Abstract View

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Space and Time Scales of Mesoscale Motions in the Eastern North Atlantic

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ABSTRACT

The Tourbillon experiment carried out in 1979–80 over the Porcupine Abyssal Plain in the eastern North Atlantic is the fist experiment providing data that allow an efficient description of the spatial structure of the mesoscale low-frequency flows in an eastern midlatitude basin. The eddies appear to scale in the horizontal as the internal Rossby radius of deformation and, although of an energy level comparable to those observed during MODE, they are intrinsically more nonlinear because of reduced horizontal scale. In much the same way the time scales are less than what is observed in western basin experiments MODE, Polymode III A, B suggesting some kind of turbulent dispersion relation with frequency proportional to wavenumber in the eddy energy-containing range. We observe in Tourbillon an equipartition of eddy kinetic and potential energy. The frequency kinetic-energy spectra have slopes of order −2 in a log–log form, hence are more white than in western basins (−2.5, −3). The distribution of eddy kinetic is highly intensified above the main pycnocline (more so at high rather than low frequencies). An empirical-orthogonal-function decomposition has been carried out in the vertical direction and indicates that the lowest frequencies (450–64 days) are vertically coherent, 72% of the total energy being described by only one EOF with baroclinic structure. The vertical coherence decreases with period. Finally the relevance of variable atmospheric driving to induce eddy motions is discussed.