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Polar Oceanography, Arctic Sea Ice and Climate

MARY-LOUISE TIMMERMANS, Yale University

Intensive sampling from oceanographic moorings, shipboard measurements, and drifting autonomous buoy systems has brought new understanding to Arctic freshwater dynamics, ocean heat and mixing processes, circulation and eddies, and atmosphere-ice-ocean interactions. Observations indicate apparently rapid changes in the basin-scale freshwater distribution that have marked effects on Arctic stratification. Recent measurements support the idea that a strengthened stratification limits the vertical flux of deep-ocean heat. All ocean layers exhibit a rich mesoscale eddy field; eddies, with scales comparable to the Rossby Deformation Radius [O(10km)], transport water and heat over long distances and enhance ocean mixing. Measurements further reveal an active submesoscale flow field in the ocean surface layer. These upper-ocean features, having length scales of a few kilometers or less, are dynamically important in that they can impede surface-layer deepening and modify heat, salt, and momentum fluxes between the surface ocean and adjacent sea-ice cover. This talk will review highlights of recent Arctic Ocean observational studies across a range of temporal and spatial scales, and outline advances in our understanding of ocean drivers of sea ice and climate change.