Geophysical Research Abstracts
Vol. 19, EGU2017-16594, 2017
EGU General Assembly 2017

Diurnal and seasonal variations of pH for a year in the western subarctic North Pacific observed by using a hybrid pH sensor

Yoshiyuki Nakano (1), Tetsuichi Fujiki (2), Katsunori Kimoto (2), and Tetsuya Miwa (1)

(1) JAMSTEC, Marine Technology and Engineering Center, Yokosuka, Japan (ynakano@jamstec.go.jp), (2) JAMSTEC, Research and Development Center for Global Change, Yokosuka, Japan

Ocean acidification has many far reaching impacts on plankton community in the ocean. There is great need of quality instrumentation to assess and monitor the changing seawater pH. To meet the need, we have developed the in situ high accurate pH sensor (Hybrid pH sensor: HpHS) for the long-term seawater pH monitoring to participate the Wendy Schmidt Ocean health XPRIZE. The HpHS has two types of pH sensors (i.e. potentiometric pH sensor and spectrophotometric pH sensor). The spectrophotometric pH sensor can measure pH correctly and stably, however it needs large power consumption and a lot of reagents in a long period of observation. The pH sensor used m-cresol purple (mCP) as an indicator of pH. On the other hand, although the potentiometric pH sensor is low power consumption and high-speed response (within 10 seconds), drifts in the pH of the potentiometric measurements may possibly occur for a long-term observation. The HpHS can measure in situ pH correctly and stably combining advantage of both pH sensors. The HpHS is correcting the value of the potentiometric pH (measuring frequently) by the value of the spectrophotometric pH (measuring less frequently). It is possible to calibrate in situ with Tris buffer or CRM on the spectrophotometric pH sensor. Therefore, the drifts in the value of potentiometric pH measurements can be compensated using the pH value obtained from the spectrophotometric pH measurements. Thereby, the HpHS can measure accurately the value of pH over a long period of time with low power consumption.

In order to understand the seasonal and inter-annual variabilities of biogeochemical cycles and ecosystems, ship-based studies have been carried out since 1997 at time-series station K2 (47oN, 160oE) in the subarctic western North Pacific, which is a region with progression of ocean acidification. However, the ship-based studies of the open ocean have been limited in their ability to conduct high-frequency observations for understanding the biogeochemical cycles and ecosystems. To overcome the problem, we developed a hybrid profiling buoy system. The HpHS was attached to a remote automatic water sampler (200m) in the buoy system in July 2015. We recovered the buoy system in June 2016 and succeeded in observing seawater pH every four hours for a year. Here, we show an overview of the diurnal and seasonal variations of pH for a year at station K2. In addition, we examine a relationship between the pH variations and marine calcifiers recovered by the sediment trap during the same period.