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Development of drifting buoy system with in situ sea surface pCO2 sensor for long term observation

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A lot of observations to obtain the fate of CO2 in the atmosphere which is related with long term climate change have been carried in the world. However, the surface pCO2 observations on ships of opportunity and research vessels concentrated in the North Atlantic and North Pacific. To obtain the spatial and temporal variation of surface pCO2 in the whole ocean, new simplified automated pCO2 measurement system is needed.

We have been developing newly small and simple in situ system for pCO2 measurement using spectro-photometric technique. The pCO2 is calculated from pH of indicator solution equilibrated with seawater through a gas permeable membrane. An amorphous fluoropolymer tubing form (AF-2400) with high gas permeability was tested as a gas permeable membrane. This measuring system was constructed from LED light source, optical fiber, CCD detector, micro pump, and downsized PC. The new simple system is attached in aluminum drifting buoy with satellite communication system, which size is about 300 mm diameter and 500 mm length and weight is within 30 kg. A Li-ion battery is occupied about one third of the drifting buoy. In the laboratory experiment, we obtained high response time (less than 2 minutes) and precision within 2 μatm.