

Variations of Carbon Cycle Greenhouse Gases in the South China Sea

C. Ou-Yang¹, S.R. Babu¹, J. Chiu¹, E.J. Dlugokencky², D.H. Neff³, R.C. Schnell^{3,2}, Y. Chiu⁴, J. Yu⁴, C. Huang⁴, P. Shieh⁴, and N. Lin^{1,5}

¹National Central University, Department of Atmospheric Sciences, Taoyuan, Taiwan; +886-3-4227151 ext.65543, E-mail: cfouyang@cc.ncu.edu.tw

²Retired from NOAA Global Monitoring Laboratory (GML), Boulder, CO 80305

³Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO 80309

⁴Environmental Protection Administration, Department of Environmental Monitoring and Information Management, Taipei City, Taiwan

⁵National Central University, Center for Environmental Monitoring and Technology, Taoyuan, Taiwan

This study presents the preliminary results of CO₂, CH₄, and CO observed in the South China Sea (SCS) from May 2019 to November 2022. Flask air samples were collected once per week at two island sites, i.e., Dongsha Island (20.699°N, 116.730°E; code: DSI) and Taiping Island (10.379°N, 114.371°E; code: TPI), located in the northern and southern SCS, respectively. Distinct seasonal variations were found for all the compounds at both sites. However, higher wintertime maxima were observed at DSI than TPI in response to Asian continental outflow driven by northeast monsoon. In contrast, summertime seasonal minimum levels at DSI and TPI were close. Similar backward trajectory paths at the two sites as identified by cluster analysis were selected to calculate their differences in concentration. For the same origins of air masses associated with Asian continental outflow, the differences in CO₂, CH₄, and CO were 6.0 ppm, 54.1 ppb, and 89.7 ppb, respectively, between DSI and TPI. In addition, a significant increase in CO with a monthly mean of 287.0 ppb was observed at TPI in September 2019, which could be related to the severe biomass-burning episode in Jambi, Indonesia. However, the change was insignificant for CO₂ and CH₄ in this case. Furthermore, the biomass-burning plume did not spread to northern SCS, thus no CO enhancement at DSI.

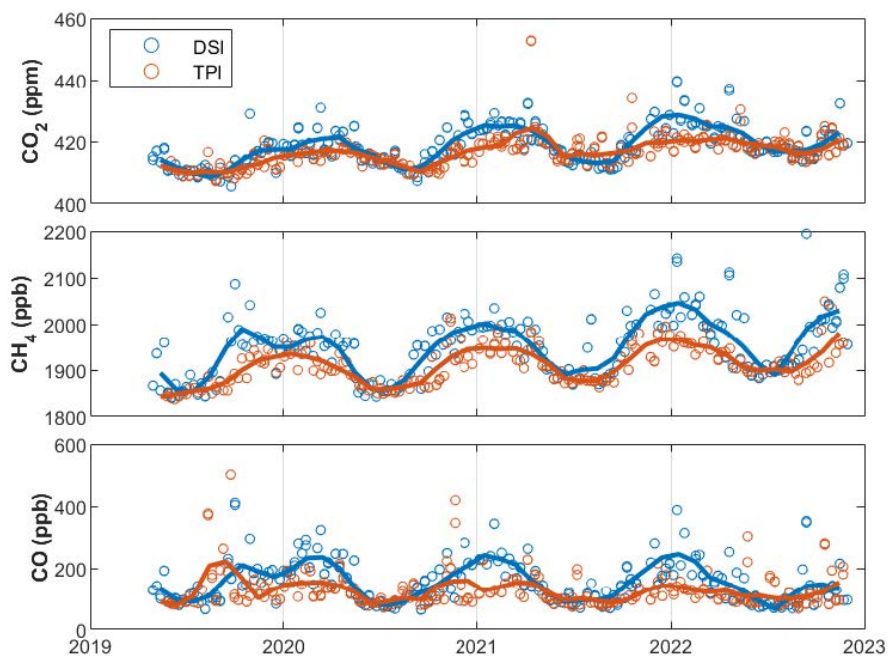


Figure 1. Temporal variations of CO₂, CH₄, and CO observed at Dongsha Island (DSI) and Taiping Island (TPI) in the South China Sea.