令和二年度　環境科学院　修士論文内容の要旨

Interannual variation of annual maximum snow depth in Hokkaido and its relation to large-scale atmospheric circulation

（北海道における年最大積雪深の年々変動と大規模な大気循環場の関係）

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Snow cover is an essential component of winter climate in Hokkaido. Better understanding on the dominant large-scale atmospheric pattern affecting snow cover variation could help improve the prediction of snow depth variation. This study investigates the interannual variation and long-term trend of annual maximum snow depth (AMSD) in Hokkaido using 22 station data over 58 years during 1962—2019. There is a large year-to-year variation of AMSD. The empirical orthogonal function (EOF) analysis is conducted for interannual AMSD variations to characterize the leading spatial patterns of AMSD variability. The first two principal components (PCs) explain approximately half of the total variance (the first and the second PC account for 35% and 15%, respectively). The first PC shows in-phase (i.e., homogeneous) spatial pattern of AMSD. The 500hPa geopotential height regressed on the first PC resembles that of the positive phase of the Arctic Oscillation (AO). The EOF2 indicates west-east contrasting snow depth variation pattern (i.e., high in Sea of Japan side region and low in Pacific side region, or vice versa), meanwhile, the time series of the second PC and East Asian winter monsoon (EAWM) index are significantly correlated. These results suggest that AO can modulate snow depth variation in Hokkaido homogeneously by changing surface air temperature and snowfall. On the other hand, EAWM can induce the west-high east-low snow depth distribution in Hokkaido by modulating the snowfall. Interestingly, the long-term observation data demonstrates a significant decreasing trend in the Sea of Japan side region while an increasing trend dominates on the Pacific side. To clarify the relation between the trends and large-scale circulation, the AMSD data is reconstructed by the linear combinations of the first two PCs. It is demonstrated that the observed linear trend is due neither to AO nor EAWM because the reconstructed AMSD does not have the trend. The decreasing trends of AMSD in Sea of Japan region is likely attributable to decreasing cyclone track frequency.