

# A WN2-type Major Sudden Stratospheric Warming Event in February 2018

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A zonal wavenumber 2 (WN2) type major sudden stratospheric warming (MSSW) event occurred in February 2018 (MSSW18), which is the first vortex-splitting event in nine years since the MSSW occurrence in January 2009 (MSSW09, Harada et al. 2010). In this study, stratospheric and tropospheric fields during MSSW18 are analyzed and compared with those in the previous WN2-type MSSW events, i.e., the MSSW09, and MSSWs in February 1989 (MSSW89), December 1984 (MSSW84), and January 1963 (MSSW63), by using the Japanese 55-year Reanalysis and its near real-time data. The MSSW18 is found to be characterized by an associated extraordinarily strong peak of the upward Eliassen-Palm (EP) flux from the upper troposphere to the lower stratosphere. However, it rapidly decreases to about half until the middle stratosphere, partly due to strong convergence of wave packets from the Eastern Hemisphere at the western edge of the Aleutian High (Harada and Hirooka 2017). In addition, in the Western Hemisphere, wave packets emanated from repeatedly-developed upper-tropospheric ridges over Alaska propagate into the upper stratosphere, as commonly seen in the previous events except for the MSSW84, although the propagation is not as strong as that of the MSSW09 in the upper stratosphere. Consequently, rapid temperature increases, as seen in the MSSW09, were hardly observed at the 10-hPa level. The polar night jet was once decelerated in middle to late January 2018 and could not fully recover after that, which might play an important role in the subsequent polar night vortex splitting despite the relatively weak wave packet propagation in the upper stratosphere. Furthermore, the El Niño-Southern Oscillation (ENSO) has the possibility to influence the MSSW18 occurrence. The previous studies have shown that La Niña SSWs are selectively associated with WN2 amplification (e.g., Barriopedro and Calvo 2014; Calvo et al. 2010). The MSSW18 also occurred under positive SSTs in the eastern part of the North Pacific and a La Niña condition in the equatorial region.

Key words: sudden stratospheric warming, zonal wave number 2, wave packet propagation, repeatedly-developed upper-troposphere ridges over Alaska, La Niña condition in the equatorial region

## References

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