Towards a Distributed System for Essential Variables for the Southern Ocean

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Abstract

The Southern Ocean (SO), delinated to the north by the Antarctic convergence, is a unique environment that experiences rapid change in some areas while remaining relatively untouched by human activities. At the same time, these ecosystems are under severe threat from climate change and other stressors. While our understanding of SO biological processes (e.g., species distributions, feeding ecology, reproduction) has greatly improved in recent years, biological data for the region remains patchy, sparse, and unstandardised depending on the taxonomic group (Griffiths et al. 2014).

Due to the scarcity of standardised observations and data, it is difficult to model and predict SO ecosystem responses to climate change, which is often accompanied by other anthropogenic pressures, such as fishing and tourism. Understanding the dynamics and change in the SO necessitates a comprehensive system of observations, data management, scientific analysis, and ensuing policy recommendations. It should be built as much as feasible from current platforms and standards, and it should be visible, verifiable and shared in accordance with the FAIR (Findable, Accessible, Interoperable, and Reusable) principles (Van de Putte and Griffiths 2021). For this we need to identify the stakeholders' needs, sources of data, the algorithms for analysing the data and the infrastructure on which to run the algorithms (Benson and Brooks 2018). Existing synergistic methods for identifying selected variables for (life) monitoring include Essential Biodiversity Variables (EBVs; Pereira and Ferrier 2013), Essential Ocean Variables (EOVs; Miloslavich and Bax 2018), Essential Climate Variables (ECVs; Bojinski and Verstraete 2014), and ecosystem Essential Ocean Variables (eEOVs; Constable and Costa 2016). (For an overview see Muller-Karger and Miloslavich 2018.) These variables, can be integrated into the Southern Ocean Observation System (SOOS) and SOOSmap but also national or global systems (e.g., Group on Earth Observations-

Biodiversty Observation Network (GEO-BON)). The resulting data products can in turn be used to inform policy makers.

The use of Essential Variables (EVs) marks a significant step forward in the monitoring and assessment of SO ecosystems. However, these EVs will necessitate prioritising certain variables and data collection. Here we present the outcomes of a workshop organised in August 2023 that aimed to outline the set Essential Variables and workflows required for a distributed system that can translate biodiversity data (and environmental data) into policy-relevant data products.

The goals of the workshop were:

1. Create an inventory of EVs relevant for the Southern Ocean based on existing efforts by the GEO-BON and the Marine Biodiversity Observation Network (MBON).
2. Identify data requirements and data gaps for calculating such EVs and prioritise EVs to work on.
3. Identify existing workflows and tools.
4. Develop a framework for developing the workflows required to turn public biodiversity data into relevant EVs.

Keywords

data standard, data gap

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Presented at

TDWG 2023

Conflicts of interest

The authors have declared that no competing interests exist.

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