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Observations, Diplomacy, and the Future of Ocean Governance

Jan-Stefan Fritz

"We know less about the ocean's bottom than about the Moon's back side."

—Attributed to Roger Revelle, a University of California, San Diego, scientist who was a pioneer in the study of global warming[1]

Since the 1950s, scientists have begun countless presentations with this pithy aphorism in order to impress on audiences the neglected importance of ocean science. Recently, it has been used with particular frequency to advocate more detailed and systematic collection of data and information about the oceans.[2] Proponents argue that sustained ocean observation should complement traditional ocean research, much as satellite applications complement human spaceflights, to deliver the best scientific data and knowledge for policy making. Enlisted in this task are infrastructures known as ocean observatories, which collect data and information usually for scientific (e.g., to understand ocean dynamics) or operational (e.g., for shipping or weather forecasting) purposes. While a number of ocean observation systems exist, the budgetary and institutional requirements of collecting data from remote and hostile sites on Earth is so high that most of these operate on politically and financially modest or uncertain foundations. This may be about to change. To the surprise of many observers, in 2015 the leaders of

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the G7 industrialized states agreed on a declaration that specifically highlights the importance of ocean science. In 2016, their science ministers agreed to support an ocean observation initiative as a means of providing scientific evidence for more appropriate policy making.

Given unprecedented international political interest in their work, members of the marine scientific community are under great pressure to produce what are deemed by governments to be useful research findings. The G7 recommendation comes in a period of raised governmental and commercial interest in the oceans and increasing reports of a decline in their environmental quality. Whereas the strains in international relations are often highlighted in public, for example conflicts over various regional seas, the international community has simultaneously taken positive steps, such as agreeing to discuss strengthening environmental governance of the oceans. Marking the greatest sign of such interest is the agreement at the United Nations in 2015 to include a separate goal (no. 14) for the oceans in the Sustainable Development Goals. This goal seeks to "conserve and sustainably use the oceans, seas and marine resources for sustainable development." As an initial step toward implementing this goal, the UN General Assembly has agreed to hold a first global conference on the oceans in June 2017 in New York City. In parallel, negotiations for an agreement under the UN Convention on the Law of the Sea concerning the use of marine biological resources and separate negotiations on the exploitation rules for deep-sea minerals are under way. Ocean science is identified as a key area of focus in all of these negotiations.

Against this background, the time seems right to launch a global science-based effort to collect data and information about the state of the oceans. In fact, a 2010 report by the Royal Society and American Association for the Advancement of Science argued that "international spaces beyond national jurisdictions—including Antarctica, the high seas, the deep sea and outer space—cannot be managed through conventional models of governance and diplomacy, and will require flexible approaches to international cooperation, informed by scientific evidence and underpinned by practical scientific partnerships."[3] If a global ocean observation initiative is to successfully deliver on such an expectation, a bridge must be built between the science-based partnership and the intergovernmental process.

This article explores the current G7 proposal for a global ocean observing initiative and the challenges and opportunities that may arise from vis-à-vis interstate competition and cooperation. Given that states use data and information from the oceans to compete as well as cooperate, the article argues that science diplomacy is a useful conceptual tool to reflect on and shape relations between scientific and policy communities. It concludes that the proposed global ocean observing initiative is a valuable test case for the role of science in shaping interstate relations in their governing of ocean spaces beyond national jurisdiction.

A Time of Great Expectations

A recent report by the Organisation for Economic Co-operation and Development (OECD) estimated that the ocean economy is worth at least $1.5 trillion and that, in the future, "scientific and technological advances are expected to play a crucial role both in addressing many of the ocean-related environmental challenges...and in the further development of ocean-based economic activities."[4] It is precisely these developments—both the environmental and economic—to which ocean observatories are expected to contribute data and information. Generally speaking, ocean observatories are defined as "suites of instruments and sensors with long-term power supplies and permanent communications links that can feed data to scientific laboratories and the Internet."[5] In practice, such observatories take on myriad forms, from site-specific, cabled infrastructures to global, decentralized collections of instruments. The partners, legal frameworks, funding, and purposes vary from observatory to observatory, but all share a focus on collecting long-term, systematic data series. Over the past few decades, dozens of observatories have been launched around the world. Some of the most prominent include the Tropical Atmosphere Ocean network of moorings, which collect data related to El Niño and La Niña; the Argo global system of more than three thousand floats, measuring currents and other data; and the Neptune cabled observatory off Vancouver Island, which acts as an early-warning mechanism for earthquakes and tsunamis.

