

“NASA Global Integrated Ocean Science”

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NASA launched three satellites in 1978 which revolutionized worldwide ocean sciences by demonstrating, for the first time, the new technology required to record global ocean measurements of sea ice, wind speed and wind vector at 10-m height, sea surface temperature (both high-spatial resolution data dependent on clear sky and low-spatial resolution independent of clouds and light rain), near-surface phytoplankton abundance, and sea surface topography. Sea surface salinity was subsequently added to the suite of ocean measurements from space. Platforms for oceanographic measurements from space included uninhabited and inhabited satellites, as well as uninhabited and inhabited aircraft. Continuous improvements occurred in the 1980s (and to the present) in: knowledge of biological, chemical and physical ocean dynamics from sub-meter to ocean basin dimensions; satellite technology; algorithm development; radiative transfer; and, data processing efficiency. These advancements provided the requisite datasets to study the role of global ocean circulation, including its impact on marine living resources and on the new global integrated Earth system science. The late 1980s to early 1990s witnessed the beginnings of time series of satellite ocean measurements, which were initiated solely by NASA, with sufficiently high accuracy and spatial-temporal resolution for weather and seasonal-to-interannual climate impacts on oceanic ecosystems. After a brief historical perspective of NASA oceanography from space, I shall describe examples of NASA's recent contributions to: improved forecasting of hurricanes and typhoons; the socio-economic benefits of diagnosing Arctic sea ice variations; global sea level rise and the debate on the recent global warming hiatus; global and regional ocean currents, including those at depth through depth penetration of surface information with ocean general circulation models; an updated perspective on El Niño and La Niña; the development of operational oceanography; and, generation of new knowledge by worldwide scientists through NASA's adherence to an open data policy.