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Postprocessing through linear regression

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Meteorological *ensemble* predictions provides the forecaster not only with a forecast but also an estimate of its variability and therefore its reliability. It is known that the predictability features of such ensemble forecast may be improved by use of statistical post-processing. We present a comparison of several post-processing schemes for ensemble forecasts, all based on linear regression. The regression schemes under consideration include the “classical" least squares method, the total least squares (Van huffel and Vandewalle, 2008), a “best member" method (Unger et al. 2009) and a variant of the error-in-variables (EVMOS) method as recently proposed by Vannitsem (2009).

Taking the low-order chaotic Lorenz atmospheric model as our model system we introduce both model errors and initial condition errors and focus on the dynamics of the statistical features of the forecast errors after post-processing. Several generic timescales are identified, each of which may be attributed a best post-processing method. In the presence of large model errors post-processing may significantly improve the forecast quality at short times when the amount of significant predictors chosen tend to be very important. After long times, on the other hand, the classical post-processing scheme is known to yield forecasts which converge to the climatological mean, thereby lacking any inherent variability. The EVMOS scheme which turns out to be the overall best method, naturally accounts for this lack of variance. Finally, we also discuss the presence of heavy-tales in the error distributions.

References

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