

Integrating ocean observations across the coastal shelf boundary

B.M. Sloyan¹, J. Wilkin², R. E. Todd³, C. A. Edwards⁴

¹Commonwealth Scientific and Industrial Research Organisation (CSIRO), Hobart, Tasmania, Australia

²Institute of Marine and Coastal Sciences, Rutgers University, NJ, USA

³Woods Hole Oceanographic Institution, MA, USA

⁴University of California, Santa Cruz, CA, USA

Text:

The coastal ocean and near shore zone influences a diverse range of human activities including maritime industry, recreation, and defence, and it plays a vital role in environmental health and productivity that deliver important ecosystem services. Coastal circulation is driven by local terrestrial influences at the land-shore boundary, coastal zone meteorology, tides, and equally importantly by remote forcing at the shelf-sea/open-ocean boundary. On coasts for which estimates exist, fluxes of nutrients and carbon across this boundary are leading order terms in the nitrogen and carbon budgets of shelf ecosystems.

The coastal ocean and shelf edge dynamics have immediate impact on ecosystem function and productivity on weekly to seasonal time scales, but can also drive multi-decadal changes in ecosystem structure through effects on habitat ranges and biodiversity. Changes in watershed land use and global weather will alter the net volume and characteristics of variability of river flows discharge into the coastal zone.

The provision of robust three-dimensional and time-varying coastal and shelf circulation models is seemingly within reach through advances in data-assimilative ocean models. However, development of integrated systems (ocean, land and atmosphere) that could deliver the scope of observations required and the model capable of fully utilizing them is challenging. To succeed, this will require a coordinated international effort that brings together the expertise in observations and modeling across all domains.