The U.S. Ocean Observatories Initiative (OOI) is perhaps the best example of the ambitious nature of ocean observation and the challenges faced in implementation. Funded by the U.S. National Science Foundation, the OOI is described as a "networked infrastructure of science-driven sensor systems to measure the physical, chemical, geological and biological variables in the ocean and seafloor as well as the overlying atmosphere, providing an integrated system collecting data on coastal, regional and global scales."[6] It serves principally scientific purposes and engages in an active educational campaign but does not provide operational services for either government or commerce. After several years of construction, in mid-2016 the initiative began delivering real-time data from more than nine hundred sensors at seven sites in U.S. coastal seas.[7] This success, however, has been tempered by controversy. Dubbed "Oceanography's Billion-Dollar Baby" by Nature, the project's construction cost is estimated to cost $386 million, after which the program will consume about $55 million per year for operations and maintenance. By the end of its planned twenty-five-year lifetime, the OOI will have cost nearly $1.8 billion.[8] Criticism of this budget has been widespread, even from within the scientific community. A recent evaluation led by the Ocean Studies Board of the U.S. National Research Council recommended that funding be cut by up to 20 percent on grounds that the observatory was useful, but not essential, to ocean science.[9]

Given the challenges facing ocean observatories, recognition exists within the research community that technical ambition and scientific excellence must be balanced with a promise of societal value. Nevertheless, the addition of ocean sciences to the G7 summit declaration in 2015 demonstrates an enduring expectation that ocean observatories can be central in providing data and information for informed decision making. While references to ocean science in the declaration are thematically specific, focusing on marine litter and deep-sea mining, the science ministers subsequently agreed to broader language stating that "a step change in approach is required if we are to address the challenges our seas and oceans face."[10] Informal discussions in winter of 2015–16 saw states calling for a "CERN for the oceans" (a British proposal)[11] and "a new G7/global initiative for conservation and sustainable use of the oceans, seas and marine resources" (a Japanese proposal). In the process, the science ministers shifted from narrowly defined themes to a more general focus on the collection, management, and analysis of data and information from the oceans.

At their May 2016 meeting in Tsukuba, Japan, the G7 science and technology ministers agreed to support a global ocean observation initiative. Under the heading "The Future of the Seas and Oceans: Toward Science-Based Management, Conservation and Sustainable Use of the Oceans, Seas and Marine Resources," the Tsukuba Communiqué encompasses two elements: a set of broad expectations and a list of concrete actions. The expectations can be summarized as follows: First, the ministers note that the "health of the oceans has rightly been recognized as a crucial economic development issue and was included as [a] United Nations sustainable [development] goal 14 (SDG 14)." Second, they agree that a means to this end is the science-based management, conservation, and sustainable use of the ocean and its resources. In turn, they link this approach with the belief "that it is crucial to develop far stronger scientific knowledge necessary to assess the ongoing changes and their impact on economies" and that "appropriate policies [must be developed] to ensure the sustainable use of the seas and oceans." Finally, given that "many parts of the ocean interior are not sufficiently observed," the ministers agree to "support the development of an initiative for enhanced global sea and ocean observation required to monitor inter alia climate change and marine biodiversity."[12]

The concrete actions agreed upon in Tsukuba include four related to ocean observatories: (1) supporting an initiative for enhanced global sea and ocean observation; (2) promoting open science and the improvement of the global data-sharing infrastructure; (3) strengthening regional observing capabilities and knowledge networks, especially in developing countries; and (4) promoting increased G7 political cooperation to enhance future routine ocean observations. While such actions indicate a strong willingness to support ocean observatories, the G7 has not yet decided what its initiative will look like in practice. Nor has a decision been made on what other countries to involve, although through the

participation of the European Commission, interested European Union member states will be invited and the desire exists to involve the G20 major economies. However, the ministers did agree that, ultimately, the proposed initiative should fulfill the expectations just outlined, namely to: collect data on not-yet-sufficiently-observed areas of the ocean; provide knowledge to assess the economic impact of changes in the ocean; and provide knowledge for appropriate policies. At present, the Italian government, which holds the G7 presidency in 2017, has stated in preparatory meetings that it will keep oceans on the agenda, and in preparation, a number of expert working groups on ocean observatories have been appointed.

