Boundary Ocean Observation Network for the Global South

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ABSTRACT

The UN Decade of Ocean Science for Sustainable Development should establish a Boundary Ocean Observing Network (BOON) for the Global South. The BOON is part of the OceanGlider Program which is part of the Global Ocean Observing System (GOOS). The BOON is a network of established timeseries transects collecting long term data sets. Timeseries are critical for making immediate operational decisions and for identifying long term trends of anthropogenic global environmental change. The network has proven important enough to continue observations and expand them. Due to resource and expertise limitations, expanded locations are in similar locations. The UN should build on this success and establish a BOON for the Global South. The same benefits will be garnered by countries and regions that have been missing out. Increased observation coverage will benefit humanity, improving understanding of the Ocean-Climate System, e.g. leading to improved climate prediction models. The UN will facilitate activities to realize a BOON for the Global South including: coordinating local scientists, partnering scientific and technical experts with local scientists, identifying new affordable and easy-to-operate technologies, channeling funds for initial and ongoing costs, and building a framework to continue the BOON-GS long after the Ocean Science Decade.

Vision and Potential Transformative Impact

The Boundary Ocean Observation Network (BOON) is part of the OceanGlider initiative. BOON coordinates existing observation networks at ocean basin boundaries and designates locations for additional timeseries. The desired additional BOON transects are in geographically similar locations to existing lines meaning both observations and researchers will be similar to ongoing efforts. While the program is incredibly useful, more boundary observations in more varied places are needed. The existing program is successful, making it a good example for global expansion.

The UNDOSSD should establish BOON-Global South, an observation network across South America, Sub-Saharan Africa, and the Indian Ocean emulating the BOON transects. BOON-GS locations may require varying levels of scientific, technical, and financial assistance. Building capacity will benefit local communities through investment and education. New scientific voices will bring regional knowledge and perspectives into the global conversation. UNDOSSD partners need to 1) establish BOON-GS objectives, locations, & researchers 2) provide local institutional support, 3) identify new technologies to reduce observational costs, 4) connect new researchers with ongoing BOON researchers to overcome technological and scientific challenges, and 5) incorporate BOON-GS data into automated Data Acquisition Centers (DAC), and 6) realize educational opportunities for students from grade school to graduate school.

Realizable, With Connections to Existing U.S. Scientific Infrastructure, Technology Development, and Public–Private Partnerships

BOON-GS is realizable as an extension of the existing BOON program. It has a successful approach. There is a functioning team overseeing the coordination. To make BOON-GS more than just another research opportunity for Western researchers, active and systematic capacity building is required. Capacity building could include: Local/Regional Researcher partnerships with established Research Groups, funding/support for technologies to conduct observations (e.g. underwater gliders, coastal HF radar, etc.), providing a UNLOS ship periodically for more intensive observations. The benefits of the BOON would be recreated for newly incorporated regions, including: integrating BOON-GS researchers into a global community, providing research opportunities for GS academic groups, and building up scientific groups in critical regions where capacity is lacking. In the future, some locations could be selected for a full observatory similar to OOI Endurance Array.

