

Editorial

MDPI *Oceans*: A New Publication Channel for Open Access Science Focused on the Ocean

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Received: 1 August 2019; Accepted: 7 August 2019; Published: 12 August 2019



The ocean is the most important subsystem of the Earth's climate system and functions as its heart, regulating the energy distribution of the planet. It has absorbed more than 90% of the energy accumulated since 1971 and about 30% of the emitted anthropogenic carbon dioxide. As a result, water temperature rises and oceans acidify and deoxygenate, which lead to changes in oceanic circulation and biogeochemistry, to rising sea levels, to more extreme weather events, to shifts in the distribution of species and migratory routes, and to loss of species and habitat diversity. Awareness of the importance of oceans for the sustainability of the global human population is increasing, including the conservation of biodiversity and its legacy to future generations [1]. For instance, oceanic organisms are more vulnerable to warming than terrestrial ones, as the former are generally at temperatures near their upper thermal limits and lack of thermal refuges [2]. Half of the atmospheric carbon fixed annually in natural systems is cycled into the ocean mainly by the biological carbon pump in the open ocean, but some of the main areas capturing and storing this carbon (as mangroves, seagrasses, salt marshes, and coastal upwelling ecosystems) cover less than 3% of the world's ocean surface [3]. Particularly,

eastern boundary upwelling systems are highly productive ecosystems, with up to 40% of the reported global fish catch [4].

In addition, there are growing human pressures on the ocean and on its resources. Today, the coastal zone has the largest economic importance in human history [5] and the number of initiatives to use the ocean and its resources grow each year. However, fishery productions stabilized at 90–95 million tons since the mid-1990s, but global aquaculture production and the world trade of fish and fishery products rapidly increased in response to rising demand. These activities depend on healthy ecosystems, but the impacts of climate change and other anthropogenic pressures challenge their resilience and adaptive capacity at the local and regional scales [6]. Human activities also alter the amount and spatiotemporal distribution of nutrients and toxins delivered to the ocean [7].

Knowledge of the ocean's functioning, including their physical, chemical, biological, and geological processes, is critical for the management and sustainable use of its ecosystems. However, large areas of the oceans are still poorly studied, particularly taking into account that the responses of the ocean to the impacts have timescales ranging from days to decades and more and over several magnitudes of spatial scales. Despite several decades of research, the impact of oceans on maritime aerosol and cloud and, therefore, the climate is still poorly defined [8]. Sustained ocean observations (e.g., use of research vessels, autonomous and remotely operated vehicles, and remote sensing) are required not only to monitor marine processes and ecosystems but also to develop and validate numerical models to understand past and present-day states and to predict future climate and ocean health. Most of the observations spanning several decades are concentrated in the coastal zone of the northern hemisphere, leaving most of the ocean largely unobserved [9]. This is particularly critical for marine physical and geological hazards and biological and biogeochemical data, which would need a more globally distributed network of observations to assist in the differentiation between natural and anthropogenic processes [10]. Predictions of the future ocean and adaptation to global change will require a correct description and understanding of trends, sources of uncertainty, tipping points, thresholds, points of no return, cumulative impacts, acclimation, and adaptation, among other issues [11].

For instance, there is a need to address the role of biodiversity in maintaining the functionality of ocean ecosystems, understanding the impacts caused by global change and the relationships between human pressures and ecosystems, assessing marine ecosystems health in an integrative way [12]. Ecosystem services must be delivered after conserving and protecting ecosystem structure and functioning through restoration, managing the ocean resources using the ecosystem approach, and spatial planning. Because of its paramount importance in the sequestration of carbon by the ocean, more research will be required to advance our understanding of the physical, geological, chemical, biological, and biogeochemical mechanisms regulating the export and reprocess of organic matter in the ocean [13]. The role of food web properties in the regulation of export and predator–prey interactions as well as the role of organisms traditionally poorly constrained in models and budget estimations as viruses and parasites or gelatinous organisms (e.g., salps and jellyfish) must be considered. In addition, the rates of transformation between the particulate and dissolved pools must be quantified in a wide range of spatial and temporal scales, taking into account episodic events (e.g., salp blooms) that remain unpredictable but may have profound implications for the overall flux of organic matter into the deep ocean.

