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# Avoiding the ensemble decorrelation problem using member-by-member post-processing

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Forecast calibration or post-processing has become a standard tool in atmospheric and climatological science due to the presence of systematic initial condition and model errors. For ensemble forecasts the most competitive methods derive from the assumption of a fixed ensemble distribution. However, when independently applying such "statistical" methods at different locations, lead times or for multiple variables the correlation structure for individual ensemble members is destroyed. Instead of reastablishing the correlation structure as in Schefzik et al. (2013) we instead propose a calibration method that avoids such problem by correcting each ensemble member individually. Moreover, we analyse the fundamental mechanisms by which the probabilistic ensemble skill can be enhanced. In terms of continuous ranked probability score, our member-by-member approach amounts to skill gain that extends for lead times far beyond the error doubling time and which is as good as the one of the most competitive statistical approach, non-homogeneous Gaussian regression (Gneiting et al. 2005). Besides the conservation of correlation structure, additional benefits arise including the fact that higher-order ensemble moments like kurtosis and skewness are inherited from the uncorrected forecasts. Our detailed analysis is performed in the context of the Kuramoto-Sivashinsky equation and different simple models but the results extent succesfully to the ensemble forecast of the European Centre for Medium-Range Weather Forecasts (Van Schaeybroeck and Vannitsem, 2013, 2014) .

## References

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