Ethical recommendations for ocean observation

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In the face of the Anthropocene’s growing human population, sustainable management of marine resources depends on knowledge of ocean systems. The study of the many interrelationships in the ocean requires the integration of multidisciplinary approaches and different investigative skills, one of which is observation. The ocean observing community, therefore, has a responsibility to collaborate internationally to provide the scientific knowledge needed for wise global ocean governance.

1. Open access to data impacts science and operational oceanography, Argo as a successful example

Argo’s Open Data Policy has fostered the development of an observing network that is now essential to both research and operational oceanography.

Impact on Science: 3633 papers since 1998 - more than 1 paper a day in past years
Impact on Operational Oceanography: Argo is complementary to Altimetry providing the 3D dimension.

Applying this concept, the Global Drifter Program started a barometer upgrade scheme whereby interested parties fund additional sensors on these buoys (see DBCP link below). The impact of the additional data is shown as the pie chart (below).

While satellites are the first contributors to weather forecasting skill, surface pressure data from drifters contribute nearly 3% of the 24-h forecast error reduction to global weather forecasts, via the data assimilation in the ECMWF operational system.

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2. Transfer of knowledge is essential for capacity building and integration

Training is key as it creates and generates a capacity to implement and transfer of standard methods and equipment. Because training is strongly linked to building capacity, building capacity is essential for developing observations in areas where they do not exist and can facilitate the interoperability of data collected by different people through different means.

In capacity building, the place of young scientists from all countries is important and programmes have been implemented to train and offer access to cruises for early-stage researchers.

3. Improving effectiveness increases the data returns for societal applications, the Global Drifter Program as an example

Surface Velocity Plots were devised to monitor sea-surface currents in the open ocean, with small buoys equipped with a holey sock drogue centered at 15 m. depth. These buoys all carry temperature sensors, but adding further sensors enables them to generate greater data returns.

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This assessment, consistent with prior studies (Centurioni et al., 2017), is obtained by analyzing the contributions of the various observing systems to the Forecast Sensitivity to Observations (Cardinali, 2009), in the ECMWF operational assimilation between June 2018 and April 2019 (see Figure).

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4. Move to a governance adapted to socio-ecological systems and based on scientific advice

The Anthropocene era provides a new framework for polycentric governance, well illustrated by COP21 in Paris. A new paradigm emerges: the “Policy driving policy” evolves to “science driving policy” & “policy driving science”, closing the loop.

To go further, many actors must exchange and better communicate so that political decision-makers can make the best decision for our Earth stewardship.

5. Ensuring equity, fairness, reciprocity & transparency favor trustful relationships

Major disparities exist around the world (see figure) and some areas are disadvantaged because they do not have the infrastructure for the adequate collection of information about the local marine environment. The sharing of expertise and information is an asset in capacity building as oceans and seas are interconnected, local information is an integral part of a global understanding of ecosystem functioning. Equity is an essential component of planetary stewardship, and equity and sustainability are linked (Steffen and Stafford Smith, 2013). Scientists have an ethical responsibility to share infrastructure, resources and data.

World map by anamorphosis of national Gross Domestic Product (per inhabitant). Northern countries are inflated (higher GDP) than Southern countries.

Trust is an essential constituent of all social relationships and all societies and refers to both human behavior and to technological expertise.

The PIRATA network based on collaborations among France, Brazil and the USA is a good example of building trust (Bourbou, et al., 2019). These very different cultures have established a long-lasting, mutually beneficial partnership that has also helped the global community since the mid-1990s. PIRATA has established itself as the reference network of oceanic and atmospheric observations in the tropical Atlantic Ocean, supporting dedicated climate research and operational climate and ocean prediction.

Ensuring equity, fairness, reciprocity & transparency favor trustful relationships

6. Animal ethics in ocean observation is essential, as implemented at the Ocean Tracking Network

Ethical issues facing OTN researchers include obligations to the animals and obligations to the broad group of stakeholders interested in the results from OTN studies and access to OTN data.

The main recommendations for respect for animals in ocean observing systems are as follows: ensure the animal’s good health; identify the levels of distress that could be caused to animals by their capture, handling and labelling, and provide means to mitigate these problems; use appropriate anaesthesia and surgical procedures, oxygenate–air the animals, ensure that surgeons are trained and perform their tasks quickly, provide appropriate recovery facilities, and return the animals to the wild at a time and place that minimize the risk of predation.

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7. Compliance with laws avoids source of potential diplomatic conflicts

For ocean studies, it is important that scientists clearly identify obligations, regulations and laws governing access to and utilization of ocean resources under national jurisdiction and/or other agreements including treaties or conventions at the international, regional and national level (see figure next for overview of regulations).

Biological data must be treated carefully.

UNCLS defines zones of coastal jurisdiction, for which states have different rights and duties (1982).

The territorial sea: territorial sovereignty of the coastal state to 12 nautical miles including a right of innocent passage for ships of all states.

The exclusive economic zone (EEZ) may extend 200 miles and may claim exclusive rights for the exploration and exploitation of marine resources over 200 miles.

The continental shelf: submarine seabed and its subsoil to a depth of 200 meters, or beyond, up to 350 miles, with sovereign rights on natural resources.

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