The actual and potential skill of dynamical decadal forecasts

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We analyze the skill of decadal predictions based on ensemble experiments with dynamical climate models from CMIP5. The models are initialized every year in November for the period 1960-2005 either by full-field initialization or by anomaly initialization. While the whole globe will be considered special focus will be given to the North Atlantic where some skill has been reported previously.

In general only weak skill is found for lead times larger than 5 years. We investigate how the skill improve with increasing temporal and spatial averaging. We also demonstrate the importance of the details of the temporal detrending (e.g., linear vs polynomial) that is necessary to isolate the skill originating from initialization from that originating from the anthropogenic warming.

The potential skill - which measures the model's ability to predict itself - is found to be higher than the actual skill in most but not all circumstances. We discuss the reasons behind the differences in potential and actual skill - in particular the reason why actual skill can be larger than potential skill.

We also study how the skill of the ensemble mean depends on the ensemble size. We discuss why the skill in general improves with increasing ensemble size and why the ensemble mean often gives better results than the individual ensemble members.