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# Seasonal forecasting of the European North-West shelf seas: limits of winter and summer sea surface temperature predictability

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The European North-West shelf seas (NWS) support economic interests and provide environmental services to several adjacent populous countries. Skilful seasonal forecasts of the NWS would be useful to support decision making. Here, we quantify the skill of an operational large-ensemble ocean-atmosphere coupled dynamical forecasting system (GloSea), as well as a benchmark persistence forecasting system, for predictions of NWS sea surface temperature (SST) at 2-4 months lead time in winter and summer. We also identify sources of- and limits to NWS SST predictability with a view to what additional skill may be available in the future. We find that GloSea NWS SST skill is generally high in winter and low in summer. Persistence of anomalies in the initial conditions contributes substantially to predictability. GloSea outperforms simple persistence forecasts, by adding atmospheric variability information, but only to a modest extent. Where persistence is low – for example in seasonally stratified regions – both GloSea and persistence forecasts show lower skill. GloSea skill can be degradeded by model deficiencies in the relatively coarse global ocean component, which lacks a tidal regime and likely fails to properly fine-scale NWS physics. However, using “near perfect atmosphere” tests, we show potential for improving predictability of currently low performing regions if atmospheric circulation forecasts can be improved, underlining the importance of development of atmosphere-ocean coupled models for NWS seasonal forecasting applications.