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Interannual variability of the North Pacific winter storm track and its relationship with extratropical atmospheric circulation

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Interannual variability of the North Pacific storm track and the three-dimensional atmosphere circulation during winter are investigated using NCEP/NCAR reanalysis data during 1950–2015. Results show that year-to-year variations of the storm track exhibit two principal modes, i.e. the monopole intensity change and the meridional shift of the storm track, respectively. The intensity change mode is linked to weakening of the Siberian high, northward shift of the western Pacific jet stream and Aleutian Low, and well corresponding to the Western Pacific teleconnection. The meridional shift mode is related to intensification and south-eastward extension of western Pacific jet stream and Aleutian Low, and linked to the Pacific-North America teleconnection. The internal atmospheric dynamics responsible for the storm track variability are further investigated from the perspective of wave-flow energy conversion. For the intensity change mode, accompanied by the enhanced baroclinity over the entrance region of the storm track, more energy is converted from mean available potential energy to eddy available potential energy and then transferred to eddy kinetic energy, which is favorable for the overall enhancement of the storm track intensity. For the meridional shift mode, more energy is transformed from mean available potential energy to eddy available potential energy and further transferred to eddy kinetic energy over the southern (northern) areas of the storm track, contributing to the southward (northward) shift of the storm track. Additionally, the increased (decreased) conversion from mean-flow kinetic energy to eddy kinetic energy over the north-eastern Pacific region is also in favor of the southward (northward) shift of the storm track.