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Decadal prediction with a high resolution model

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The ability of a high resolution coupled atmosphere-ocean general circulation model (with a horizontal resolution of the quarter degree in the ocean and of about 50 km in the atmosphere) to predict the annual means of temperature, precipitation, sea-ice volume and extent is assessed. Reasonable skill in predicting sea surface temperatures and surface air temperature is obtained, especially over the North Atlantic, the tropical Atlantic and the Indian Ocean. The skill in predicting precipitations is weaker and not significant. The Sea Ice Extent and volume are also reasonably predicted in winter (March) and summer (September). It is however argued that the skill is mainly due to the atmosphere feeding in well-mixed GHGs. The mid-90's subpolar gyre warming is assessed. The model simulates a warming of the North Atlantic Ocean, associated with an increase of the meridional heat transport, a strengthening of the North Atlantic current and a deepening of the mixed layer over the Labrador Sea. The atmosphere plays a role in the warming through a modulation of the North Atlantic Oscillation and a shrinking of the subpolar gyre. At the 3-8 years lead-time, a negative anomaly of pressure, located south of the subpolar gyre is associated with the wind speed decrease over the subpolar gyre. It prevents oceanic heat-loss and favors the northward move, from the subtropical to the subpolar gyre, of anomalously warm and salty water, leading to its warming. We finally argued that the subpolar gyre warming is triggered by the ocean dynamic but the atmosphere can contributes to its sustaining. This work is realised in the framework of the EU FP7 SPECS Project.