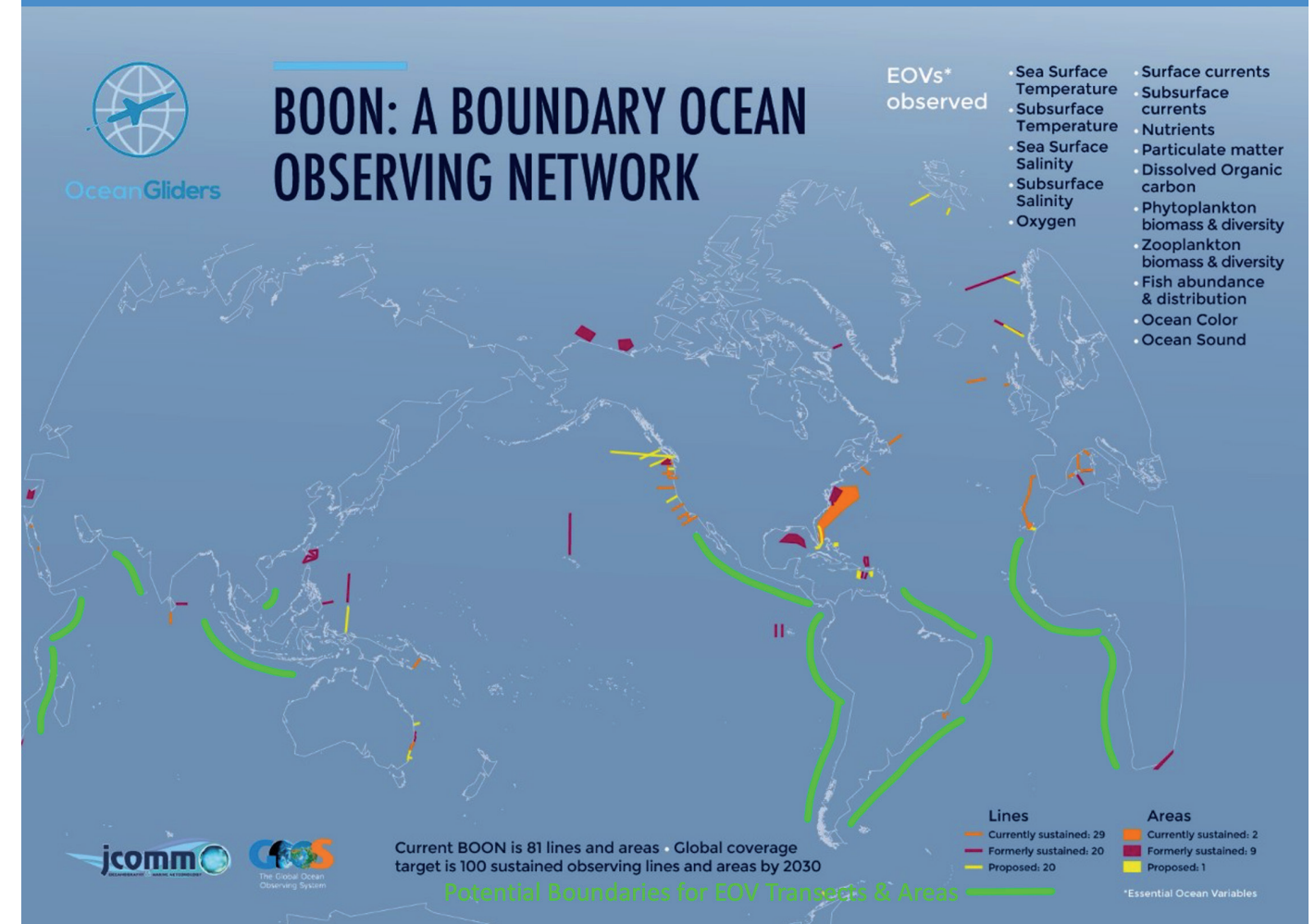## Scientific/Technological Sectors Engaged Outside of Traditional Ocean Sciences

New ocean observation technologies will need to have lower initial investment costs, present lower maintenance effort, and require less operational personnel. Data handling and data observations will be critical for BOON-GS, but the software expertise can arise from non-ocean sectors. Deployments and recoveries of autonomous vehicles and sensor platforms will require hiring local vessels. The data collected will be of tremendous importance to local communities.

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BOON: A BOUNDARY OCEAN OBSERVING NETWORK

EOVs* observed
- Sea Surface Temperature
- Subsurface Temperature
- Sea Surface Salinity
- Subsurface Salinity
- Oxygen
- Surface currents
- Subsurface currents
- Nutrients
- Particulate matter
- Dissolved Organic carbon
- Phytoplankton biomass & diversity
- Zooplankton biomass & diversity
- Fish abundance & distribution
- Ocean Color
- Ocean Sound

Lines
- Currently sustained: 29
- Formerly sustained: 20
- Proposed: 20

Areas
- Currently sustained: 2
- Formerly sustained: 9
- Proposed: 1

*Essential Ocean Variables

Current BOON is 81 lines and areas · Global coverage target is 100 sustained observing lines and areas by 2030

Potential Boundaries for EOV Transects & Areas

The water mass data will support pollution spill tracking. Ecological data will aid sustainable fishing (e.g. upwelling information) and provide baseline information necessary for establishing marine protected areas. Better understanding of marine ecology, especially as it changes, ultimately promotes food security. Observations can track hazards, such as Harmful Algal Blooms (HABs) and anoxic upwelling events.

Opportunities for International Participation and Collaboration

Three phases of operation each present opportunities for international participation and collaboration. First, setting up the program: identifying research partners and observation locations, identifying key technologies, performing initial baseline data collection including geophysical maps, and procuring technologies. Second, operating the program: helping kick-off operations, supporting data handing & QC, and providing guidance on best practices for maintaining a transect. Third, long-term collaboration: teaming up for multi-region research papers, launching new research efforts

based on findings, and integrating new observations & findings into global climate models.

Develops Global Capacity and Encourages the Development of the Next Generation of Ocean Scientists, Engineers, and Technologists

The BOON-GS will build capacity providing new funding, new technology, and new opportunities for scientific researchers and their university students. Several actions can further build capacity. The collected data and the data portal could be utilized in classrooms to help teach mathematics, basic sciences, and introductory earth sciences. BOON-GS Glider deployments could be merged with onboard field trips, similar to Ocean Inquiry Project, which also collect transect data (e.g. water chemistry samples, plankton net tows, etc.). If the research organization facilities become a center of community education with a physical classroom, important environmental information can be disseminated to the public.