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Multiyear Predictability of Surface Air Temperature in the Kiel Climate Model

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The multiyear predictability of unforced surface air temperature (SAT) variability is examined in the Kiel Climate Model (KCM), a coupled ocean-atmosphere-sea ice general circulation model. A statistical method that maximizes Average Predictability Time (APT) is used to find the most predictable patterns in the model. Multiyear SAT predictability is detected in the North Atlantic and North Pacific sectors. In both regions, ocean dynamics enhances predictability, while the net heat flux is a damping factor. Enhanced predictability in the North Atlantic sector is concentrated near the sea ice margin. The multiyear predictability there is linked to the Atlantic Multidecadal Oscillation/Variability (AMO/V) and also associated with variability of the subpolar gyre. In the North Pacific, the most predictable pattern is characterized by a zonal band in the western and central mid-latitude Pacific. It is linked to the Pacific Decadal Oscillation (PDO) which produces temperature anomalies in the surface layer during winter. These are subducted into deeper layers and re-emerge during the following winters, giving rise to multiyear predictability. The results are consistent with those obtained from the CMIP5 ensemble.