Abstract View

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The Formation of Labrador Sea Water. Part II. Mesoscale and Smaller-Scale Processes

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ABSTRACT

In a previous paper, Clarke and Gascard argued that the formation of Labrador Sea Water was taking place in a cyclonic gyre set up each winter in the western Labrador Sea.

Within the gyre and at its boundaries, a number of different scales of organization are believed to be important in the formation processes. The longest of these scales is the mesoscale (50 km), which appears to be related to topographic Rossby waves generated in the Labrador Current and propagating offshore. The next smaller scale is an eddy scale (20 km) believed to arise because the mesoscale is baroclinically unstable, as shown by applying a two-layer model of Tang. This instability is believed to promote mixing by generating frontal structures and vertical motions along them, thus bringing subsurface *T-S* maxima nearer the surface. Then within the mesoscale and eddy-scale structures, intense vertical convective cells take place at scales which are probably of the order of 1 km in three dimensions. These events are short-lived and occur in response to particularly intense air-sea exchanges.

Most of these processes have already been recognized in the Mediterranean Sea (MEDOC): that is, baroclinic instability of mesoscale features generating mixing at an eddy scale which is quite small because the scale is related to the internal radius of deformation (5–10 km). What is new is the link between the unstable mesoscale structures and the large-scale general circulation through the generation of topographic Rossby waves.

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