Ecosystem CO_2 Exchange and Anthropogenic CO_2 from American Samoa 1976-2005

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A study of the diurnal CO_2 exchange and photosynthesis of the Samoa tropical forest was published in 1990 using data from a three day period when the observatory was continuously downwind of eastern Tutuila Island (Ryan, *Global Biogeochemical Cycles, V4, No.1*, p69-84). This analysis is now extended to the entire 29 year SMO record. The data are divided into sectors based on wind direction: Anu'u Island (165^O to 179^O), local Tutuila (186^O to 236^O), and distant Tutuila (237^O to 270^O). Respiration and photosynthesis cause a diurnal change in atmospheric CO_2 from all three sectors. Samoa was hit by hurricanes in 1990, 1991, and 2004, perturbing the ecosystem CO_2 exchange for over a year afterwards. Excess CO_2 at night has increased significantly in all three sectors since the late 1990's some of which can be attributed to human activity. A 125 kw generator was installed on Anu'u Island in 1999, resulting in a 1 ppm increase above baseline at night from that sector. Since the mid-1990's, biomass burning has become widespread across Tutuila, which may be responsible for much of the 0.5 to 1 ppm increase in CO_2 coming from the Tutuila sectors since 2000.

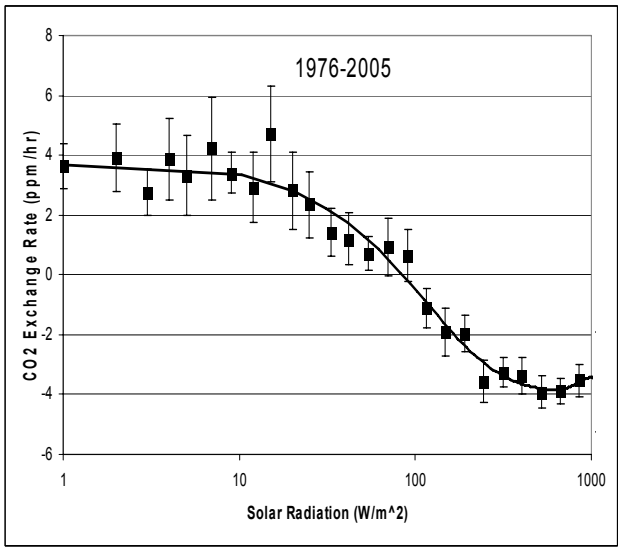

Figure 1. Photosynthesis curve averaged over the entire record. Ecosystem respiration balances photosynthesis at 90 W/m2

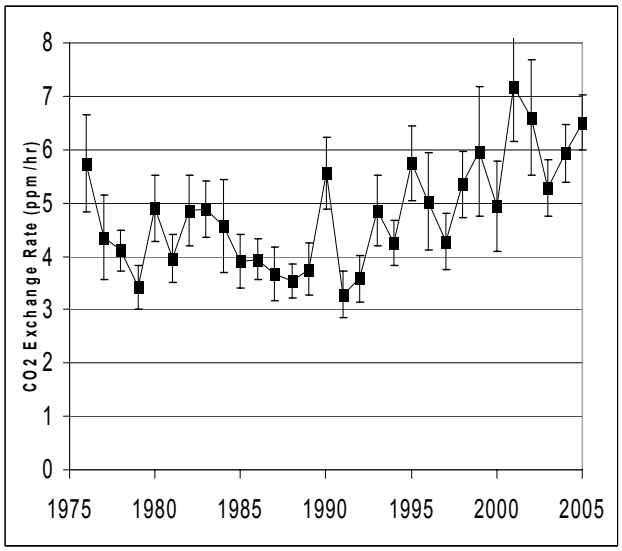

Figure 2. CO_2 exchange rate (baseline differenced CO_2 divided by residence time over land) in the local Tutuila Sector.