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# Observations of atmospheric radiocarbon in carbon dioxide at Hateruma Island and Cape Ochi-ishi, Japan

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Atmospheric radiocarbon in carbon dioxide ($^{14}CO_2$) is a powerful tracer for understanding of carbon cycles, e.g. oceanic and biospheric $CO_2$ exchanges and $CO_2$ emissions from fossil fuel combustion. Observation sites for radiocarbon concentrations, $\triangle^{14}C$, are not many enough to evaluate the global and regional carbon flux. We present an analysis of trends, interannual variability (IAV) and seasonal cycle of $^{14}CO_2$ in background air from July 2004 to December 2012 at two NIES/CGER monitoring stations; Hateruma Island (HAT; latitude 24.06N, longitude 123.81E) and Cape Ochi-ishi (COI; latitude 43.16N, longitude 145.50E). The air samples were collected in 2 L Pyrex glass flasks. The sampling frequency was monthly. $CO_2$ was extracted from the whole air at NIES and CO2 samples were converted to graphite and analyzed ratios of $^{14}C/^{12}C$ by accelerator mass spectrometry (AMS, National Electrostatics Corp., 1.5SDH) at Paleo Labo Co., Ltd., Japan. Analytical precision in $\triangle^{14}C$ determined from statistical uncertainty (number of $^{14}C$ counts) was $\pm$1.7-2.0 ‰ for most samples. The repeatability of measurements using modern reference air was $\pm$1.9 ‰ . A decreasing trend in $\triangle^{14}C$ was -5 ‰ $yr^{-1}$ in average but large IAV was observed at both stations: large decreases in 2007-2008 and in 2010-2011 (-8 to -9 ‰ $yr^{-1}$) and almost zero decrease in 2009. We also observed clear seasonal cycle of $\triangle^{14}C$. The peak-to-peak amplitudes in the seasonal cycle determined from the smooth curve fits were 7 ‰ at both stations and the maximum of $\triangle^{14}C$ appeared in July and the minimum in January at HAT, and the maximum in September and the minimum in May at COI. The differences in phase of $\triangle^{14}C$ seasonal cycle between HAT and COI suggested that the atmospheric $\triangle^{14}C$ at COI was influenced by $CO_2$ emitted from terrestrial biosphere.