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Direct temporal cascade of temperature variance in eddy-permitting simulations of multidecadal variability

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The North Atlantic is characterized by basin-scale multidecadal fluctuations of the sea surface temperature with periods ranging from 20 to 70 years.
One candidate for such a variability is a large-scale baroclinic instability of the North Atlantic Current. Because of the long time scales involved, most of the studies devoted to this problem are based on low resolution numerical models leaving aside the effect of explicit meso-scale eddies.
How high-frequency motions associated with the meso-scale eddy field affect the basin-scale low-frequency variabiliy is the central question of this study.

This issue is addressed using an idealized configuration of an Ocean General Circulation Model at eddy-permitting resolution (20 km). A new diagnostic allowing the calculation of nonlinear fluxes of temperature variance in frequency space is presented. Using this diagnostic, we show that the primary effect of meso-scale eddies is to damp low frequency temperature variance and to transfer it to high frequencies.