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The North Atlantic eddy heat transport and its relation with the vertical tilting of the Gulf Stream axis

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Correlations between temperature and velocity fluctuations are a significant contribution to the North Atlantic meridional heat transport, especially at the northern boundary of the subtropical gyre. In satellite observations and in a numerical model at 1/12° resolution, a localized pattern of positive eddy heat flux is found northwest of the Gulf Stream, downstream of its separation at Cape Hatteras. It is confined to the upper 500 m. A simple kinematic model of a meandering jet can explain this eddy flux, taking into account a spatial shift between the maximum velocity of the jet and the maximum cross-jet temperature gradient. In the Gulf Stream such a spatial shift results from the nonlinear temperature profile and the vertical tilting of the velocity profile with depth. The numerical model suggests that the meandering of the Gulf Stream could account for the large eddy heat transport (of order 0.3 PW) near 36°N in the North Atlantic, and for its compensation by the mean flow