OS24A-04 Observations of biological production and light transmittance with warming and sea ice decline across the Pacific Arctic Distributed Biological Observatory (Invited)

Tuesday, 10 December 2024

16:30 - 16:40

147 B (Convention Center)

Abstract

Recent low sea ice extents across Distributed Biological Observatory (DBO) sites in the northern Bering, Chukchi, and Beaufort seas of the Pacific Arctic region have been due to both later fall/winter freeze-up and earlier spring breakup, which in turn have important cascading impacts on the physical, biological, and biogeochemical state of the overall marine environment throughout this region. Satellite observations of the DBO sites that span across a large latitudinal gradient (~62–72°N) include sea surface temperature (SST), sea ice concentration, annual sea ice persistence and the timing of sea ice breakup/formation, chlorophyll-*a* concentrations, and primary productivity. While we observe significant trends in SST, sea ice, and chlorophyll-*a*/primary productivity throughout the year, the most significant and synoptic trends for the DBO sites have been those during late summer and autumn (warming SST during October/November, later shifts in the timing of sea ice formation, and increases in chlorophyll-*a*/primary productivity during August/September). Measurements of the transmittance of solar radiation through the ocean water column is also one of the critical elements for understanding the potential implications of these recent shifts in sea ice, including impacts on primary production, damaging effects of UV radiation on phytoplankton, photodegradation of dissolved organic matter, and upper ocean heating. Field-based observations of downwelling irradiance and upwelling radiance profiles in the top ~30-50 meters of ocean waters are also presented, collected at discrete stations across DBO sites 1–5 in the northern Bering and Chukchi Seas. Profiles were collected during July 2018, 2019, 2021, 2022, and 2023 as part of the DBO program onboard the Canadian Coast Guard Ship (CCGS) *Sir Wilfrid Laurier*, and represent a first time series of

optical measurements across these DBO sites. Continued monitoring of the transmittance of solar radiation through the water column at these DBO sites will be crucial for understanding changes in the underwater light field as the duration of the open water season continues to lengthen with declining seasonal sea ice cover.

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