In recent decades, marine geosciences have expanded global observation networks and data archives, with new challenges derived from the effective handling and use of multidisciplinary observations. Paleoscience has substantially contributed to a better understanding of how the Earth's climate system works, by introducing new concepts that redefined our perception of the underlying processes [14]. Improving knowledge on the response and coupling of the climate system under past climate conditions beyond the instrumental period is essential for a risk assessment of what the future might bring and fundamental to develop strategies for a sustainable management. There is also an increasing effort in forecasting geohazards (e.g., submarine landslides and earthquakes and their related tsunamis) [15]. In turn, improving the efficient use of geological resources and energy will

require new developments in marine engineering and shipbuilding industries, adapted to meet the new challenges in energy production systems, transportation, and extraction of marine minerals. Additional developments are expected to increase the incorporation of new and emerging technologies for ocean observation, more efficient data management systems, and appropriate models and services, allowing, for instance, to improve seafloor and subseafloor mapping, sediment and rock sampling, geological and geophysical imaging, turbidite paleoseismology, and geochemical fluid-flow measurements [16].

While the list of challenges presented above is not exhaustive, it shows the need for making available ocean observation knowledge (including data) to effectively address local, national, and global challenges, including ocean and climate forecasting; to manage ocean biodiversity, fishing, and geological and mineral resources; and to mitigate the impacts of climate change and ocean acidification. Today, the translation of scientific findings into information that can be used for management is of crucial importance. The scientific community should aim to bridge the gap between science and practical applications of such knowledge (i.e., ocean governance). This will require multi- and interdisciplinary approaches and networks improving the application of new technologies and data handling processes (e.g., artificial intelligence and big data developments) along with the expertise of specialists to address global and complex issues in ocean science and technology.

The need for an improved ocean knowledge is shown by the increase in scientific articles in recent years (Figure 1). While the number of journals listed under the categories “oceanography”, “fisheries”, and “ocean engineering” was almost constant between 2013 and 2017, the number of articles published in these journals increased and, more importantly, the number of cites increased even at faster rates. However, most of these articles were accessible only through subscription or specific fees to the editorial companies. Articles freely accessible under open access or similar policies can increase their impact by almost doubling the rate of cites, when considering journals in the “oceanography” category (Figure 2). Taking into account that there is a large fraction of ocean science that is published also in generalist journals (e.g., marine and freshwater research), the number and impact of citations of articles on ocean research in recent years is likely even higher. The benefits from open access publishing include enhanced data discovery, open discussion, and facilitation of the emergence of new paradigms.

The new MDPI *Oceans* journal provides an advanced forum specifically addressed to studies related to all branches of oceanography with an emphasis on the functioning of the ocean and the sustainable use of its resources and ecosystem services. Contributions will focus on new field and experimental data on ocean geosciences, physics, biogeochemistry, and ecology as well as on new results from theoretical research and modeling and on new specific methodological approaches. Authors are also encouraged to submit the original raw data to international repositories for further use and amplification of their findings. The scope of the journal includes (but is not limited to) the following:

- Ocean geosciences
- Ocean climate and meteorology
- Paleoceanography
- Ocean circulation
- Ocean chemistry and biogeochemistry
- Ocean ecology and biology
- Ocean resources (e.g., fisheries, aquaculture, and mining)
- Ocean engineering
- Ocean modeling
- Ocean governance

The journal is devoted specifically to the oceans research, thus complementing other areas of research in the MDPI group. With the enthusiastic commitment of the editorial board for rapid and fair review, editorial processing, and publication of the best ocean science considering either local, regional, or global scales, MDPI *Oceans* will contribute to filling the gap of the required knowledge of the ocean.

