



Variability of the northern hemisphere polar stratospheric cloud potential: the role of North Pacific disturbances

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The potential of the Arctic stratosphere to sustain the formation of Polar Stratospheric Clouds (PSCs) is a key factor in determining the amount of ozone destroyed each winter, and is often measured as a “PSC volume”. The latter quantity has been shown to closely follow a near-linear compact relationship with winter-averaged column ozone loss, and displays a high variability from monthly to decadal time scales. We examine the connection between meteorological conditions in the troposphere and the variability of lower polar stratospheric temperatures over the last four decades, and specifically, conditions leading to a high PSC volume. In addition to the well-established connection between the North Atlantic Oscillation (NAO) and the polar vortex, we demonstrate the large influence of precursory disturbances over the North Pacific and the Far East, the region of maximum climatological upward wave activity flux. Namely, very high monthly PSC volume (in the top 12% percentile) predominantly follows the development of positive tropospheric height anomalies over the Far East, which lead to a weakening of the background planetary wave trough, and lessened upward wave activity flux into the stratosphere. Precursory anomalies over the Far East are reminiscent of East Asian monsoon amplification episodes.