DEEP OCEAN OBSERVING STRATEGY

Physics & Climate

The Deep Ocean Observing Strategy (DOOS) is being developed under the auspices of the Global Ocean Observing System (GOOS), and will embrace observations below 200 m.

As a GOOS Project, DOOS will be aligned with the Framework for Ocean Observing (Framework). In 2012 the GOOS adopted the Framework as a guide for GOOS activities and alignment. The purpose of the Framework is to assist in the development and delivery of an integrated ocean observing system fit for many purposes.

The Framework describes a clearly defined structure that allows ocean observing providers and users to plug-in at various points within the system. It traces a path from Inputs (requirements or EOVs) to Processes (observations), to Outputs (data and products). To maintain an ocean observing system that is fit-for-purpose, the outputs must properly address the issues that drove the original requirements. This creates a constant feedback loop such that requirements are always science driven and informed by societal needs; and that EOVs are part of the system that responds iteratively to this evolving set of science and societal needs.

A focus on measuring EOVs provides a way for all stakeholders to speak a common language fostering collaboration in this highly voluntary system. EOVs are identified based on how feasible they are to observe and their level of scientific or societal impact. Targeting investments based on EOVs, in conjunction with the evaluation and encouragement of improved readiness levels for sustained observations, ensures a path for research and innovation to shape the evolution of GOOS.

Physics and Climate EOVs

GOOS is organized by the user-driven requirements of EOV observations for the following Earth system needs:

- Monitoring the climate system;
- Detecting and attributing climate change;
- Assessing impacts of, and supporting adaptation to, climate variability and change;
- Application to national economic development;
- Research to improve understanding, modeling, and prediction of the climate system.

The Physical EOV observational requirements can be satisfied in a number of different ways using a variety of sensors and observational platforms. To meet the Physical EOV requirements (spatial and temporal) and to provide the greatest resilience of the observing

system, the ocean observing system is coordinated through global networks which are organized around a particular platform or observing approach (e.g. satellite constellations, Argo profiling floats, OceanSITES time series sites, etc.) and with defined missions and implementation targets.

Different observing networks monitor ocean EOVs globally, but at varying temporal and spatial scales, depending on requirements and feasibility. Sustaining observations of EOVs relies on the existence of a range of different platforms equipped with a range of different sensors.

GOOS Physical EOVs

GOOS Physical EOVs of physical ocean environment include:

- Temperature (surface and subsurface)
- Salinity (surface and subsurface)
- Currents (surface and subsurface)
- Sea Level
- *Sea State
- Sea Ice
- Ocean Surface (Vector) Stress
- Ocean Surface Sensible and Latent heat fluxes

*All of these existing GOOS EOVs are relevant to the deep ocean, except for Sea State.

DOOS Physics & Climate EOVs

For the deep ocean the EOVs must be able to provide observations that answer deep-ocean observing driving scientific questions. These include (but are not limited to):

- The role of the deep ocean in the earth's energy balance and freshwater cycle; Sea level rise
- The ocean ability to redistribute key climate variables and the change and variability of this circulation, namely the (deep) global overturning circulation
- Ocean-Atmosphere-Ice processes at high latitudes leading to deep water mass formation
- Severe events – sediment transport in canyons and continental slopes to the deep ocean

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Given the unique science drivers for the DOOS additional EOVs must be added to the GOOS EOV list. These DOOS specific EOVs are:

- Ocean turbulence
- Ocean Bottom Pressure
- Geothermal Fluxes
- Ocean Bottom Boundary Fluxes

Next Steps

For the deep ocean, it is important to design an observing system that encapsulates the required temporal and spatial scale for each of the relevant GOOS EOVs and additional DOOS EOVs that meet the requirements of key deep ocean scientific questions.


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