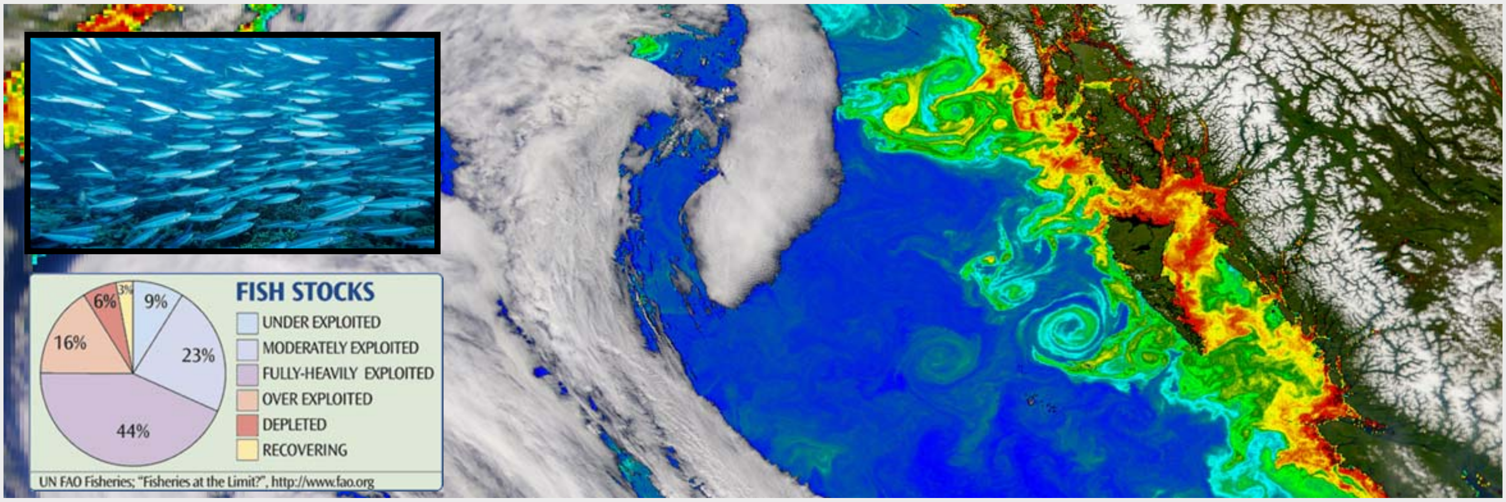
PACE MISSION APPLICATIONS - Marine ecosystem resources: Fisheries



Main panel: Ocean eddies to the west of British Columbia's Queen Charlotte Islands and Alaska's Alexander Archipelago result in high biological activity in the ocean (Image Credit: SeaWiFS Ocean Color image; SeaWiFS Project, NASA/Goddard Space Flight Center, and ORBIMAGE). Upper Inner panel: Fisheries (Photo Credit: ESA, id 289871). Lower inner panel: ~70% of the major marine fish stocks are either depleted, overexploited or being fished at their biological limit (Credit: UN FAO fisheries, http://www.fao.org)

Application Question/Issue: ***How can we improve monitoring of our global ocean resources and their habitat, as needed for implementing ecosystem-based management approaches for productive and sustainable fisheries, safe sources of seafood, the recovery and conservation of protected resources, and healthy ecosystems?***

Who Cares and Why?

The international trade in coastal and marine fisheries contributes $70 billion annually to the US economy (NOAA's State of the Coast). Yet, according to the Food and Agriculture Organization of the United Nations (FAO), 70 per cent of the world's fish stocks for which assessment information is available are reported as fully exploited or overexploited and, thus, require effective and precautionary management.

A wide range of users from the private and public sectors, including NOAA Fisheries, regional Fishery Management Councils, local health departments, global conservation organizations (e.g., WWF), and private fish forecasting companies, are interested in assimilation of earth-observation data into fisheries research and management. Among their major goals is providing services for productive, healthy and sustainable fisheries, assessing the status of fish stocks, ensuring compliance with fisheries regulations, and supporting conservation of protected species.

Needed Measurements

Improved monitoring and forecasting of our global ocean resources and their habitat requires global-scale satellite observations of sea surface temperature (SST), sea surface height (SSH), surface vector winds, and ocean color (e.g., chlorophyll-a, diffuse attenuation coefficient, ocean reflectance, phytoplankton pigments). To meet the needs of the user communities (e.g., NOAA Fisheries), satellite imagery must be at a global scale, medium to high spatial resolution (i.e., 100 m to 4 km at nadir), every 3hrs to daily. Hyperspectral ocean color capability is critical for quantifying phytoplankton biomass and pigments, assessing key phytoplankton groups, and estimating net primary productivity.

The NASA Response

With advanced global remote sensing capabilities (2-day global coverage, extended spectral range, climate-quality hyperspectral observations, high signal-to-noise ratio, reduction in instrument artifacts, and better instrument performance tracking compared to heritage sensors), the PACE ocean color sensor will help refine measurements of primary productivity in coastal and open ocean environments, of phytoplankton pigments and biological communities, and of ecosystem structure needed to help improve the way we use our global ocean resources.

An important application of satellite ocean color imagery is the mapping of ecological boundaries often through delineation of mesoscale ocean features, such as fronts, upwelling currents, gyres and eddies. These mesoscale features cross major sections of our oceans and influence nutrient availability, primary production, distribution and abundance of fish, including commercial species and also protected species such as whales, sea turtles, and salmon. As our planet changes, PACE will provide a unique capability to observe how the spawning habitats of different species of organisms change, and where ecological conditions make life possible for these species as they adjust their range and life cycles. Combined with ancillary data on ocean physical properties, PACE ocean color observations will help us to better understand essential fish habitats and the productivity dynamics of the phytoplankton that forms the base of the global ocean food web.

Comments? Thoughts?

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