

Endurance of larch forest ecosystems in eastern Siberia under warming trends

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The larch (*Larix* spp.) forest in eastern Siberia is the world's largest coniferous forest. Its existence is considered to be depending on near-surface permafrost, which increases water availability for trees, and the boundary of the forest closely follows the permafrost zone. Therefore, the degradation of near-surface permafrost due to forecasted warming trends during the 21st century is expected to affect the larch forest in Siberia. However, predictions of how warming trends will affect this forest vary greatly, and many uncertainties remain about land-atmospheric interactions within the ecosystem.

We developed an integrated land surface model to analyze how the Siberian larch forest will react to current warming trends. This model analyzed interactions between vegetation dynamics and thermo-hydrology and showed that, under climatic conditions predicted by the IPCC's RCP scenarios 2.6 and 8.5, annual larch net primary production (NPP) increased about 2 and 3 times, respectively, by the end of 21st century compared with that in the 20th century. Soil water content during larch growing season showed no obvious trend, even after decay of surface permafrost and accompanying sub-surface runoff. A sensitivity test showed that the forecasted warming and pluvial trends extended leafing days of larches and reduced water shortages during the growing season, thereby increasing productivity.

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