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A weighting technique for reproducing the mesoscale signal using an ensemble of 13 RCM

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As part of the ENSEMBLES effort to produce probabilistic high-resolution regional climate scenarios for Europe, an extension of the Reliability Ensemble Averaging method was developed and applied to generate weights of different models used in the ENSEMBLES project based on their ability to simulate the mesoscale" signal associated with the temperature and precipitation fields. The underlying idea of this approach is to produce weights based only on the "added value" of the RCMs. The mesoscale signal was obtained for each model by first filtering out the large scale signal form the full model fields. Therefore the mesoscale signal is a measure of the added value of using the RCMs nested within the GCMs.

The 13 ENSEMBLES ERA40-RCMs at 25 km resolution over the European domain are used in this work. A large-scale signal is first identified by carrying out a 9x9 grid point running spatial average of the surface temperature and precipitation fields. This yields a signal roughly at a scale of 250 km, which is typical of the ENSEMBLES GCMs.

The large-scale signal is then subtracted from the full field. The anomaly signal derived in this way constitutes the mesoscale signal.

Five functions that measure the model mesoscale performance for temperature and precipitation have been identified and used to derive the weights for the 13 ENSEMBLE RCMs. The individual models weights are then based on functions that measure the ability of the models to reproduce the observed mesoscale signal.

Conclusion are derived on the difference between the simple model mean and the weighted model mean for representing the "mesoscale" signal of the model ensemble when compared with the observed mesoscale signal.