Relationship between the Boreal Summer Intra-seasonal Oscillation and the Stratospheric Quasi-Biennial Oscillation

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In the equatorial stratosphere, quasi-biennial oscillation (QBO) is the dominant mode. The previous studies have shown the influence of QBO on Madden Julian Oscillation (MJO) during the austral summer (Nshimoto and Yoden 2017; Son et al. 2017). On the other hand, Kikuchi et al. (2012) pointed out that boreal summer intra-seasonal oscillation (BSISO), in which active convective region migrate northward in the Indian Ocean and the western Pacific with a period of 30–90 days, is the dominant mode compared to MJO during the boreal summer. In this study, statistical relationships between stratospheric BSISO and QBO are examined. BSISO index based on Kikuchi et al. (2012), the Japanese 55-year Reanalysis (JRA-55, Kobayashi et al. 2015), ERA-Interim (Dee et al. 2011), and cloud top pressure (Rossw and Schiffer 1999) provided by International Satellite Cloud Climatology Project (ISCCP, Schiffer and Rossw 1983) are used for composite analysis.

The results reveal that the amplitudes of BSISO tend to be extraordinarily large during the strong low-frequency easterly anomalies at around the 20-hPa level associated with QBO. we also found that the frequency of lower cloud top pressures (higher cloud top heights) tend to increase during the strong easterly phase of QBO in the BSISO region. Moreover, we analyze the vertical profile of the static stability around the tropopause. The results obtained from the two reanalyses show more unstable (stable) condition in the lower stratosphere in BSISO region during the strong and weak easterly phases (westerly phase) of QBO, although the vertical profiles of the static stability in the upper troposphere are different from each other.

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