

Ratios of Greenhouse Gas Emissions Observed over the Yellow Sea and the East China Sea

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During a cruise of the survey vessel *Dongfanghong II* on the Yellow Sea and the East China Sea in the spring of 2017 we performed accurate measurements of the mole fractions of carbon dioxide (CO_2), methane (CH_4), carbon monoxide (CO), and nitrous oxide (N_2O) using two types of Cavity Ring-Down Spectrometers (CRDS). The spatial variations of the mole fraction of the four trace gases were very similar. The emission sources of these gases were divided into several regions by using the NOAA HYSPLIT model. Then we analyzed the variations of the ratios of the mole fraction enhancements between every pair of trace gases downwind of these source areas. The ratios showed that the distributions of these trace gases over the Yellow Sea and the East China Sea in the spring were mainly caused by the emissions from Eastern China. The much higher enhancement ratio of $\Delta\text{CO}/\Delta\text{CO}_2$ and the lower ratio of $\Delta\text{CH}_4/\Delta\text{CO}$ observed in the air parcels from big cities like Beijing and Shanghai indicated high CO emission from the cities during our time of observation. Compared with the values of NOAA's Marine Boundary Layer (MBL), the ratios of the averages in the air coming from the northern sector (Russia) were on average closer to the MBL, and the air that stayed over the Yellow Sea and the East China Sea was a mixture of emissions from wide regional areas. The highly variable N_2O data of the air from Qingdao and Shanghai showed much more fluctuation.

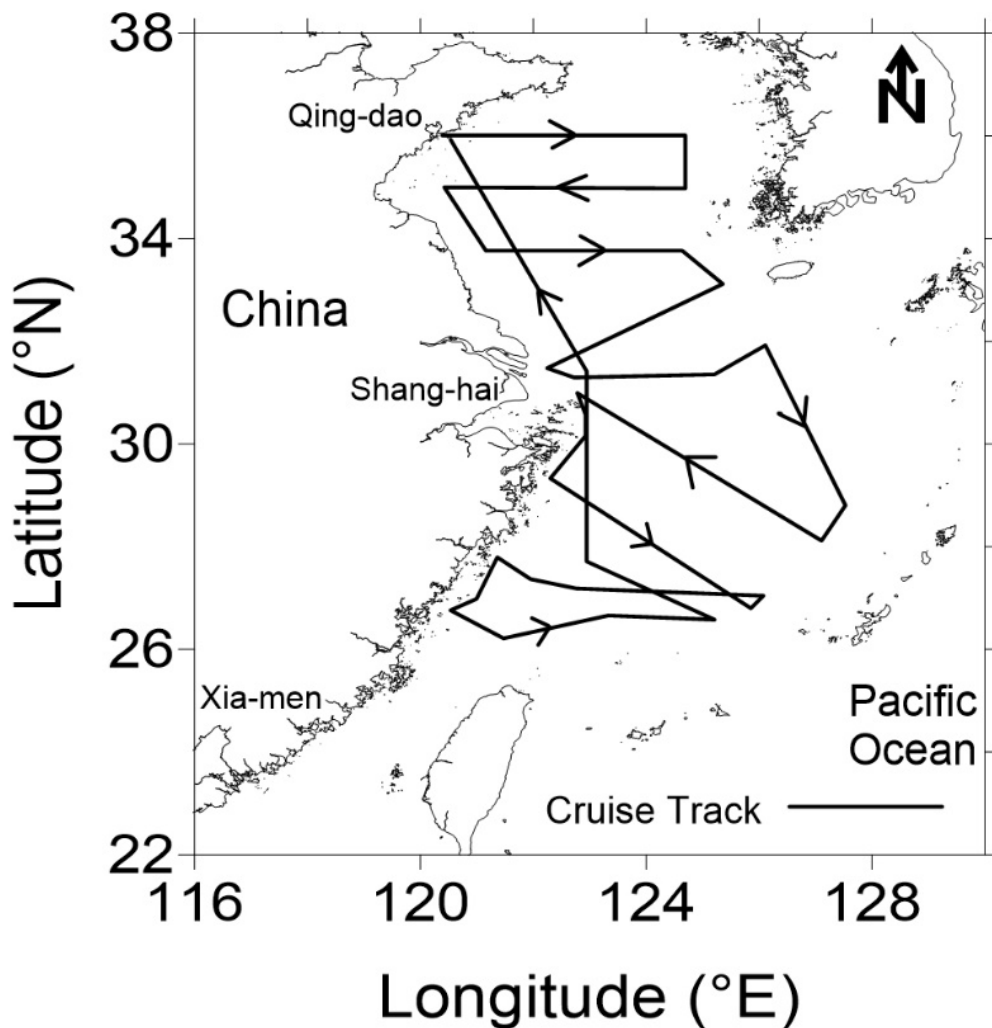


Figure 1. Cruise track of the survey vessel *Dongfanghong II* on the Yellow Sea and the East China Sea in the spring of 2017.