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Equatorial MLT dynamics using long-term radar observation

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In the equatorial region, atmospheric waves cause the S-QBO(Stratospheric Quasi-Biennial Oscillation) in the lower stratosphere, S-SAO(Stratospheric Semi Annual Oscillation) in the upper stratosphere and M-SAO(Mesospheric Semi Annual Oscillation) in the MLT(Mesosphere Lower Thermosphere).S-SAO and M-SAO is opposite phase.

We investigate the periodic oscillation and random variation of wind in the MLT over equatorial region by using long-term meteor radar observation in Indonesia. Especially, we focus on the peculiar phenomenon that enhance westward wind in Feb.-Apr. once in 2 or 3 years, M-QBE(Mqsosphere Quasi-Biennial Enhancement).M-QBE occur only spring but not fall. We think that there must be 1-year oscillation which restrict the M-QBE to spring.

N.V.Rao et al.[2012] reported that gravity wave enhancement coinside with westward wind enhancement. This result suggest that gravity waves drive the M-QBE. However, we have to measure the momentum flux with gravity waves to reveal the relationship between M-QBE and gravity waves.

Hocking[2005] proposed a new method that enables us to measure the momentum flux by using meteor radar. However, this method has several doubtful points, so we checked the validation.

We have two meteor radars which have the same system and which are in the neighborhood in Indonesia(Koto Tabang and Biak) on the equator. We used these meteor radar data ,calculated the momentum flux, and checked the validation in Hocking method.

We compared the data from two meteor radar, and we got the similar momentum flux results during high acquisition rate. From this result, We are succeeded to measure the momentum flux by using the Hocking method.

On the other hand, we did a composit analysis in Koto Tabang which have 12 years long-term data. This composit analysis suggests that the momentum flux has the periodicity of the half year. This result is consistent with M-SAO.

Keywords: Mesosphere and Lower Thermosphere, Quasi-biennual Oscillation, momentum flux, Hocking