[EE] Evening Poster | A (Atmospheric and Hydrospheric Sciences) | A-OS Ocean Sciences & Ocean Environment

[A-OS11]What we have learned about ocean mixing in the last decade

convener:Toshiyuki Hibiya(Department of Earth and Planetary Science, Graduate School of Science, University of Tokyo), Louis St Laurent (Woods Hole Oceanographic Institution), Ren-Chieh Lien(None, 共同), Robin Ann Robertson (China-ASEAN College of Marine Science Xiamen University Malaysia)
Mon. May 21, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)
The study of ocean mixing processes has made great strides in development of observation technology over the last decade. This includes the improvement of micro-scale and multi-scale profilers, innovation of ocean gliders, as well as identifying internal waves and turbulence through echo sounding from an underway research vessel. These new technologies enable field observations of ocean mixing processes to extend much deeper and wider than ever before. The accumulated knowledge of the observed features has stimulated theoretical and modeling studies related to ocean mixing processes such as internal wave-wave interactions, internal wave interactions with background shear, and associated energy cascade down to dissipation scales as well as assessment and reformulation of existing turbulent mixing parameterizations to be incorporated into the global circulation and climate models.
This session encompasses a wide variety of coastal and open ocean mixing processes; from the surface through the interior to the near boundary benthic mixing, including the roles of mixing in the biological processes and productivity of the ocean. Through detailed discussions, we would like to confirm how far our understanding of the ocean mixing processes has advanced over the last decade, defining the new frontier of ocean mixing research to be tackled in the next decade.

[AOS11-P16]Laboratory experiments of heated wastewater discharge from the power plant using thermo-color dyes

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Several power plants located along the east coast of Korea discharge heated water used as a coolant. To reduce its thermal pollution impact to the surrounding coastal regions near the power plants, the behavior of heated wastewater should be monitored and predicted. However, lots of difficulties exist not only in surveying the coastal regions around the power plants but also in maintaining in-situ monitoring systems there. In this study we demonstrate a novel method for estimating the thermal diffusivity of heated wastewater from the power plant using thermocolor dyes which can visualize temperature changes by color transition in the solution. The solution shows violet, green, and yellow colors when the water temperature ranges <18°C, 18–21°C, and >21°C, respectively. Salt water in the tank is set to 17°C and warmer solution, considered hot wastewater, is discharged through submerged tube at the bottom. Behavior of the warmer solution is recorded by digital camera, and eye-catching colors are converted to HSV-color coordinate (Hue, Saturation, Value) to determine the absolute color. Thermal diffusivity is estimated by analyzing spreading extent of warmer solution from HSV-color images and by solving the advection-diffusion equation. Our novel approach has following two advantages: 1) Any sensors (like thermometer) are unnecessary, and hence any disturbances by sensors on fluids are prevented, 2) Converting video images to HSV-color provides absolute color so that we can determine the temperature changes quantitatively using the images taken at a certain angle and brightness. The estimated thermal diffusivity shows a reasonable value compared to that from a numerical simulation. Therefore, our method using thermocolor dye solution and converting HSV color coordinate can be applied in reproducing and predicting the movement of heated wastewater. It also can be applied for conventional experimental studies

of heat transfer in fluids like turbulent mixing.