Bridging the Science-Policy Gap

An important task in 2016–2017 will be to manage the great expectations of ocean observing by defining the relationship between science and policy. During this period, various proposals will presumably begin to shape the international ocean observatory initiative. While speculating about the final form of an initiative is futile at this stage, it is entirely worthwhile to analyze expectations and challenges likely to be faced during implementation. Specifically, the proposed initiative is expected to bridge everything from collecting data about the state of the oceans to informing what are termed "appropriate" policies.

Indeed, one of the key questions already facing the ocean observing community is what role data and knowledge ought to play in ocean governance and decisions concerning the conservation and sustainable use of ocean resources. On this count, data and knowledge about the oceans are fundamentally intertwined with the ways in which states and societies govern the global oceans. However, the role of data and knowledge has been ambiguous to date. The more humankind has learned about the oceans, the more states have entered the ocean realm to claim its space and exploit its resources. In the observation of one legal scholar, the "foundations of today's law of the sea are basically the product of often-antagonistic struggles among and between dominant human forces. These forces have produced impressive technological capabilities and made possible the modern way of life in industrialized societies, but ultimately they also seem to threaten the stable Holocene state."[13]

Simultaneously, increased knowledge about the impact of human actions on the oceans has led to calls to govern the ocean and to use its resources more responsibly. Much as weather data has provided the basis for sophisticated meteorological analyses and improved predictive capacities, the Intergovernmental Oceanographic Commission (IOC) sees the "scientific knowledge acquired through sustained ocean observations [being] applied through early warning for ocean-related hazards, climate forecasts and projections, ecosystem management and assessments and ocean governance."[14] In line with this view, the broader scientific community engaged in ocean observations profoundly recognizes the need for

societal relevance. A 2009 IOC-endorsed ocean observing community strategy paper, titled A Framework for Ocean Observing, states that global ocean observing should "address both ocean research and societal needs. These include the growing concerns of national and international decision-makers, and the public at large, regarding reliable sources of factual and unbiased information on the state of the ocean to inform needed decisions and services."[15] To this end, a number of initiatives already exist addressing most of the expectations raised by the G7 science ministers.

Regarding the need for more knowledge about the insufficiently observed areas of the oceans, countless experts and observers support such an endeavor. However, given limited budgets and the logistical complexity of conducting ocean research, the marine scientific community is engaged in an almost perpetual debate as to which data should be collected in order to best characterize the oceans. Perhaps the most widely accepted list of essential data types was defined under the auspices of the Global Ocean Observing System, a mechanism cosponsored by a number of UN bodies and the International Council for Science. Referred to as Essential Ocean Variables, the list contains approximately thirty physical environmental variables for which quantitative data can be collected. While no formal agreement exists on exactly which data types should be included on the list and which excluded, these variables can be described as sets of data needed to understand the functioning of and changes in the ocean system, including human impacts—though, to date, no socioeconomic data are included. While agreeing such a list is more or less straightforward, the practical implications of deciding which data to collect with limited funds and to ensure societal relevance will require an extensive dialogue about "which data should be collected for which purpose." While the G7 ocean observation initiative is not at a stage where decisions about such questions can be made, proponents of ocean observing can realistically expect a lively debate about which data ought to be collected and what these should indicate about the state of the oceans.

The second expectation presently being addressed involves the interrelationship between the ocean and economy, especially in light of potential changes in the ocean. In recent years, a number of high-profile reports on the ocean economy have been published by such organizations as the World Wildlife Fund (WWF) and OECD.[16] Although such reports offer some broad figures on the presumed size of the ocean economy, the OECD project team, for example, encountered such a dearth of statistics on the ocean economy that they created a new OECD Ocean Economy Database for their report. Moreover, the lack of data has complicated efforts to estimate the costs and benefits to the ocean economy from investments made in ocean observing. In short, data are lacking about the oceans and how humans create value from them. Ultimately, the quandary is whether the benefits of knowing more about the oceans would outweigh the substantial costs of collecting relevant data and information.

