MARIE THARP LECTURE SERIES FOR OCEAN RESEARCH | **NO.34**

GEOMAR

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"IT WAS VERY EXCITING IN THOSE DAYS. WE WERE EXPLORERS."

Marie-Tharp (1920-2006), Oceanographer

Online Seminar Wednesday, 16th December 2020, 11:00 a.m.

Do Small-scale Physical Processes matter for Marine Biogeochemistry Responses to Anthropogenic Climate Change?

Decline in marine primary productivity, loss of oxygen, loss of biodiversity, are among the most alarming threat of anthropogenic climate change to the ocean. Earth System Models (ESMs) projections show that under a wide range of greenhouse gas emission scenarios, global ocean primary production will decline in the 21st century and beyond, and the oxygen content of the ocean will decrease, principally due to increase in temperature and reduced exchanges between the surface and sub-surface of the ocean.

Due to strong computational constrains, an important limitation of these models is that transient eddies and jet-like flows of horizontal scales 100 km and less fall below the size of their computational ocean grid and are crudely parameterized. Moreover, representation of planktonic ecosystems in ESMs is crude and marine diversity badly resolved. Early investigations of our group have revealed the importance that physical transport processes occurring at small spatial scale, ranging from the mesoscale to the submesoscale, may have for the ocean nutrient and oxygen budgets, and for planktonic biodiversity in general. We have participated to the development and analysis of the IPSL Earth System Model. Our investigations on small-scales are based on regional models, which share the numerical code of our in-house ESM but with finer resolution of the physical grid, and finer resolution of the planktonic diversity. In my talk, I will present recent work suggesting that current projections based on coarse resolution ESMs might overestimate the decline in primary productivity and oxygen loss over the North Atlantic. I will also emphasize the importance of small-scale frontal processes for marine biodiversity. Our results argue in favor of the use of fine-resolution models to better constrain the future evolution of marine biomass and fish catch potential for decision-making.

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