

AAS001-P13

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## 西部太平洋における大気酸素のGC/TCD法を用いた船上観測

### Shipboard measurements of atmospheric O<sub>2</sub> in the western Pacific by using a GC/TCD technique

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We have been observing atmospheric O<sub>2</sub> concentrations in the western Pacific onboard cargo ship, Trans Future 5 (TF5), since September 2007. TF5 has repeated round-trip cruises between Japan and Oceania (Australia and New Zealand) every 6 weeks. The changes in the atmospheric O<sub>2</sub> concentration are measured by a gas chromatograph equipped with a thermal conductivity detector (GC/TCD) every 10 minutes, and the precision of the 1-hour average is about 1 ppm. The shipboard O<sub>2</sub> values during a period from October 2007 to July 2009 are compared with the O<sub>2</sub> values from about 300 flask samples, which were collected on the ship and later analyzed at our laboratory by using the same GC/TCD technique with the precision of about 1 ppm. The average of the differences between flask and onboard O<sub>2</sub> values except the data obtained during June-July 2008 is 0.0±1.9 ppm. This good agreement strongly supports the reliability of the onboard O<sub>2</sub> measurements. During the exceptional 2-month period, the intake flow rate was reduced from 8 L/min to 5 L/min and the sample loop flow rate was reduced from 8 mL/min to 6 mL/min because of clogging of the pump filter and the mass flow controller, respectively, and the onboard O<sub>2</sub> values were 4.6±1.8 ppm lower than the flask values on average. In the following analysis, we add the average difference of 4.6 ppm to the onboard O<sub>2</sub> values obtained during the relevant 2-month period. To investigate the oceanic components of the observed O<sub>2</sub> change, we use the tracer APO = O<sub>2</sub> + 1.1xCO<sub>2</sub> instead of O<sub>2</sub> only, where 1.1 represents the O<sub>2</sub>:CO<sub>2</sub> molar exchange ratio for land biotic photosynthesis and respiration. Here, we use onboard CO<sub>2</sub> values determined by an NDIR analyzer. The time series of APO between 40 deg. S and 35 deg. N are binned into 1-degree latitude bands and the smooth-curve fits to the binned data are computed by using a combination of the least-square and digital filtering techniques. Then, the latitudinal differences in the seasonality and the annual averages of APO are investigated based on the smooth-curve fits. The seasonal amplitudes of APO show minima of 4 ppm between 10 deg. S and 15 deg. N and poleward increases with maxima of 13 ppm at 40 deg. S and 10 ppm at 35 deg. N. The latitudinal distribution of APO shows maxima between 5 deg. S and the equator and poleward decreases in both hemispheres. This APO latitudinal profile strongly supports the recent coupled ocean-atmosphere model predictions for this region. Because the density of the onboard data is much higher than that of the flask data (21 flasks per round-trip cruise), more detail features of the APO latitudinal distribution in the western Pacific have been revealed.

キーワード:大気酸素,船上観測,大気ポテンシャル酸素

Keywords: atmospheric O<sub>2</sub>, shipboard measurements, atmospheric potential oxygen