Dear Mark,

Over the past ten years I have spent more than 500 days at sea, often as chief scientist, in the Atlantic, Indian, Pacific and Southern oceans, collecting and analyzing observations of air-sea interaction for climate studies. Recently, my work has focused on more applied problems, with the submission of a proposal related to hurricane prediction, and a collaboration with other PIs on a calibration/validation experiment for the next NASA satellite scatterometer (SWOT). It has been an amazing experience to explore with other passionate professionals and students the wonderful natural world that WHOI is dedicated to study and understand. However, like many of my colleagues, I have been witness to many and increasing threats to the global environment, most often caused by human activities. This letter is therefore a respectful request for WHOI to make strides about environmental conservation and a call to action for more sustainable practices, while continuing to expand its scientific leadership.

The most efficient ways to reverse environmental shifts such as global warming is to lower greenhouse gases (GHG) emissions. The G20's Task Force on Climate-Related Financial Disclosures* has become the standard for policies of GHG reduction in the financial, services and industrial sectors. Below are four propositions for WHOI to reduce its emissions:

1) Solar panels must be installed on all new buildings, within one year of completion. Diligent efforts must be made to install panels on existing buildings (e.g. Losos). The new NQF has the capability for roof panels, which is encouraging, but enforced policies are better than promises. Switching to renewable energies has economic benefits, as these energies are subject to little price volatility, low maintenance costs, less hidden costs compared to fossil fuels (health impacts, pollution from extraction, transportation and distribution). In the long run, this would decrease our overall budget and overhead cost. The state of Massachusetts is very supportive of renewable energies, and established the Global Warming Solutions Act** and Green Communities Act.
2) Transportation is a major source of GHG. WHOI must encourage its employees to use alternative ways to participate in conferences, by promoting video conferencing, providing incentives for rail, coach and carpooling, participating in local conferences (e.g American Meteorology Society meeting in Boston in January 2020). Such alternatives have been tested and described in a recent Physics Today article ***. Financial incentives for alternative commuting (local public transportation, carpooling, biking), must be provided as well and would help with parking pressure in Woods Hole village.
3) Research vessels routinely refuel hundreds of thousands of gallons of fuel between voyages. This represents a large financial cost and carbon footprint. We must therefore optimize our scientific output to fuel consumption ratio. One way is to maximize the number of scientific cruise participants. A mechanism must be established to provide support for students or other scientific personnel to participate as ancillary projects on cruises. There must be a coordinated effort between all stakeholders, including scientists, mariners and ship operators to establish a strategy for reduction of fuel consumption, using prediction tools such as in Bialystocki ****. WHOI also needs to engage in alternative research vessel capabilities, such as ships of opportunity, private sailing vessels. An attractive

option would be to partner with solar powered boats such as Turanor Planet Solar, on which I sailed in 2013 with colleagues from the University of Geneva to sample marine aerosols in the Gulf Stream. Such collaborations with existing or future vessels would make a tremendous outreach opportunity. Some of WHOI donors may be interested in providing such support.

4) WHOI must issue a clear policy on energy conservation that promotes efficient technology and behavior. Current infrastructure and practices show many inefficiencies (e.g. high heat losses in Clark Building, high bay areas equipped with air blower systems and used as long term work space). Building envelope upgrades should be implemented. Hydronic radiant floor heating should be considered in new building designs, especially warehouse and high bay spaces. Procurement must include energy efficiency as a selection criterion for new equipment. Coordinated efforts must occur to avoid unwarranted redundancies (e.g. shared data servers, possibly across institutions). All these can be financed by long term energy savings.

It is true that WHOI has made some efforts towards sustainable development, such as the installation of solar panels, implementing purchase agreements for renewable energy, setting up policies for single use plastics. Like many others, I have made some efforts towards environmental conservation, both in my private life (roof solar panels, electric car, commuting by bus), or at work through my participation in the Sustainability Task Force. However, as recent IPCC or National Climate Assessment data reports show, our whole society must do better in order to avoid irreversible climate and ecosystem tipping points in the next ten years. Recent environmental crises like the massive forest fires in subarctic Siberia or tropical Amazonia show the urgency. The youth involvement across the globe during the recent UN Climate Summit also show that the public is now responsive and demanding a shift in behavior.

I believe WHOI has an opportunity to become a leader in sustainability and environmental stewardship, while keeping its scientific excellence. Today's youth are tomorrow's PIs, workers and donors and we should strive to attract them. Future science funding will shift towards more applied research dealing with environmental changes. WHOI should therefore diversify its portfolio and look into cross-sector research programs related to environmental conservation, mitigation and adaptation. With its current assets, WHOI has an opportunity to not only be a leader in ocean research, but also become one of the solution makers for tomorrow's problems.

I hope WHOI will increase its sustainable practices. I intend to invite my colleagues in the coming weeks to a brainstorm session on sustainability and concerted strategies as individuals or coordinated groups.

Respectfully,

Sebastien Bigorre

- * https://www.fsb-tcfd.org/publications/final-recommendations-report/
- ** https://www.mass.gov/service-details/global-warming-solutions-act-background
- *** https://physicstoday.scitation.org/doi/10.1063/PT.3.4291
- **** Bialystocki N., Konovessis D., 2016. On the estimation of ship's fuel consumption and speed curve: a statistical approach. Journal of Ocean Engineering and Science, vol. 1, pp 157-166.