



Change in winter snow depth and its impacts on vegetation in China

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Snow on land is an important component of the global climate system, but our knowledge about the effects of its change on vegetation is limited, particularly in temperate regions. In this study, we use daily snow depth data from 279 meteorological stations across China to investigate the distribution of winter snow depth (December - February) from 1980 to 2005 and its impact on vegetation growth, here approximated by satellite derived vegetation greenness index observations (NDVI). The snow depth trends show strong geographical heterogeneities. An increasing trend (> 0.01 cm yr⁻¹) in maximum and mean winter snow depth is found north of 40 °N (e.g. Northeast China, Inner Mongolia, and Northwest China). A declining trend (< -0.01 cm yr⁻¹) is observed south of 40 °N, particularly over Central and East China. The effect of changes in snow depth on vegetation growth was examined by ecosystem type. In desert, mean winter snow depth is significantly and positively correlated with NDVI during both early (May and June) and mid growing seasons (July and August), suggesting that winter snow plays a critical role in regulating desert vegetation growth, most likely through carry-over effects on soil moisture. In grassland, there is also a significant positive correlation between winter snow depth and NDVI in May-June. However, in forest, shrubland, and alpine meadow and tundra, no such correlation is found. These ecosystem-specific responses of vegetation growth to winter snow depth may be due to differences in growing environmental conditions such as temperature and rainfall.