Dynamics of lower tropospheric vertical velocity induced by sea surface temperature fronts

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Air-sea interaction at sea-surface temperature fronts is marked by regions of surface wind convergence, that are thought to anchor deep convection in the atmosphere. Without advection, the classic Lindzen and Nigam model predicts co-location of vertical velocity and the Laplacian of hydrostatic pressure induced by virtual temperature variations within the boundary layer. We deploy an extension of this model to include advection by a background Ekman spiral to investigate impacts of advection, the role of pressure fluctuations induced outside of the boundary layer - the so-called back pressure, and the distinct signatures of the thermally direct overturning within the boundary layer and of the secondary circulation further aloft. Predictions of the linear model will be compared with atmospheric general circulation model integrations forced by high-resolution sea surface temperature fields.