



Popular science summary of the PhD thesis

PhD student	Athanasios Kandylas
Title of the PhD thesis	Carbon Sequestration and Oxygen Minimum Zones in the Ocean
PhD school/Department	DTU Aqua

Science summary

The ocean covers approximately 70% of our planet and plays a critical role in regulating its climate. It acts both as a reservoir of carbon, where carbon can be stored in its interior for hundreds of years, or as an emitter of carbon by releasing a fraction of this carbon back to the atmosphere.

Tiny photosynthesizing organisms (phytoplankton) and the smallest animals on planet (zooplankton) produce organic particles in the upper ocean which by sinking to the deeper parts of the ocean remove carbon from the atmosphere and hence help in mitigating the effects of human-induced climate change.

In this thesis, we introduce SISSOMA which is a platform that enables us to track the fate of these particles from production to their export out of the mixed layer. More importantly, through SISSOMA we can test the effect of different factors, such as the production cycle and stickiness of these particles, as well as water's properties, such as turbulence, on the transformation of these particles through aggregation, fragmentation and remineralization which overall define their sinking speeds.

In their journey to the abyssal ocean, microbes, by attaching and feeding on them, consume oxygen and release carbon back to the surrounding water. This, in combination with the amount of oxygen that is replenished through the mixing/ circulation of the ocean, defines then the oxygen availability in the deep ocean.

In the last part of this thesis, we investigate the impact of the artificial - enhancement of marine productivity through ocean fertilization on the oxygen levels in the global ocean. We find that such activities in the Pacific and Indian ocean will have significant negative local effect on the oxygen levels with the potential of the expansion of areas with already very low oxygen concentrations.