



Impact of snow cover in western and central China on the Northern Hemisphere Wintertime Blocking Frequency

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The role of boreal late autumn snow cover over western and central China in modulating the Northern Hemisphere wintertime blocking frequency is investigated using reanalysis data. The study results show that wintertime atmospheric circulations affected by late autumn snow cover anomalies form favorable conditions for increased blocking frequency (BF), especially in the North Pacific and North Atlantic. Evidence is also presented that the stratosphere–troposphere interactions are the key mechanism of the lag response of wintertime North Pacific and North Atlantic BFs to the late autumn snow cover. That is, positive anomalous snow cover can induce a dipole anomaly in the geopotential height field over the lower stratosphere, due to the decrease of the 300–1000-hPa thickness and the concurrent variation between the East Asian plateau jet and the polar front jet. The associated positive geopotential height anomalies are located over northwestern Eurasia. Meanwhile, western and central China shows remarkably negative geopotential height anomalies. Also, the corresponding atmospheric circulation in the lower stratosphere increases the Eliassen–Palm flux that propagates into the stratosphere through the constructive interference between the forced and climatological waves. The upward wave activity fluxes collapse the polar vortex in the stratosphere, resulting in the downward propagation of the geopotential and wind anomalies from the stratosphere. Consequently, the decreased zonal wind speed in the upper layer of the blocking region forms conditions favorable for wintertime blocking.

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