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“Phytoplankton-Virus Arms Races at Sea: Placing Subcellular Controls on Oceanographic Scales”

Despite the critical importance of viruses in shaping marine microbial ecosystems and lubricating upper ocean biogeochemical cycles, relatively little is known about the molecular mechanisms mediating phytoplankton host–virus interactions. Recent work in the *Emiliana huxleyi*-Coccolithovirus host–virus system has shed unprecedented insight into the elegant strategies of viral infection and subcellular regulation of cell fate, which not only reveal tantalizing aspects of viral replication and host resistance strategies but also provide novel diagnostic tools toward detecting infected host populations at sea and, when coupled to multifaceted in situ oceanographic and optical measurements, elucidating the impact of virus-mediated processes in the ocean. In this talk, I’ll discuss the key mechanistic controls of the lipid-based co-evolutionary ‘arms race’ between *E. huxleyi* and Coccolithovirus and demonstrate how they have enabled us to show that active Coccolithovirus infection of natural assemblages stimulates carbon export in the North Atlantic. Our findings run counter to the classic ‘virus shunt’ paradigm of stimulating attenuation and respiration of organic carbon in the upper ocean and instead provide a heretofore unappreciated mechanism of virus-induced vertical flux.