



## Regionally improved seasonal forecast of precipitation through Best estimation of winter NAO

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### Title

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### Abstract

Skill and error characteristics of winter NAO forecasts for some Copernicus seasonal forecasting systems (SFS) are analysed in this study.

Based on these features, a bias correction scheme is proposed and implemented for the NAO simulated by a large ensemble of members created with two different lead times of ECMWF System 5 SFS. Then, a modified NAO pdf based on Gaussian errors is formulated. Finally, we apply the statistical estimation theory (e.g. Kalnay, 2003) to achieve the Best linear unbiased estimation of this dominant mode of extratropical variability and its uncertainty. For this purpose, a priori estimations of the Gaussian forecasted NAO pdf from ECMWF System 5, and either a skilful empirical relationship or another SFS showing enough good performance regarding forecasted NAO are used. Although ensemble members' equiprobability is generally assumed by SFS based on a single model, and considering that our specific final goal is to improve winter precipitation over the Iberian Peninsula, we propose to compute forecasted precipitation pdf by ensemble members' weighting extending the original idea by Dobrynin et al. (2016) and using the Best NAO pdf as weighting metric.

We show the improvement of winter precipitation forecasts over our region of interest when members are weighted with the bias corrected Gaussian pdf based on ECMWF System 5 compared with the usual approach based on equiprobability of ensemble members.

### References

Dobrynin, M. et al.: Improved Teleconnection-Based Dynamical Seasonal Predictions of Boreal Winter, *Geophys. Res. Lett.*, 45, 3605-3614, 2018.

Kalnay, E.: *Atmospheric modelling, Data Assimilation and Predictability*, Cambridge University Press, 2003.