In order to better understand the opportunity costs of investing in data collection, a joint effort is being initiated between the European-funded AtlantOS project and the OECD Future of the Ocean Economy project. AtlantOS is a pan-Atlantic research project funded largely by the European Union's 2020 program, but with contributions from Brazil, Canada, South Africa, and the United States. The project's mandate is to build the foundations for enhanced collaboration to improve understanding of the Atlantic Ocean and sustainably manage its resources. AtlantOS has been cited in G7 meetings as a potential best-practice model for a future global observatories initiative. The joint OECD/AtlantOS initiative will bring together economists, industry analysts, and public administrators, as well as social and natural scientists, to examine the economic potential of data from ocean observatories with the aim of better understanding where observatories lie in the value chain of the ocean economy. A first scoping workshop was held in June 2016, and a formal kickoff is planned for early 2017.

Data for "Appropriate" Policies

While we can expect a future global ocean observation initiative to collect data about the oceans, and we can reasonably expect to assess the added value of this data to the economy, a far more fundamental challenge is posed by the expectation that data should ultimately contribute to appropriate policies. At face value, the choice of language in the G7 communiqué reflects a widely-accepted view about the role of scientists in international relations, a view well summarized by Peter Haas. In his widely cited work on the role of knowledge-based communities ("epistemic communities," in his language) in intergovernmental decision making, Haas observed that "under conditions of complex interdependence and generalized uncertainty, specialists play a significant role in attenuating such uncertainty for decisionmakers. Policymaking leaders are typically in the dark about the sources of pollution, extent of contamination, interaction between emissions and water quality, the costs of clean-up, and the likely actions of their neighbors."[17]

The scientific community views this policy-related role as somewhat problematic. For example, a 2009 ocean observation strategy paper positions one of the community's goals as "foster[ing] an improved culture of public decision-making in climate and ocean issues based on impartial scientific data." However, it then adds that "advocacy (influencing national or global policies, laws or conventions) will not be a goal...although the data from sustained ocean observing systems will support this sort of policy development as a result of better ocean information being made available."[18] The case for such ambiguity is perhaps not unfounded. While science is expected to reduce uncertainty, various science-policy studies have argued that good science doesn't necessarily lead to good policy. For example, one prominent scholar has argued that when "it comes to evidence-based policy, viewpoint matters. Whether wittingly or not, typical advice guides focus on

the production side of scientific evidence and not on the use side. They tell us what counts as good science, not how to use that science to arrive at good policy."[19] Even if uncertainty can be overcome by collecting a sufficient amount of high-quality data, societal debates about climate change or fish stocks, for example, have shown that the gap between good science and appropriate policies is not only difficult to bridge but also subject to varying interpretations. While the observing community may refer to "essential" data variables that need to be collected to characterize ocean functioning, the question for society is "For what purpose?" This question is particularly relevant considering that the oceans are a wildly contested space, where alongside any potential cooperation on environmental matters, states often have competing or even conflicting economic and security priorities.

Ocean Observatories as Tools for Science Diplomacy

Since at least the mid-nineteenth century, scholars have put forth the view that science can play a valuable role in shaping relations between states. Accompanying debates about exactly what institutional form that relationship can or ought to have similarly continue. The 2010 Royal Society/AAAS report on science diplomacy offers a simple yet very useful typology, arguing that three broad approaches exist to science diplomacy: informing foreign policy objectives with scientific advice (science in diplomacy); facilitating international science cooperation (diplomacy for science); and using science cooperation to improve relations between countries (science for diplomacy). Given that no policy-making process or institutional framework currently exists to govern the oceans, a global ocean observatory initiative could not initiative could not simply provide scientific advice for governance. This initiative is also not intended to facilitate intergovernmental relations to establish a scientific program. Instead, the proposed initiative would inaugurate a new form of international science cooperation. The scholarly challenge is that, to date, no research or policy analyses exist on the potential contributions of ocean observatories, as a practical scientific partnership, to inform intergovernmental cooperation. Thus, the aim within the scope of this short article can only be to raise a few questions and issues that might hopefully be addressed in more detail in the coming year or two.

Perhaps the the key question requiring a detailed answer in the near future is: What form of international cooperation would allow both science and policy communities to benefit from a global initiative that supports the better management, use, and protection of the oceans while maintaining its status as a science-based endeavor? While governments will expect an initiative to serve their agreed interests and scientists will want to serve their diverse academic interests, this question will require thoughtful consideration. Moreover, if the turbulent science, society and policy debates surrounding the negotiation, agreement, and implementation of climate-change targets are taken as an example, then a

collaborative data collection effort to meet ocean targets exclusively aimed at improving marine environmental quality would have little chance of success.

