CO_2, CH_4, and Stable Isotopes at Lulin and Dongsha Island, Taiwan

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The Taiwan Lulin Atmospheric Background Station (LABS; 23.47°N, 120.87°E; 2,862 m a.s.l., begun in 2006) monitors Asian dust, biomass burning and acidic pollutants originating in Southeast Asia. As part of the Global Montoring Division's (GMD) Cooperative Air Sampling Network, flask sampling at Dongsha Island (DS; 20.70°N, 116.73°E; 3 m a.s.l.) began in 2010 to characterize sea level greenhouse gases in the South China Sea. The annual maxima and minima of CH_4, CO and O_3 at LABS and DS occur in March and July, respectively. At LABS, springtime maxima were related to long-range northeasterly monsoon transport from Southeast Asia moving polluted air masses into the South China Sea as indicated by elevated CO_2 levels at DS. Vegetation growth in spring drew down CO_2 concentration at LABS and DS in summer. At LABS, a daily minimum of CO_2 with a lager standard deviation was observed during daytime when photosynthesis was active. The diurnal patterns of CH_4, CO and PM10 were similar, which was induced by the mountain-valley circulations. The stable isotope ($\delta^{13}C$) of CO_2 decreased at an annual rate of -0.056 ‰ per yr at LABS over the past 7.5 years with annual means of $\delta^{13}C$ and $\delta^{18}O$ of CO_2 in 2013 of -8.494±0.167 ‰ and +0.282±0.478 ‰, and at DS -8.452±0.212 ‰ and +0.014±0.374 ‰, respectively.

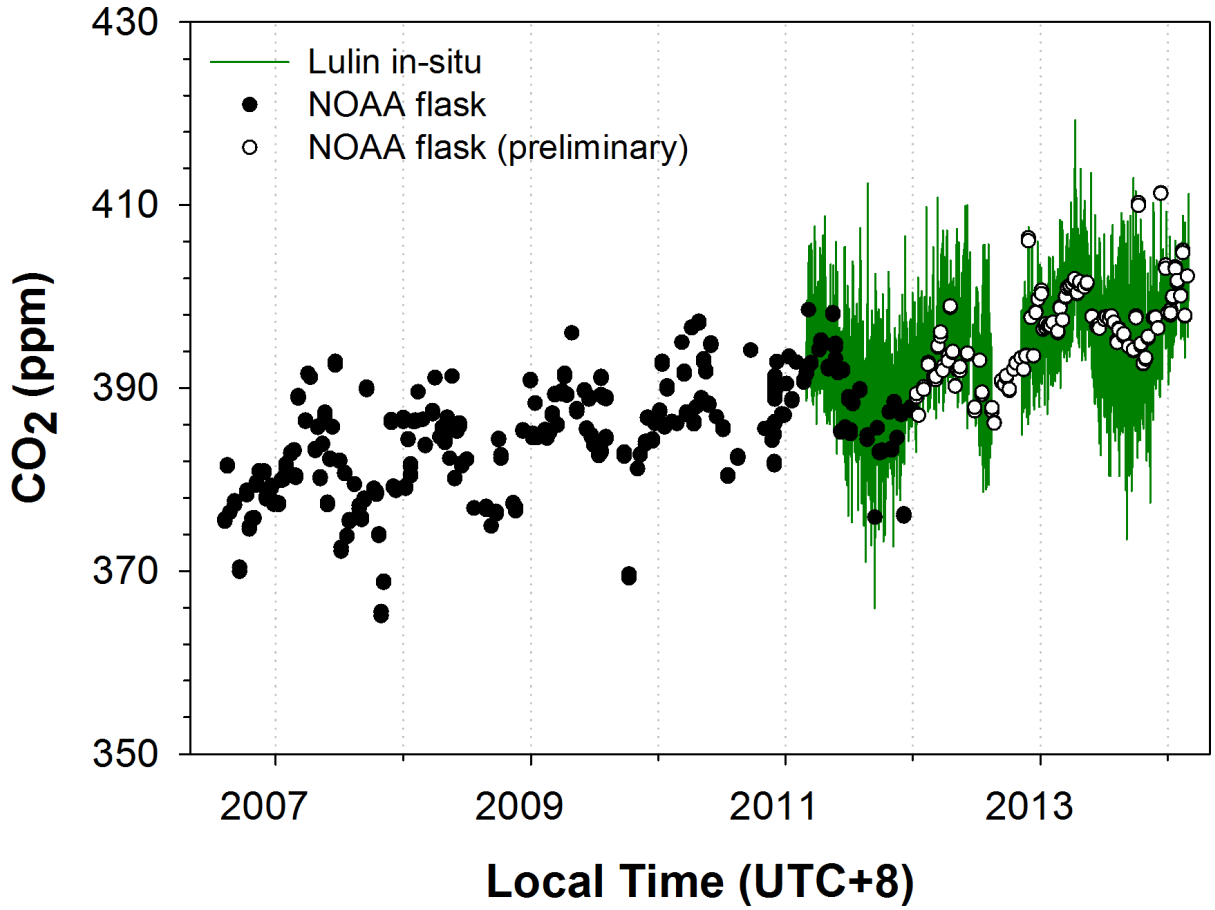

Figure 1. Time-series of CO_2 observed at LABS. Open circles are from GMD flask air samples and green continuous CO_2 data measured with a Cavity Ring-down Spectroscopy.