



Topography controls the abundance of Siberian Larch Forest

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Larch trees are the dominant elements of coniferous forests in Eastern Siberia, and its abundance largely depends on local hydrological conditions, which are predominantly mediated by topographic properties at the scale of 100-meter. This study evaluated how geographic heterogeneity of the larch forest is formed with a special focus on topography and its related environmental heterogeneity.

A principal component analysis (PCA) was conducted for larch-dominated areas to aggregate the geographic correlations among environmental variables, namely topographic properties, flooding risk, and climatic variables. In the PCA, the first three principal components (PC1, PC2, and PC3) explained the 63.6% of geographical heterogeneity of environmental variables. PC1, PC2, and PC3 were tightly correlated with the environmental gradient along latitude, soil water holding capacity, and slope aspect, respectively. Employing these first three PCs as independent variables, a multiple regression equation was calculated to explain geographic heterogeneity of larch LAI. The multiple regression equation extracted trends that the larch LAI becomes higher for environmental conditions of (1) lower latitude, (2) higher soil water holding capacity until a certain threshold, and (3) south-faced slope.

Besides, the 2 by 2 contingency tables of inundation risks and presence of larch forest showed that larch forests avoid areas threatened by flooding.

These results suggest that topographic properties, besides climatic environment, control the abundance of larch forest via both drought and flooding stresses in Eastern Siberia.