



Impacts of ocean change on marine pelagic ecosystems and biogeochemistry (Vladimir Ivanovich Vernadsky Medal Lecture)

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Rising atmospheric CO₂ and the resulting climate change cause the ocean to undergo two major alterations: sea surface warming and ocean acidification. While there is growing evidence of the individual and, to a lesser extent, synergistic effects of these changes on a variety of marine organisms, up-scaling these responses to the community and ecosystem level remains a major challenge. Hence, our ability to forecast the resulting impacts on ocean productivity, elemental cycling and air/sea exchange is rudimentary and model scenarios of future ocean changes are mostly based on simplifying concepts of possible ecosystem and biogeochemical alterations.

Progress in our understanding of the impacts of ocean change on marine ecosystems and biogeochemistry will crucially depend on integrating evidence from a variety of approaches, including laboratory and mesocosm experiments, field surveys and ocean biogeochemical modelling. In my presentation I will review observed responses of pelagic organisms and communities to (i) ocean acidification (decreasing pH) and carbonation (increasing pCO₂), and (ii) surface ocean warming and the associated changes in vertical mixing and overturning circulation, and assess their potential biogeochemical impacts. The results of this analysis underscore that some of these responses may cause major changes in pelagic ecosystems and elemental cycling. Because several of the underlying processes are interlinked and nonlinear, the sign and magnitude of the ocean's carbon cycle feedback to the climate system is yet unknown. Understanding these processes and their sensitivities to global change will be crucial to our ability to project future climate change.