By contrast, most states will expect to benefit from an expanded ocean economy and will not want to be seen as destroying the underlying natural capital from which this growth is derived. Given that ocean economic activity is expected to expand, in some areas perhaps faster than comparative land-based sectors, the aim according to OECD recommendations is to exploit ocean resources more sustainably and use its space more efficiently. To this end, a global ocean observatory could be pivotal in providing a knowledge basis upon which costs and benefits of different ocean uses can be weighed. Rather than simply providing advice, a G7-initiated ocean observatory might better be viewed as an initiative that encompasses both rigorous scientific activity to collect and publish data and information, as well as a science-based venue for debate about the potential applications and implications of that data and knowledge.

Nothing in this article presumes or requires any a priori link between a particular set of data and a specific policy outcome. In themselves, data variables are little more than indicators selected by the scientific community to characterize the state of the oceans. However, the implications of choosing specific indicators and drawing conclusions from these could engender potentially powerful diplomatic tools that may shape interstate relations and, consequently, ocean governance. For this reason, an active process should be undertaken to debate data and their value for economic and policy analyses. If this approach were pursued, data from the oceans would constitute the beginning of a process of analysis and debate about the implications of that data, rather than the end of a process whereby the scientific community publishes data and disassociates itself from the ensuing debate on implications. Of course, such processes of analysis and debate should be managed within a scholarly institutional context, much as think tanks debate economic, energy, and foreign policies, to ensure it is decoupled from intergovernmental relations and, possibly, negotiations.

By framing efforts as a science-based discussion, a global ocean observation initiative might not only encourage policy to take available data into account when reflecting on the potential meaning of "appropriate" policies for the conservation and sustainable use of the oceans, but it may also strengthen the scientific community's reflection on which data are important for society. Certainly, much "boundary work" will need to be done to determine where the competencies of the observing community begin and end.[20] The purpose of such work will be to ensure that the scientific community's findings are not taken to serve only the particular interests of one state or another. However, with careful management, the result might be an invaluable role for the scientific community in the better governance of ocean resources, notwithstanding the persistence of competing visions among states on what constitutes good ocean policy.

While an active dialogue with states will certainly pose challenges for the ocean science community and will have its skeptics, this has potential benefits. First, such an iterative approach is an ideal way of bridging the descriptive aspects and the normative implications of ocean data. If the scientific community managed such a process, it could contribute to promoting a science-based discussion from early on and, if successful, later contribute to science-based policies. Second, encouraging non-scientists to reflect on the benefits of a high-cost observatory might broaden societal awareness and acceptance of scientific knowledge by giving society a sense of "co-ownership" over such an initiative—much as many societies feel spaceflight is a worthy investment of public funds. In this way, the observing community could implement one of its guiding principles—namely, to create a broader understanding of ocean influences and to foster an improved culture of public decision-making in ocean issues.

At the same time, dialogue is aimed at more than just building momentum in the scientific community and encouraging public support. The concept of science diplomacy inherently also encompasses the need for interstate dialogue to overcome divergent and competing interests. Much as human spaceflight is characterized by interstate competition, so too is use of the oceans, where states seek to place flags as markers of their respective technological and economic achievements. Nowhere is this competition more evident than in areas beyond national jurisdiction. At least since the UN Convention on the Law of the Sea was agreed to by most states, intergovernmental diplomacy concerning the seas and oceans has focused on balancing between states' freedom and their duties to maintain peace and security as well as to cooperatively manage that space. Data and information are essential means for both exercising freedoms and managing cooperation. To date, ocean observing is seen as a mainly scientific-technical challenge with no significant political dimension. In the future, an intergovernmental ocean observing system would have a special role in internationalizing knowledge about the condition of the oceans. Thus, in order to answer the earlier-stated question about possible forms of international cooperation, further analysis is needed concerning state interests in gathering data and information for their competitive advantage and as a basis for collaboration.

As efforts continue to develop integrated ocean observing systems, the questions and issues raised in this article will need to be considered in more detail. The challenges of linking scientific collaboration with intergovernmental diplomacy are certainly enormous. However, the G7 states have initiated a process that offers a valuable test case on the conceptual and practical merits of science diplomacy in the management of international spaces beyond national jurisdiction. Specifically, this initiative could eventually yield knowledge on whether ocean observing systems could be useful means to promote cooperation and prevent conflict among states. For this reason alone, much time and effort should be invested by the scientific

and policy communities in considering the variety of avenues that might lead to a successful initiative. SD

Endnotes

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