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Beaufort Gyre Exploration Project: Dispatch 11: Light in the Ocean

Jinping Zhao (Ocean University of China)
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Jiuxin Shi and Yutian Jiao from the Ocean University of China are participating on this cruise to the Arctic Ocean to observe the physical and optical profiles of seawater. The optical properties of water respond primarily to incident solar radiation (sunlight), and longwave radiation generated by the mass of the Earth. Their objective is to establish the connection between physical and ecological processes, which will be helpful to understand heating process in the marginal ice zones and open water areas of the Arctic Ocean. Both scientists have experience in both the Antarctic and Arctic regions in the 1990s and 2000s.

When the ship is stopped for a CTD station, Jiuxin and Yutian deploy an optical profiler down to 120 m that measures the upward and downward optical fluxes which are used to obtain the optical attenuation coefficient. The instrument (produced by the Biospherical Instruments Inc.) measures the fluxes at 18 wavelengths from 313 to 873 nm with high sensitivity, so as to capture the weak light in deeper water. Another profiling instrument with sensors of temperature, salinity, pressure, and fluorescence is combined with the optical measuring profiler to measure the hydrographic properties, chlorophyll and turbidity. Water samples at 5 m, 20 m and the depth where the maximum amount of chlorophyll is observed, are filtered by different films to measure the intrinsic optical absorptions by various substances in water. In addition, a separate surface optical instrument is mounted to the ship's railing in the air to measure the solar radiance simultaneously with the underwater profiling.

So far this cruise, eighteen casts have been conducted by Jiuxin and Yutian, including 4 on this day alone. The results analyzed together with nutrient data obtained by the CTD chemistry group will establish linkages among the physical, optical, chemical, biological processes. The OUC group is dispatched by an Arctic project "Adjustment of thermodynamical structure of Arctic Ocean under the background of global change and its feedback to Arctic climate" funded by the National Nature Science Foundation of China.

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Jiuxin Shi and Yutian Jiao prepare the optical seawater profiler for deployment. The optical instrument must be lowered at the side facing the sun, and finding an appropriate opportunity with reasonable winds, sea ice, clouds sun is very important for the deployment, but can be difficult in the Arctic Ocean. *Photo by Rick Krishfield, WHOI.*

Yutian Jiao (middle) deploys the optical seawater profiler from the forward A-frame with the assistance of Chief Officer John Jenner (near) and Dan MacLean (far). *Photo by Jiuxin Shi, OUC.*

The surface optical sensor fixed at to the ship's railing near the deployment location in order to provide a reference for the profiler when lowered into the water. *Photo by Jiuxin Shi, OUC.*

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Mail: Woods Hole Oceanographic Institution, 266 Woods Hole Road, Woods Hole, MA 02543, USA.
E-Contact: info@whoi.edu; press relations: media@whoi.edu, tel. (508) 457-2000
Problems or questions about the site, please contact webdev@whoi.edu