HIGHLIGHTS FOR NESDIS LEADERSHIP

Partnerships

**MetOp-SG MWI-ICI Science Advisory Group 14th Meeting:** The Micro-Wave Imager (MWI) and Ice Cloud Imager (ICI) are two microwave radiometers that will be aboard the Metop-SG B-series satellites. H. Meng and M. Kulie attended the 14th Meeting of the Metop-SG MWI-ICI Science Advisory Group (SAG) virtually on June 14th as the NOAA observers on the Group. The meeting included status reports of the Metop-SG mission and the MWI and ICI instruments by EUMETSAT and ESA, an overview of the L1B test data package, and the preparations for MWI and ICI at ECMWF and the Met Office. Radiometric performance tests showed that both MWI and ICI are well within specifications at all channels. MWI will be fully integrated in a proto-flight model by November 2022 for environmental test. The first ICI instrument will be delivered to the satellite prime contractor in July 2022. Both MWI and ICI test data (version 2) will be made available to the public at the end of this year. The first Metop-SG B-series satellite, B1, is scheduled to launch in January 2025.

(Huan Meng, SCSB & Mark Kulie, huan.meng@noaa.gov, Funding: PDRA)
PUBLICATIONS

Particulate Matter Distribution, Sources, and Dynamics along Trans-Arctic Sections

Citation: Gardner, Wilford D., Mary Jo Richardson, **Alexey Mishonov**, Pheobe Lam and Yang Xiang, 2022: Distribution, sources, and dynamics of particulate matter along trans-Arctic sections. *Journal of Geophysical Research: Oceans, 127*, e2021JC017970, [https://doi.org/10.1029/2021JC017970](https://doi.org/10.1029/2021JC017970) [Article 1 of 20 in special section: *Uncovering the hidden links between dynamics, chemical, biogeochemical and biological processes under the changing Arctic*]. The first trans-Arctic section of beam attenuation ($c_p$) and chlorophyll-a (Chl-a) concentrations revealed significant interaction with Arctic hydrography. Coupling optical measurements with large-volume *in situ* filtration provided a powerful set of techniques to better understand sources, sinks and dynamics of particles found throughout the Arctic water column.

**Summary:** CISESS Scientist Alexey Mishonov, co-authored a study published in the June issue of *Journal of Geophysical Research: Oceans*. Optical data from two 2015 fall expeditions (one from Bering Strait and the other from Barents Sea) that met at the North Pole were combined to create the first trans-Arctic section of beam attenuation ($c_p$) to estimate particle distribution. High-resolution optical measurements of particle concentration throughout the water column were coupled with simultaneous measurements of salinity, temperature, chlorophyll-a fluorescence, and nitrate. Particle composition analyzed from filtered samples made it possible to discern sources, distribution, and dynamics of particles. The study revealed significant interaction with Arctic hydrography on a basin scale. Nutrient-rich Pacific water moves swiftly through Bering Strait and sinks below a thin, low-density, low-nutrient surface mixed layer, forming a thick lens of higher salinity water. Nutrient-rich Atlantic water that enters the Barents Sea is not isolated from surface waters from ice or stratification and fuels high surface chlorophyll-a (Chl-a) concentrations. As the surface water cools, high-density water cascades into $\sim$400 m basins in Barents Sea and into Nansen Basin. A key finding was that optical proxies for particle mass, particulate organic carbon, and Chl-a enabled general identification of particle sources and dynamics. It was also found that patches of turbid layers (nepheloid layers) are evidence of sediment transport from margins to basins, and their limited presence in deep basins indicate weak currents.
Figure: Sections of beam attenuation ($c_p$) from Bering Strait via North Pole to Norway with contours of (a) salinity, (b) seawater temperature (°C), and (c) fluorescence-based Chl-a ($\mu$g 1$^{-1}$). Note the y-axis (pressure) scale change at 500 db in panel (a). Color scale is $c_p$ (m$^{-1}$) (a proxy for particle matter or particulate organic carbon), and shown as a horizontal color bar beneath the
sections for 0–500 m in panels (a–c) and as a short vertical color bar on the right-hand side of the deep portion of panel (a) for water >500 m. The finer scale is to better visualize the benthic nepheloid layers in the deep basins. Blue lines above the sections schematically represent the sea surface ice condition: dashed line indicates the area along which ice cover increased from 20% to 80%, bold blue line represents area covered by >80% ice, light-blue line indicates ice-covered area reported previously (Schauer, 2016) for the R/V Polarstern expedition. No line represents relatively ice-free areas. Vertical dotted lines are station locations and the labels above each frame are station numbers (H for Healy, P for Polarstern). Some station lines appear thicker because multiple casts were made there. The cruise map in the top panel indicates the stations along orange lines used in this section. Distance along ship track is used for the x-axis.

(POC: Alexey Mishonov, CISESS; alexey.mishonov@noaa.gov; Funding: NCEI)