Abstract View

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Summertime Hydrography at the Shelfbreak Front in the Middle Atlantic Bight

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ABSTRACT

We present results from a study of the shelfbreak front in the middle Atlantic Bight during summer when we obtained the best resolved hydrography in time and space yet published for that structure. Repeated transects enabled us to treat the hydrographic data statistically. While the general features of our mean fields are not new, their statistical basis is new. A principal result is the firm basis for two features of the shelfbreak front density field: the near absence of across-shelf density gradients above the pycnocline and the presence of only weak gradients in the subsurface front. No published models exist that treat the front with this density structure. Consistent with the weakness of the frontal baroclinic field, we found that the alongshelf transport was dominated by the barotropic component, the baroclinic component being only about 20% of the total. We report a new finding that much of the subtidal frequency variability at the front is best explained by the alongshelf advection of alongshelf gradients, not by across-shelf advection of across-shelf gradients. We show that computations of geostrophic transport for the summertime front are unreliable, even when based on transects repeated at 6 h intervals and with adequate spatial resolution, as ours were. We ascribe this unreliability to the aliasing of energetic isopycnal displacements by supertidal internal waves present in summer. We found large values of across-shelf shear in the near-surface currents at the shelfbreak by tracking large arrays of drifters. We also obtained new insight into energetic isopycnal displacements at the shelfbreak at tidal frequencies. As large as 15 m in amplitude, these displacements impose powerful constraints on the conduct of proper sampling for the shelfbreak front. During summer, when the supertidal internal waves are also present, these constraints become even more daunting.