Department of Ocean and Resources Engineering
Seminar

Measuring exchange on multiple spatial scales: from the Golden Gate down to sand ripples

By

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Abstract

I will present measurements of exchange across the ocean-estuary interface in San Francisco, across the sand-water interface at the Kilo Nalu Observatory in Honolulu, between aquatic vegetation and tidal open waters, and across the thermocline of an Arctic lake. In each of these disparate aquatic settings I used temperature to quantify transport across a complex interface. I modeled the dominant exchange processes and how they affect residence time of water on one side of each interface. At the Golden Gate we transected a tow-yo profiler almost 600 times across the channel to quantify net salt, heat, suspended solid, and chlorophyll fluxes. We identified how cross-channel density gradients change the timing of tidal eddies, which alters the main exchange mechanism, tidal pumping. For the Kilo Nalu site, our numerical modeling indicated that porewater is ventilated by surface waves about a sand ripple wavelength below the sand-water interface, and that transport decreases strongly with depth. We are quantifying this transport with a new thermistor array, subsurface dye releases, and sand elevation measurements. I will present new results from our efforts to quantify anoxia in shoals along the Hudson River due to an invasive floating plant. Its shade reduces water temperatures, which allows us to quantify cross-shoal mixing. Finally, I will show that a group of lakes along the North Slope of Alaska are mixing less as the Arctic warms due to fewer weather fronts, not just mean temperature rise.