UPDATE ON ATMOSPHERIC O_2/N_2 MEASUREMENTS, FROM 1994 TO 2002

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ABSTRACT

Our current understanding of the global carbon cycle has greatly benefited from atmospheric O_2 measurements, pioneered by R.F. Keeling and collaborators in 1990. Our parallel sampling program, with sampling locations added periodically beginning in 1991, now includes Point Barrow (Alaska), Sable Island (Eastern Canada), American Samoa (Tropical South Pacific), Amsterdam Island (Indian Ocean, French station), Cape Grim (Tasmania, Australia), Macquarie Island (subantarctic Australian station), and Syowa (Antarctic Japanese station). Samples are also routinely collected on Ka'imimoana, a U. S. NOAA ship operating in the equatorial Pacific.

We have used analyses on samples from this network (Fig. 1) to assess the anthropogenic carbon balance and its interannual variability. From 1994-2002, average CO_2 uptake by the ocean and the land biosphere was 1.7 ± 0.5 and 1.0 ± 0.6 Gt C yr^{-1} respectively; these numbers include a correction of 0.3 Gt C/year due to secular outgassing of ocean O_2. The record of interannual variability supports previous work concluding that changes in CO_2 uptake by the land biosphere are primarily responsible for rapid atmospheric CO_2 growth rates associated with El Niño events (Fig. 2). We present a current summary of our atmospheric CO_2 records and update the anthropogenic carbon balance.

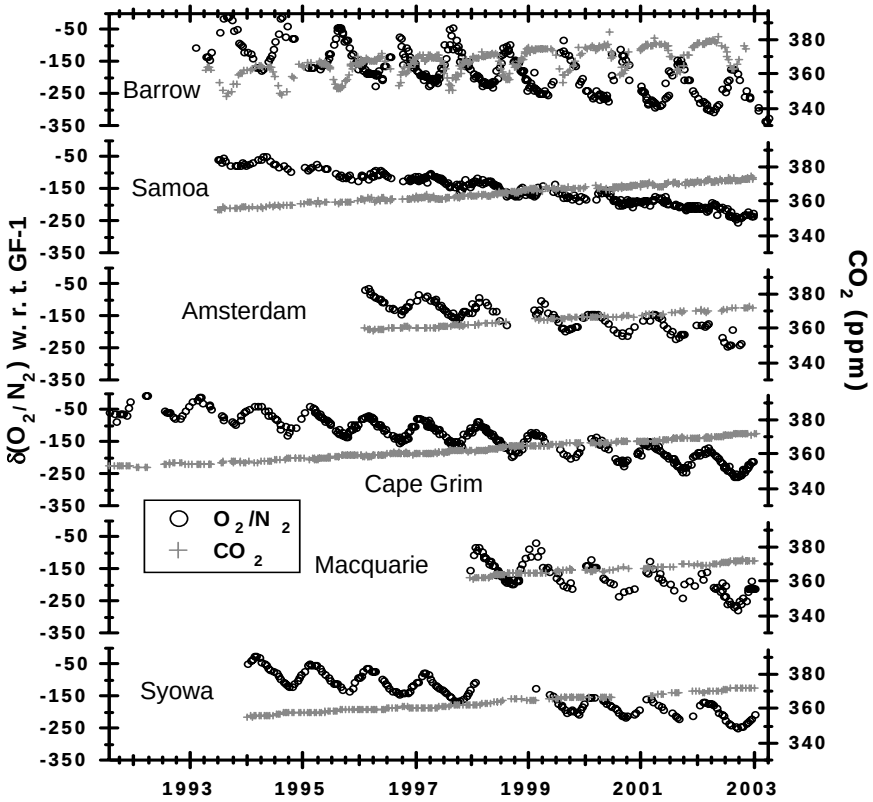

Fig. 1. O_2/N_2 and CO_2 records at our sampling locations.

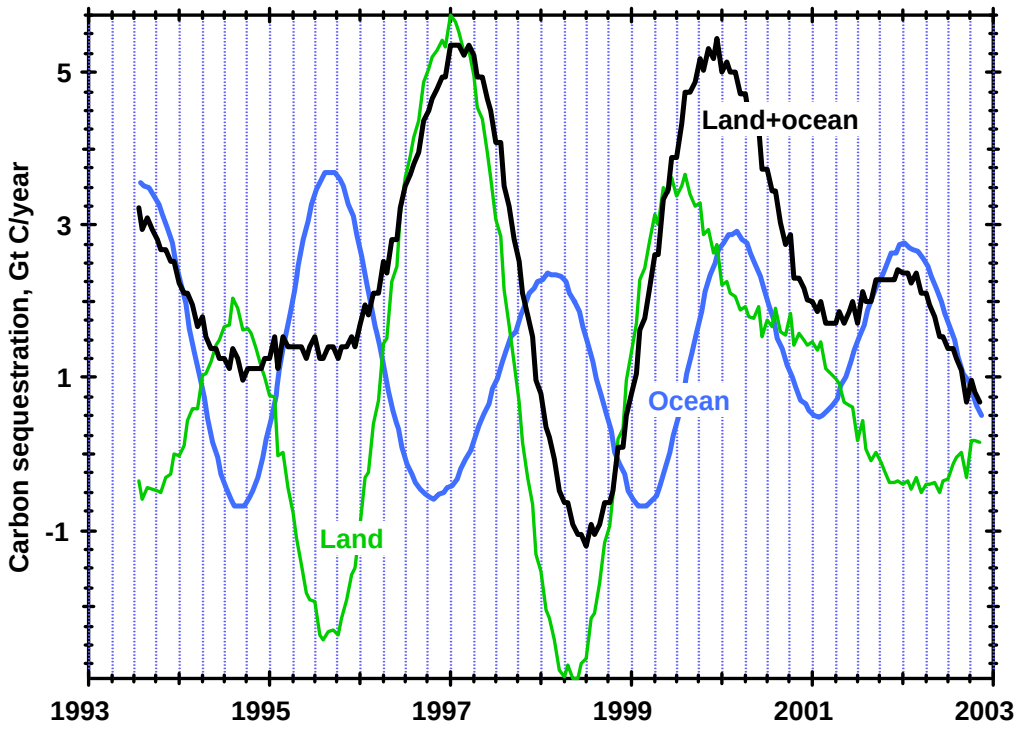

Fig. 2. Land and ocean CO_2 sequestration rates calculated from CO_2 and O_2/N_2 data at Cape Grim, Samoa, and Barrow.