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B 会場 ：11/5　PM2 （15:45-18:15）
17:30〜17:45

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DW2 tide enhanced by equatorial tropospheric ozone variation due to El Nino.

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Thermal tides transport their energy and momentum vertically from the lower to the upper atmosphere. Thermal tides also drive a neutral wind in the E-region, causing the geomagnetic solar quiet variation. One of primary tidal sources is atmospheric heating (i.e., atmospheric absorption of solar radiative and latent heating) strongly affected by the meteorological phenomenon (Chapman & Lindzen, 1970). Water vapor and rainfall are primary sources of atmospheric heating in the equatorial region and are strongly modulated by El Nino. Some studies have shown the impacts of the El Nino modulation on tides via the water vapor and rainfall modulation (Lieberman et al., 2007; Liu et al., 2017; Pedatella and Liu, 2012; Kogure et al., 2021).

On the other hand, ozone also absorbs solar radiative heating and generates tides. While ozone is well known as a primary heat source and tidal source in the stratosphere(Chapman and Lindzen, 1970), tropospheric ozone is well known as one of the greenhouse gases, as well (IPCC, 2013; Cooper et al., 2014). El Nino modulates a longitudinal variation of tropospheric ozone over the equatorial region, which possibly influences tidal activity in the mesosphere and lower thermosphere (MLT).

To investigate the impact of the ozone variation on equatorial tides, we performed two simulations by using the GAIA model (Ground-to-topside Atmosphere Ionosphere model for Aeronomy)(Jin et al., 2012) from September 2006 to 2007 March (El Nino phase). An ozone variation in run1 is prescribed as zonally symmetric values while that in run2 is prescribed as an El Nino pattern (based on Omen et al., 2013), i.e., positive anomaly (26% at maximum) in 50-120degreeE and negative anomaly (11% at maximum) in 120-300degreeE between 7 and 17 km altitudes (its maximum at 12 km). Both zonal mean values are the same.

We compared both tidal amplitudes and found, in run2, an increase in DW2 (diurnal tide with wavenumber 2) up to ˜0.3 K (˜1 m/s) at 100 km altitude. We decomposed the DW2 temperature perturbation into Hough mode functions, and this DW2 enhancement is attributed to the first symmetric propagation mode. Also, the enhancement of the first symmetric mode was found between the troposphere and MLT, suggesting the enhancement of the DW2 in the troposphere propagates into the MLT. Therefore, our results suggest that the ozone El Nino pattern in the troposphere strengthens the DW2, which propagates into the MLT. This presentation will show those results and discuss a dynamical mechanism of the DW2 enhancement.