than those currently provided by large scale, global, ensemble forecasting systems (EPS). Dynamically based forecasts at these scales can be obtained extending EPS scenarios with high-resolution, non-hydrostatic, limited area ensemble prediction systems. An alternative is represented by the direct application of stochastic downscaling techniques to the large scale ensemble forecasts.
This work compares the performances of these two very different ensemble forecast downscaling approaches. To this purpose we consider ensemble forecasts provided by the ECMWF EPS, downscaled in space using the RainFARM stochastic technique [1], and ensembles of forecasts obtained from the COSMO-LEPS limited area prediction system (which also uses ECMWF EPS ensemble members as boundary conditions), for three intense precipitation events over northern Italy in 2006. The statistical properties of the fields produced with these two techniques are compared and the skill of the resulting ensembles is verified against direct precipitation measurements from a dense network of rain gauges.

Reference:
1. Rebora, N., L. Ferraris, J. von Hardenberg, and A. Provenzale, 2006: The RainFARM: Rainfall Downscaling by a Filtered AutoRegressive Model. J. Hydrometeorol., 7, 724–738.