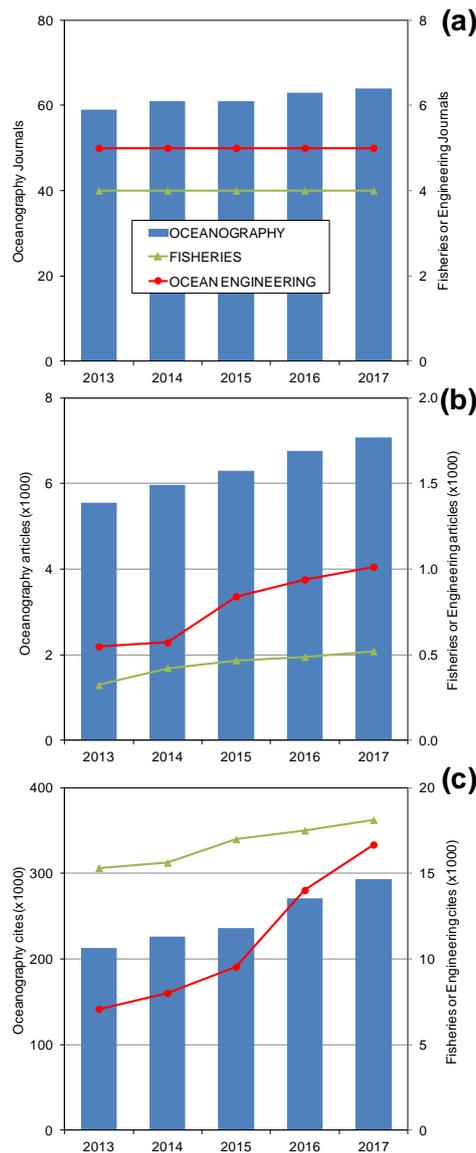


Figure 1. Variation of (a) number of journals, (b) articles, and (c) citations of publications indexed under the categories oceanography, fisheries, and ocean engineering for the period 2013–2017. Source: Journal Citation Reports, © Clarivate Analytics.

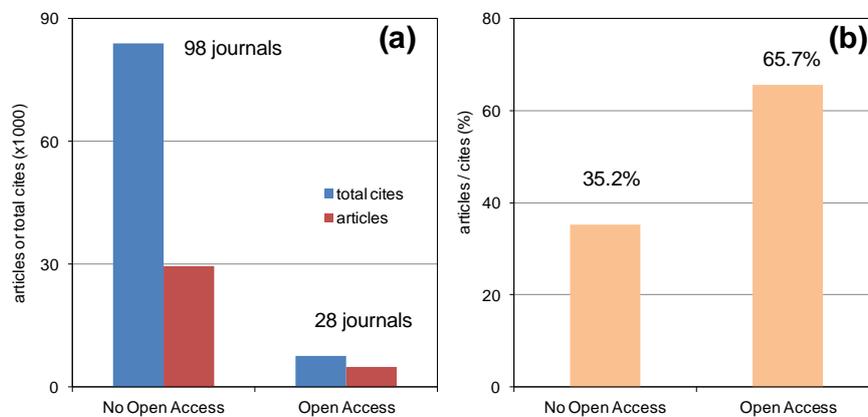


Figure 2. Number of total citations received in 2018 by articles published in journals indexed under the category “oceanography” for the period 2015–2017 (a). The number of journals is indicated above the bars. Gross percentage of articles cited in 2018 computed from the total number of articles published and cited (b). Source: SCImago Journal & Country Rank (<http://www.scimagojr.com>).

Author Contributions: A.B. (Antonio Bode) conceived and designed the content. All coauthors contributed equally to this editorial letter.

Funding: No external funding was received.

Conflicts of Interest: The authors declare no conflict of interest.

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