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Opinion Article

Oceanographic Processes and Approaches of Various Dimensions in Coastal Ocean System

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DESCRIPTION

The study of the physics, chemistry, ecology, and geology of the "coastal ocean" is referred to as "coastal oceanography." The term "coastal ocean" refers to the 200 Nautical Mile (NM) wide Exclusive Economic Zone (EEZ), a political concept introduced by the United Nations Law of the Sea Treaty (UNLOS) that has practical implications for ocean resource management, both for exploitation and conservation. It also has implications for the funding of basic and applied research, as well as the development and deployment of operational observing and modeling systems. Furthermore, using the EEZ as a defining principle for the coastal ocean is scientifically beneficial because it roughly coincides with the continental margin; that is, the continental shelf, continental slope, and so on and continental rise that shape the dynamics of the coastal ocean estuaries, coastal lagoons, the Great Lakes, and inland seas are frequently included in the definition of the coastal ocean. The marginal and semi-enclosed seas are treated as special cases of the coastal ocean. The topical coverage here is focused on coastal ocean physics, with some references to implications for ecology, chemistry, and geology where appropriate.

Coastal oceans are commonly defined as the areas between the shoreline and the continental margin. They connect the continents to the open ocean and serve as a channel for organic and inorganic, natural and anthropogenic material to be transported from land to sea. Coastal Ocean Systems are subjected to an increasing number of climate and human pressures that affect the sustainability of environmental services and the value of natural capital, such as food production and energy extraction, and thus have an impact on society. The physical, biological, chemical, and human dimensions of coastal systems are all affected by multi-scale interactions and impacts in the Earth system. Understanding, monitoring, and predicting the interactions of Earth processes with the various dimensions of coastal ocean systems. Knowledge of the coastal ocean has historically been critical to the safe and efficient conduct of maritime trade, as well as the defence of coastal nations against maritime power attacks. Concerns about coastal flooding, safe navigation, and the safety of coastal populations and infrastructure have fueled interest in tides, storm surges, tsunamis, and long-term coastal sea level variations over recent centuries. Coastal marine ecosystems are rich and diverse, supporting a large portion of the world's commercial and recreational fisheries. Many parts of the coastal ocean are rich in oil and gas deposits, other minerals, and sand and gravel. Coastal tourism has grown in importance in recent decades, but it is dependent, in part, on the quality of the coastal environment and the abundance of coastal fish. Most rivers, by definition, discharge to the coastal ocean; their discharges include suspended and bed load sediments. As modern agriculture has grown, their discharges have expanded to include fertilizers and pesticides. Their discharges include bacteria and viruses as industrial and municipal waste disposal increases, and as industrialization increases, their discharges include various hydrocarbons, toxins, and carcinogens. Some of these chemicals contaminate the coastal ocean and its ecosystems and sediments others are transferred to the open ocean, deep seafloor sediments, or the atmosphere. With already high and rapidly increasing human population densities in the world's coastal zones, coastal nations are under increased pressure to balance competing uses of the coastal ocean. Furthermore, storm surges and coastal flooding, storm-driven sea and swell, tsunamis, land-falling hurricanes, coastal erosion and deposition, rising sea level due to climate variability and global change, eutrophication, hypoxia, and harmful algal blooms are all natural hazards that threaten human coastal populations, infrastructure, and human health. Only the more developed coastal nations have a working knowledge of their coastal resources and risks, let alone a scientific understanding of coastal oceanography. There is also a severe lack of generally available, ongoing, real-time, and strategic observations for the coastal ocean, as well as supporting modeling activities.

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