Speciation of inorganic iodine in bottom water of the Funka Bay, Hokkaido

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Dissolved iodine is typically present as inorganic compounds, iodate (IO_3^-) and iodide (I^-), in seawater at concentrations approximately 500 nmol/L. In oxic seawater, IO_3^- (400 - 500 nmol/l) is more stable than I^- (< 100 nmol/L).In hypoxic seawater, IO_3^- is reduced to I^- by abiotic chemical reaction. Reduction of IO_3^- in oxic surface seawater is believed to be relevant to nitrate reductase activity in phytoplankton cell and nitrate reducing bacteria (e.g. Tsunogai and Sase, 1969). Recent studies have proposed large variety of abiotic / biological I^- oxidation processes in seawater.
In this study, the objective was to investigate the temporal variation of iodine speciation in high productive coastal environment in subarctic area.Ship observations were conducted in Funka Bay, Hokkaido, in February, March, April, May, July, August, October, December of 2016. Seawater samples were vertically collected by CTD-observation system and Van-Dorn water sampler in the basin area of the Bay. The sampling depths were 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 75, 80, 85, 90 m Nutrients (NO_3+NO_2, NO_2, NH_4, PO_4, SiO_2) were analyzed by colorimeteric method, and I^- was analyzed by voltammetry (CSV). Total inorganic iodine was determined by the CSV analysis of I^- after the ascorbic reduction of IO_3^- (Total I: T-I = I^- + IO_3^-).
The total column concentrations of T-I (560 - 580 nmol/L), which were averaged from the surface to the bottom water concentrations, had not distinct maximum or minimum throughout the year. On the other side, In the bottom water (90m), I^- concentrations increased from May (108 nmol/L) to July (150 nmol/L), and IO_3^- concentrations drastically decreased from May (432 nmol/L) to July (188 nmol/L). The N* value(= NO_2 + NO_3 + NH_4 - 16*PO_4), which is used as an indicator of denitrification in seawater, was decreased from April (-6 μmol/L) to May (-12 μmol/L) and July (-14 μmol/L), implying that denitrification occurred in the bottom sediment. We considered that the decrease of IO_3^- concentration from May to July was resulted from the IO_3^- reduction in bottom sediment accompanied by nitrate reduction (denitrification).

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