

BioGeoSCAPES workshop

Ocean Metabolism and Nutrient Cycles on a Changing Planet

Summary of a Convocation of the Brazilian Oceanographic Community

by Hugo Sarmiento, October 30, 2023

Very few researchers (from 6 laboratories) reacted to the convocation, which reveals a general lack of interest about this topic, probably because of the costs involved with *omics*.

From those who gave feedback, most researchers organized oceanographic cruises but only half of them is involved in “omics” studies. Despite that, all of them acknowledge that implementing omics in future cruises is important.

Regarding the concrete questions:

“What do you think of this BioGeoSCAPES draft mission statement? How could this be improved?”

Some said that the definition of oceanic metabolism could be better explained, others said that “hierarchical perspective of the seascape” should be clarified.

“How could your laboratory (and Brazil) contribute to BioGeoSCAPES efforts?”

All said that Brazil could help with field work, laboratory work, intercalibration, project coordination and data management.

“The Brazilian coast has an extensive coastal strip (about 8 thousand km long), with a considerable diversity of organisms, resources and marine ecosystems of commercial relevance, in addition to the complex dynamics and, mainly, little known considering, especially the microbial community of region. In this sense, our laboratory (MicrOcean Lab)'s main mission is to contribute to the understanding of the diversity and microbial processes of marine pelagic and benthic ecosystems and deep sea environments, both in the Southwest Atlantic Ocean and in the Southern Ocean, their interaction with environmental factors and oceanographic studies and their responses to global climate change. The main focus is directed to the carbon cycle, from the synthesis of organic material (photo and chemosynthesis processes) to its transfer to higher trophic levels in the marine food web, through secondary production. Another important approach of our laboratory is to contribute to the dissemination of knowledge of Ocean Sciences through scientific dissemination programs outside the academic context (involving work in schools and the non-scientific community in general). In this aspect, our laboratory is able to contribute to BioGeoSCAPES through the application of protocols focused on omics and microbial processes related to the carbon cycle in oceanographic campaigns along the Brazilian coast, especially on the southeast coast of the country and the Antarctic Peninsula; processing genetic material extractions in our laboratories to continue sequencing and analyzes within the scope of BioGeoSCAPES; work with bioinformatics and data management; participate in the coordination of projects and discussions on the subjects listed above.”

“What scientific questions are most important for Brazil in the broad scope of BioGeoSCAPES over a 10-year period?”

- *“Systematic studies on the nitrogen cycle coupled to the carbon cycle, more specifically molecular nitrogen fixation and the role of this metabolism in the introduction of new nitrogen in oligotrophic environments.”*

- *“Survey of microbial biodiversity (taxonomic and functional) (similar to that carried out by REVIZEE, a Brazilian research project of assessment of the sustainable potential of living resources in the exclusive economic zone); The exchange of researchers especially ECS for learning and training in the most advanced techniques.”*

- *“Synchronous changes in oceanic metabolism on the Brazilian continental shelf due to global warming and rainfall.”*

- *“Within the broad scope of BioGeoSCAPES, detail the taxonomic composition and functional variability of the microbial community in different Brazilian marine ecosystems; evaluate the influence of oceanographic and environmental factors on these microbial communities and, consequently, on marine metabolic processes and biogeochemical cycles, contributing to better modeling and predictability of these cycles; understand how climate change and anthropogenic activities can affect microorganisms and their responses in relation to biogeochemical cycles, understand the main mechanisms and point out favorable locations for carbon sequestration in the Southwest Atlantic Ocean and its implications for global climate change; combine the contribution of academia and society towards the conservation and preservation of the marine environment.”*

“Are there difficulties in Brazil that the international community could try to mitigate through training or collaboration?”

- *“More accurate oxygen sensors to study net productivity and community respiration in the planktonic system. Molecular nitrogen fixation measures should also be incorporated into field work along with genetic studies.”*

- *“Resources for research and publication; lack of infrastructure; training in bioinformatics and omics analysis; exchanges”*

- *“Summer courses for specific techniques for undergraduate students in marine sciences, equipment consortium”*

- *“Historically, Brazil is a country that invests little in technical-scientific development and education, with a situation that has worsened especially in recent years. Recently, the country has been facing some problems related to severe budget cuts and a lack of more consolidated investments in science and technology. As a result, there is a “scrapping of science”, especially in public research institutions (main research centers in the country). Among the consequences of this process are serious infrastructure problems, lack of acquisition of inputs and/or repair of laboratory equipment, reduction of offers and cancellation of research grants, both in undergraduate (scientific initiation) and postgraduate programs (masters/doctorate), “brain drain” (scientists with high expertise end up leaving the country to work in places with greater investment and recognition), among others. In this sense, the international community could collaborate to strengthen partnerships that favor the exchange of knowledge, as well as promote and assist the training of scientists for the development/application of standardized protocols, especially those related to the modeling of biogeochemical cycles and “omics” (genomics, proteomics, metabolomics).”*