Geophysical Research Abstracts
Vol. 21, EGU2019-18030-1, 2019
EGU General Assembly 2019

The seasonal cycle of sea-ice and upper ocean physical and biogeochemical properties in the Arctic Transpolar Drift in 2015/16

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The seasonal cycle of sea ice and its snow cover dominates the amount of light reaching the upper layers of the polar oceans, with various important implications for biological processes taking place within the water column. At the same time, the scarcity of observations in space and time, particularly in the remotest and most inaccessible regions of the central Arctic Ocean, limits our understanding of how the physical and biological realms are intertwined.
In this study, we combine year-round observations of the atmosphere, sea ice, snow and the upper ocean by an Ice-Tethered Profiler and other complementary buoys in the Transpolar Drift in 2015/16, to establish linkages between the timing of the physical processes at the ice surface, and its effects on the biosphere associated with the upper ocean layers. Our results for example confirm that a strong summer surface snow and ice melt, which subsequently increases light transmittance through the ice, triggers a strong phytoplankton bloom, also suggesting that water column processes reflect the seasonal cycle of surface properies. This study highlights the importance of multi-disciplinary, year-round observations in the polar oceans to better understand global climate- and ecsystem properties.