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Changes of the Impact of Autumn Tibet Plateau Snow Cover on Winter Temperature over North America at mid-1990s

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This study investigates the impact of the interannual variation of autumn snow cover over the eastern Tibet Plateau (TP) (ASCETP) on winter surface air temperature (SAT) over North America (NA) for the period 1979-2014 using both observational data and a linear baroclinic numerical model (LBM). The index of ASCETP shows an abrupt change with a predominant negative phase before and a predominant positive phase after 1994; thus, the analysis is performed for two subperiods, 1979-1994 (P1) and 1995-2014 (P2). The analysis of the ASCETP related energy budget shows that the variation of the ASCETP has a more pronounced cooling effect to the above atmosphere in P1 than P2. The snow related anomalous negative geopotential height above TP is more pronounced and extends further northeastward in P1 than P2. Further analysis shows that the relationship between ASCETP and North America winter SAT is not steady. During P1, associated with anomalous positive ASCETP, negative geopotential height anomalies emerge over the northeastern TP. These negative anomalies impose an anomalous vorticity perturbation near the East Asian westerly jet (EAWJ) core that propagates eastward, forming a wave train-like pattern. It crosses the North Pacific Ocean and reaches the NA region, leading to positive and negative winter SAT anomalies over western and eastern NA, respectively. In contrast, during P2, the impact of anomalous ASCETP on the variation in winter SAT over NA is weak, probably due to the relatively weak local cooling effect of the ASCETP and the weak ASCETP-related vorticity forcing around the EAWJ.