Session: B1 Oral presentation

Decadal predictions of the Atlantic ocean and hurricane numbers

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We investigate the skill of decadal predictions using both idealised model experiments and a comprehensive set of decadal hindcasts covering the period since 1960. Both initialised and uninitialised hindcasts have been performed, enabling the impact of initialisation and the externally-forced component of skill to be quantified. On multi-year timescales, the impact of initialisation on surface temperature predictions is largest in the north Atlantic sub-polar gyre. This is consistent with improved predictions of the Atlantic meridional overturning circulation (AMOC), assessed against a multi-model ensemble of ocean analyses. Initialisation also improves predictions of the tropical Atlantic atmosphere, including wind shear and tropical storm frequency. These results are supported by idealised model experiments which show that the tropical Atlantic is potentially one of the most predictable regions for atmospheric variables including precipitation, vertical velocity and wind shear. In both the idealised and hindcast experiments there is a clear link between the tropical Atlantic atmosphere and the sub-polar gyre: a warm sub-polar gyre is associated with an anomalous Hadley circulation and a northward shift of the inter-tropical convergence zone (ITCZ). By withholding data in different parts of the ocean we identify the sub-polar gyre as the key region for driving the skill in the tropical Atlantic, including tropical storm frequency. These results provide strong evidence of extra-tropical forcing of the tropical atmosphere, and further highlight the important role of the high latitude north Atlantic in the global climate system.