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Dynamical features and the relation to the polar stratospheric cloud formation in the winter 2015/2016

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Features of the general circulation and the appearance of polar stratospheric clouds (PSCs) in the Northern Hemisphere winter 2015/2016 are analyzed using satellite observations such as Aura Microwave Limb Sounder (MLS) and Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP), along with the Japanese 55-year reanalysis data, JRA-55. This winter can be described by dividing it into two periods, i.e. the extremely cold first half and the disturbed second half with minor and major sudden stratospheric warmings (SSWs): In the first half of the winter, the stable polar vortex governed the Arctic stratosphere, and lower stratospheric temperatures were extremely low due to weak planetary wave activity. As a result, plenty of PSCs appeared in the polar night region within the polar vortex during this period, which might cause severe ozone depletion over the Arctic in early spring. At the end of January, planetary wave activity became strong, which was followed by the polar vortex displacement at the beginning of February. However, influences of the polar vortex displacement were limited, resulting in the occurrence of a minor warming. Accordingly, the PSCs largely disappeared in the lower stratosphere. After that, the polar vortex was once reestablished in mid-February. However, planetary wave activity became strong again at the end of February. The polar vortex was broken up and a major warming occurred at the beginning of March. After all, severe ozone depletion in early spring was to be avoided. The detailed relationship between the PSC formation and dynamical fields will be discussed in the presentation.