Capturing particle diversity to sharpen our vision for Ocean Vital Signs

PI: Irina Rypina, Michael Jakuba, Stefan Sievert, Ken Buesseler

The biological carbon pump is a crucial process in our oceans, driven by diverse sinking organic particles, also known as marine snow, that transport carbon from the sea surface to the deep sea, where it may be stored for millennia. This process is essential in regulating our global climate and maintaining ecosystem health. However, our understanding of this process is limited, leading to large uncertainties in models that try to assess the ocean's current and future potential for carbon uptake. Improving our understanding of particle-associated processes and, based on this, their representation in models is essential for predicting and mitigating climate change. Our project aims to address this challenge through a novel approach linking microscopic scale measurements with large-scale observations of carbon transport and distribution in the ocean through imaging techniques and numerical simulations. This will provide a more accurate reflection for future models. We plan to deploy camera systems on autonomous underwater vehicles to collect extensive image data throughout the upper 300m of the ocean, where most particles are formed and a large fraction is decomposed by microorganisms.