Variability of the growth rate for dissolved inorganic carbon in surface seawater along the 165˚E line

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The atmospheric concentration of carbon dioxide (CO_2) has reached 146% of the pre-industrial level resulting from the increase of CO_2 emissions by human activities. On the other hand, the ocean has absorbed about 30% of the anthropogenic CO_2, which leads to the regulation of the atmospheric CO_2 increase (IPCC, 2013). Midorikawa et al. (2012) found that the increase of the partial pressure of oceanic CO_2 (pCO_2^{sea}) along 137˚E recently decelerates though that of atmospheric CO_2 accelerates. The variability of pCO_2^{sea} is affected by the changes in sea surface temperature and salinity, dissolved inorganic carbon (DIC), and total alkalinity, and the investigation of the DIC changes in the surface seawater helps us to understand the oceanic absorption of atmospheric CO_2. In this study, the variability of DIC in surface seawater is examined from subarctic to equatorial region along 165˚E, one of the repeat hydrographic sections of Japan Meteorological Agency (JMA).

Using the observation data collected by JMA’s Research Vessels in the 165˚E section and surface ocean CO_2 atlas (SOCAT) version 6, we calculated the mean trend of DIC in surface seawater during the period of 1996-2017. We found that DIC increases slower around 10˚N, and faster around 30˚N than atmospheric CO_2. Also, DIC growth rate is similar to the rate of atmospheric CO_2 increase in the equatorial region.

The variability of the DIC trend averaged for 10 years indicates that the DIC growth rate has increased in the equatorial region and decreased around 30˚N.

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