ABSTRACT

Remotely sensed images of the littoral ocean can be used to estimate wave breaking, currents, and features that protrude above the water. However, despite tremendous progress interpreting the backscattered signals, these techniques have not yet been used to determine what lies beneath the surface. Interior currents, important to Navy SEALS, as well as scientists and engineers, may be stronger and opposite those on the surface. Similarly, there may be quiescent areas under a fast moving layer of surface water detected by a remote device. Patterns of wave breaking may allow detection of underlying features, including crater-like holes, sandbars, obstacles, and other hazards to operations. Here, the *objective* is to determine what lies beneath remotely sensed images of the sea surface in littoral areas. The *approach* is to combine images of the sea surface with in-situ observations spanning the water column and with numerical models to relate remote sensing of the surface to the currents and features beneath. Although the goal of relating surface to interior processes is challenging, pilot work suggests significant progress can be made with focused observational and numerical studies. Combining remote and in-situ observations also will enable investigation of recently discovered, highly energetic, small-scale (< 5 m) motions in the littoral ocean. These "nearshore mesoscale" motions may be important to include in models. Moreover, they provide a unique opportunity to investigate the simultaneous nonlinear transfers of energy from small to large scales (2D turbulence) and from large to small scales (3D) where energy is dissipated, with applications to a wide range of turbulent processes. *Anticipated outcomes* include obtaining better information from remote sensing for military operations, an increased understanding of the fundamental physics of littoral process and turbulence, higher spatial- and temporal-resolution numerical models, and the potential to discover new phenomena.

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