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Statistical calibration of precipitation ensembles: An empirical comparison of a few methods

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At sites with measurements or accurate estimates of precipitation, it is often possible to enhance precipitation forecasts by means of statistical methods. The topic of this study is calibration of ensemble precipitation forecasts, and to this end four statistical methods are proposed and tested on real data: (i) transformation of ensemble members such that they in the long run have the same climatology as the observations. (ii) as (i), but preceded by linear regression in order to take into account information about ciculation pattern. (iii) use of scaling factors defined essentially as the ratio of the weighted mean observed precipitation amount and the weighted mean model precipitation amount. (iv) the Bayesian processor of output/ensemble. The first three methods all operate on each ensemble member individually without any regard to other members, while the latter uses all members simultaneously and, thus, has better statistical foundation. The statistical methods are tested at nine sites using ensemble precipitation forecasts from ECMWF's EPS with lead times up to ten days as input. Although the results vary considerably between the sites, the statistical methods generally improves the raw ensemble forecasts considerably - especially for the shorter lead times. Not surprisingly, the Bayesian processor of output/ensemble was on average the best method, both in terms of continuous ranked probability scores and not least reliability/calibration.