

Estimation of recent global carbon budgets based on atmospheric O₂/N₂ and CO₂ measurements at Hateruma and Ochi-ishi

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We have been collecting the air samples in Pyrex glass flasks for the measurements of atmospheric O₂/N₂ ratio and CO₂ concentration at Hateruma Island (lat 24N, long 124E) since July 1997 and at Cape Ochi-ishi (Lat 43N, long 145E) since December 1998. The observed CO₂ concentrations clearly show increasing trends with well-known seasonality while the observed O₂/N₂ ratios show decreasing trends with inverse seasonality. Taking into account the global mass balances of atmospheric CO₂ and O₂, we estimate the global ocean and land biotic carbon sinks based on our O₂/N₂ and CO₂ observations and global fossil fuel statistics. The partitioning of the global CO₂ sinks is also achieved by using the tracer atmospheric potential oxygen (APO), which is calculated as the weighted sums of the observed O₂/N₂ ratio and CO₂ concentration, and the NOAA/ESRL globally averaged CO₂ record. These estimates are compared with the previous estimates for the global oceanic and land biotic sinks. We also evaluate the uncertainties associated with our estimation of global carbon sinks, and discuss the individual contributions of the error sources, including ocean outgassing effect, stability of O₂/N₂ scale, and fossil fuel emission.