Guiding Principles

Observing, monitoring, and understanding the roles of the oceans in weather, seasonal variations, interannual variations (such as El Niño), and beyond is a core mission of NOAA. The oceans cover about 71% of the Earth's surface and contain 97% of the Earth's water. Global ocean conditions profoundly affect weather, the environment, marine ecosystems, and coastal regions where a large fraction of the population lives. The oceans provide vast amounts of food and resources, as well as shipping and transportation. The global oceans also store substantial quantities of heat, nutrients, and key dissolved gasses (such as oxygen and carbon dioxide) that impact the global environment now and in the future. The global ocean circulation (ocean currents) transports these properties around the planet, exchanges significant amounts of heat, water, and key gasses with the atmosphere, and effects variations in sea level. These sea level variations have major impacts on storm surges and coastal populations and infrastructure.

The Global Ocean Monitoring and Observing Program (GOMO) collects and analyzes global ocean data critical for real-time analysis and forecasting for navigation, commerce, and agriculture. Further examples include: resource extraction (e.g., oil and gas), naval operations, weather and extreme events (including hurricanes, floods, and drought), climate, search-and-rescue operations, tracking and responding to oil spills, management and understanding of fisheries and ecosystems, as well as coastal flooding and storm surge prediction and preparation.

The strategic objectives of GOMO cannot be achieved without international and interagency partnerships. The size of the ocean observing challenge is such that NOAA alone cannot meet the need and must cooperate with others in building ocean observation networks. Remote sensing from satellites and aircraft provides key data sets that complement and complete in situ observations made by GOMO and its partners. Therefore, it is critical to maintain and build partnerships with satellite data providers and in situ ocean observers in the USA and internationally.

Based on these needs, GOMO manages the following activities:

1. Observe and monitor the ocean's role in environmental variability and change. Collect and provide ocean observations critical for real-time analyses and forecasting over timescales from days through seasonal, interannual, and longer timescales and develop high quality data sets for monitoring long-term changes. These are some of the essential ocean variables that are monitored, with reasons for their importance:
    a. ***Ocean temperature*** is important for understanding and predicting variations in weather, climate, sea level, sea-ice, and marine ice sheets, as well as environmental changes relevant to marine ecosystems.
    b. ***Ocean salinity*** is a key indicator of variations in Earth's hydrological cycle (e.g. rain and droughts), sea ice, and marine ice sheets. It is also important in setting ocean stratification, which affects air-sea fluxes of heat (important for weather and climate)

and dissolved gasses such as carbon and oxygen (important to marine ecosystems and climate).

c. ***Ocean circulation*** transports heat, freshwater, nutrients, and dissolved gasses around the planet, playing an important role in variations in weather, climate, sea level, sea-ice, marine ice sheets, and marine ecosystems.
d. ***Sea level changes*** and extremes are of vital importance to coastal communities, and are affected by ocean temperature, salinity, and circulation.
e. ***Ocean Biogeochemistry*** - *carbon* and other nutrients are key in uptake and storage of atmospheric carbon and play important roles in change in ocean biogeochemistry and marine ecosystems (e.g., ocean acidification).
f. ***Air-sea fluxes*** of heat, water, momentum, and gasses including carbon dioxide and oxygen are tightly linked to ocean variations in temperature, salinity, circulation, carbon, and oxygen. These fluxes are the link to the atmosphere, hence impact weather and longer-time scale environmental variations.
g. ***Sea ice variations*** have strong effects on ecosystems, weather, climate, and navigation by changing the ability for the ocean to exchange heat, water, circulation, and gasses with the atmosphere and by altering surface reflectivity.
h. ***Arctic atmospheric and oceanic conditions, along with ecosystems,*** are changing rapidly. Sustained measurements to understand and monitor these changes are required to inform local and national policy decisions and help determine their impacts on temperate latitudes.

2. Identify and implement collection of key ocean data sets and *develop indicators* that best monitor and communicate the characteristics and effects of variability observed in the oceans, Arctic, and their effects on the broader environment.
3. Assess the impact of observations and tailored information products for stakeholders (e.g., scientists, forecasters, policymakers, and the public).