

# Role of the Stratospheric Polar Vortex and Tropospheric Blocking in winter 2016

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In January 2016, Asia and North America experienced unusual cold temperatures, although the global average of surface air temperature broke the warmest record during a strong El Niño event. This was closely related to the remarkable phase transition of the Arctic Oscillation (AO), which can be explained by stratosphere-troposphere interactions. First, the quasi-biennial oscillation changed to its westerly phase in summer 2015 and the stratospheric polar vortex was stronger in early to midwinter 2015/2016. As blocking did not occur in December, the associated downward propagation signal resulted in a strongly positive AO in late December 2015. Second, after late December, the positive phase of Pacific-North America pattern became apparent in El Niño event, which strengthened the Aleutian anticyclone in the stratosphere. In addition, an equivalent barotropic (“blocking”) anticyclone was established in the troposphere over Asia. The coexistence of blocking over Asia and North America characterized the negative AO and a strong zonal wave number 2 pattern. Due to stronger zonal wave number 2 signals from the troposphere, the stronger stratospheric polar vortex was elongated, with two cyclonic centers over Asia and the North Atlantic in January. The resultant southward displacement of polar vortices was followed by rare snowfall in the subtropical region of East Asia and a heavy snowstorm on the East Coast of the United States.

Key words: Arctic Oscillation, polar vortex, blocking, cold surge

## References

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