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Coherent pathways for vertical transport from the surface mixed layer to ocean interior MARA FREILICH, MIT/WHOI Joint Program, AMALA MAHADEVAN, Woods Hole Oceanographic Institution — The dynamical pathways of subduction, by which water from the oceanic surface mixed layer makes its way into the pycnocline, are influenced by both geostrophic frontogenesis and submesoscale instabilities in the mixed layer. We explore the pathways and mechanisms for subduction using a submesoscale-resolving numerical model of a mesoscale front. We use particle tracking to identify Lagrangian trajectories that exit the mixed layer and study the evolution of the dynamical properties during subduction from a statistical standpoint. Water parcels subduct within coherent regions along the front. These coherent subduction regions set the ˜10 km length scales of the subducted features. As a result, the vertical transport rate of a tracer has a spectrum that is flatter than the spectrum of vertical velocity. Contrary to the forced submesoscale processes that sequester low potential vorticity anomalies in the interior, we find that PV can be elevated in subducting water masses. The rate of subduction that we estimate is of similar magnitude to previous studies (˜100 m/year), but the pathways that are unraveled in this study along with the Lagrangian evolution of properties on water parcels, emphasize the role of submesoscale dynamics coupled with mesoscale frontogenesis.

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