Predicting surface heat flux with ocean heat content anomalies in the North Atlantic

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Most of the interannual heat content anomalies in the North Atlantic are driven by ocean heat transport convergence, and the heat transport convergence likely linked to AMOC (Atlantic Meridional overturning circulation) and AMHT (Atlantic Meridional Heat Transport) anomalies. The focus of investigations of the relationship between AMOC and AMHT and climate has primarily been through linkages to SST (Sea Surface Temperature). Here, an analysis of satellite altimetry observations of SSH (sea surface height) as a proxy for upper ocean heat content and net surface heat flux from OAFlux (Objectively Analyzed air-sea fluxes) 1993-2009 throughout the North Atlantic allows the identification of the times of the year and the locations where SSH anomalies drive surface fluxes. Lag correlations between times series for each month of the year at each location of SSH and the net surface heat fluxes allow identification of those regions. January surface is predicted by SSH twelve months in advance south of the Gulf Stream in the subtropical mode water region where mid-level clouds are driven by surface wind convergence. July surface flux is predicted by SSH seven months in the eastern North Atlantic where stable planetary boundary layers lead to stratocumulus clouds. East of the Florida Current, August surface flux is predicted by SSH eight months in advance where high clouds indicate deep heating. Approximately 25% of the surface flux variance is explained by SSH, indicating that heat transport convergence resulting from changes in AMOC and AMHT can drive significant heat fluxes throughout the basin.