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Editorial

Accomplishments and future perspective of coastal ocean observing systems

Coastal oceans are the most densely urbanized regions on the planet with populations growing at rapid rate. In the near future close to 40% of the human population of Earth will live within 100 km of the shore. Many of the largest environmental changes are also found in coastal zones. The associated pressures will only increase as communities increasingly rely on the coastal ocean to provide additional sources of energy (wind, waves, oil and gas), demand that coastal fisheries remain a vital food source, and support enhanced maritime commerce and recreation. As coastal populations disproportionately drive national economies, the changes in coastal systems resulting from continued growth and resource use have the potential to influence national and international social and economic systems. Therefore management and policy need to be informed by science that can provide a quantitative understanding of coastal ecosystems.

Despite these pressing needs, our ability to map and forecast the coastal ocean remains low. While certain areas are difficult to sample, the turbulent nature of the coastal ocean makes it difficult to model. This has lead to repeated calls to develop and deploy coastal ocean observing systems throughout the world. Many of proposed networks will consist of distributed ocean observing/model networks that could provide a seamless 4D (3D in space plus time) view of the ocean with information being delivered to users through wireless networks allowing for two-way control of the network on demand. Ideally these networks map the future trajectory of the world's oceans allowing management/mitigation strategies to be explored based on quantitative understanding.

Advances in technology make these visions a reality in the near future. This special issue of Continental Shelf Research is focused on the coastal ocean observatories and highlights technical advancements that will form the foundation for distributed marine networks. This special issue draws on the results collected from the Alaska Ocean Observing System (AOOS) and the Mid-Atlantic Regional Coastal Ocean Observing System (MARCOOS). These two regional systems are part of the evolving Integrated Ocean Observing System (IOOS) in the United States [see Marine Technologies Society Journal volumes 44(No.6) and 45(No. 1)]. In this special issue we highlight key technologies that are central to coastal observatories spanning from satellites, data assimilative and forecast models, autonomous underwater vehicles (AUVs), and high frequency (HF) radars. As the AOOS and MARCOOS systems are rapidly maturing, they have collected valuable data. We therefore highlight how the observatory data is improving our understanding of coastal ecosystems. Examples provided in this special issue show how the observatories are improving our understanding of sediment resuspension and transport during storms, circulation in enclosed seas, atmosphere ocean coupling, role of mixing in structuring marine food webs, the dynamics and consequences of buoyant plumes into coastal waters, and atmosphere/ocean interactions.

This special issue will hopefully contribute to demonstrating how the expanding network observatories will improve our understanding of coastal ecosystems. This will in turn increase the number of tools available to us to better utilize, manage and sustain our coastal waters. This comes at a critical time, given the increasing human pressures being placed on our coastal waters.

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