Abstract View

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The Seasonal Variation of the Surface Mixed-Layer Response to the Vertical Motions of Linear Rossby Waves

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ABSTRACT

A Kraus-Turner (1967) seasonal mixed-layer model with constant background dissipation is used to study the mixed-layer response to the vertical motions of linear Rossby waves that are not driven by direct local atmospheric forcing. The model equations are solved using analytical and simple numerical techniques. A strong seasonal variation in the response to Rossby waves is found. The mixed layer buoyancy (or sea surface temperature) response is a maximum toward the end of the heating season or beginning of the cooling season (early fall). The mixed-layer depth response is largest at the end of the cooling season. The sea surface temperature (SST) pattern in response to the two baroclinic Rossby waves that McWilliams and Flierl (1976) fit to the MODE data is very different from the temperature pattern at a fixed depth below the mixed layer. While the shape of the "eddies" as modeled by the two Rossby waves stays fixed, the shape of the SST response changes with time. In addition the SST response propagates at about half the speed of the Rossby waves. While the SST response initially leads the forcing it finally lags behind the forcing. Using the POLYMODE XBT data it is concluded that the mixed-layer response to the vertical motions of "eddies" could be important in the fall in the POLYMODE region of the North Atlantic Ocean.