Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

AAS021-08 会場:102 時間:5 月 23 日 10:15-10:30

APO の季節変動の緯度分布と下部対流圏における子午面循環との関係
Latitudinal distribution of APO seasonal cycles and its relation to the meridional circulation in the lower troposphere

遠嶋 康徳 [1*], 峰島　知芳 [1], 向井人史 [1], 町田 敏暢 [1], 山岸 洋明 [1], 野尻幸宏 [1]
Yasunori Tohjima[1*], Chika Minejima[1], Hitoshi Mukai[1], Toshinobu Machida[1], Hiroaki Yamagishi[1], Yukihiro Nojiri[1]

[1] 国立環境研究所
[1]NIES

We examine the latitudinal differences in the phasing of the average seasonal cycles of the atmospheric potential oxygen (APO= O{sub}2{/sub}+1.1xCO{sub}2{/sub}), which is based on the atmospheric O{sub}2{/sub} and CO{sub}2{/sub} observations in the western Pacific region. Because APO is invariable with respect to the terrestrial biotic exchanges, its seasonal variations mainly reflect air-sea exchanges of O{sub}2{/sub}. Investigating on the APO gives new insights into the meridional circulation because APO is a tracer from the ocean, which has very different flux distribution from those of land tracers. The seasonal minimum occurs in March and September in the Northern and Southern Hemispheres, respectively, and the latitudinal distribution of the date of the seasonal minimum shows discontinuous change at the equator. Contrary to this, the date of the seasonal maximum smoothly changes across the equator from March at 35 deg. S to July at 15 deg. N and levels off between 15 deg. N and 50 deg. N. The seasonal variation in APO is predominantly driven by the air-sea O{sub}2{/sub} fluxes between 30-60 deg. in both hemispheres because seasonal variation in the air-sea O{sub}2{/sub} fluxes in the equatorial regions are relatively small. Therefore, the seasonal cycles of APO in the tropics depend mainly on the meridional propagation of the atmospheric signals in the lower troposphere. The observational results indicate that the seasonal minima propagate equatorward with little phase lags in both hemispheres and the seasonal maximum propagate equatorward with a substantial phase lag in the Southern Hemisphere. These seasonal differences in the propagation speed could be explained by the strong and weak meridional circulation in winter and summer, respectively, in the lower troposphere. The latitudinal distribution of the date of the seasonal maximum in the Northern Hemisphere may be attributed to the influence of the propagation of the seasonal maximum in the Southern Hemisphere because the seasonal variations in the air-sea O{sub}2{/sub} fluxes is about 2 times larger in the Southern Hemisphere than in the Northern Hemisphere.

キーワード: APO, 季節変動, 子午面循環, 大気酸素, 大気‐海洋ガス交換
Keywords: APO, seasonal cycle, meridional circulation, atmospheric oxygen, air-sea gas exchange