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Thermobaric solitons in the subtropical Atlantic: A mechanism involved in Meddies?

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The T-S relation in the upper 1-2 km of the Atlantic evolves from a distinctly southern form to a northern form across a relatively narrow band of the subtropics, in waters strongly influenced by the Mediterranean outflow. Water parcels undergoing baroclinic planetary motions in this band feel differential buoyancy forces associated with temperature, compared to salinity, due to the variation of thermal expansion with pressure (the thermobaric effect), coupled with the spatial variation of the mean T-S environment. This nonlinear mechanism can sustain solitary baroclinic Rossby waves. It will be shown that the subtropical transition waters of the Atlantic are a particularly apt region for the operation of this mechanism, and it will be suggested in particular that it may be important in the propagation and maintenance of long-lived Meddies (Mediterranean eddies).