

Influences of Asian Continental Outflow on the Trace Gas Levels at Dongsha Island in the South China Sea

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The Dongsha background station, located at a small island (the largest island of Pratas Islands, about 2 km², 20°42'52" N, 116°43'51" E) situated between Taiwan and the Philippines, serves as a remote site for monitoring GreenHouse Gases (GHGs) and surface ozone in northern South China Sea (SCS). NOAA flask-sampled GHGs at Dongsha during 2010-2012 show seasonal variations with winter/spring maxima and summer minima. Asian continental outflow is likely to be the major cause for this seasonality. By comparing the results of flask air samples collected at Kumukahi (surface site in Hawaii at approximately the same latitude (19.52°N)), SF₆ and CH₄ levels at Dongsha during the southwest monsoon period in mid-summer were relatively low and steady, but higher in the winter when the air is coming off the Asian continent. During wintertime, excessive CO₂ and CO at Dongsha can be attributed to fossil fuel combustion and biomass burning permeating into the SCS. In spring and summer, vegetation growth on land completely accounted for the CO₂ signal at Dongsha which is as clean and stable as measured at Kumukahi. The N₂O at Dongsha showed a very similar trend to that of Kumukahi, while the levels were elevated when air masses originated from the Asian continent. Meanwhile, during the Seven South East Asian Studies/Dongsha Experiment in March-June of 2010, ozone was elevated to be ~60 ppbv when strong northeasterly winds prevailed. In contrast, during periodic calm periods lower ozone of about 30 ppb were detected, which is typical for marine air masses. This outflow of polluted air masses from the Asian continent and Taiwan, as well as spatial distribution of ozone, were also successfully simulated using the Fifth-Generation Penn State/NCAR Mesoscale Model (MM5) and Taiwan Air Quality Model (TAQM).

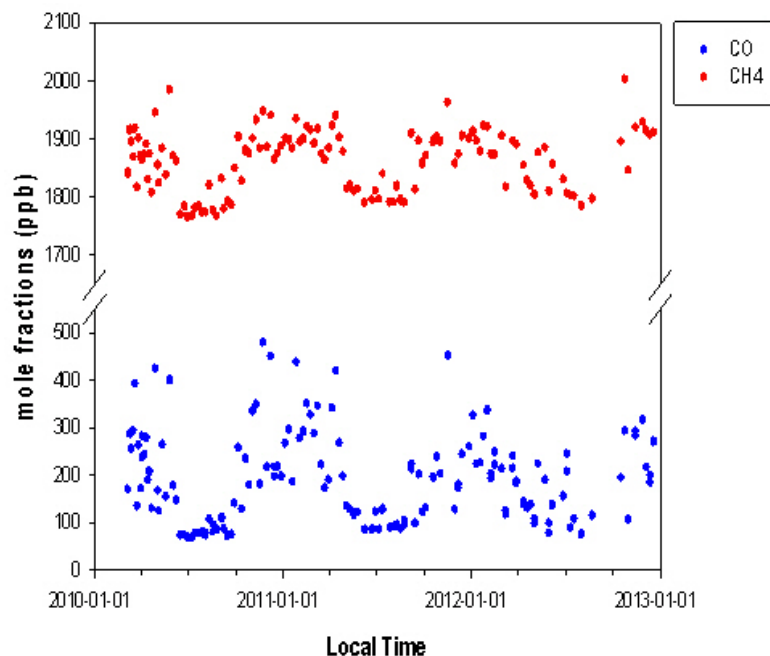


Figure 1. Flask air samples of CO and CH₄ collected at Dongsha Island from 2010 to 2012.