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Possible climate warming effects on vegetation, forests, biotic (insect, pathogene) disturbances and agriculture in Central Siberia for 1960- 2050

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Regional Siberian studies have already registered climate warming over the last half a century (1960-2010). Our analysis showed that winters are already 2–3°C warmer in the north and 1–2°C warmer in the south by 2010. Summer temperatures increased by 1°C in the north and by 1–2°C in the south. Change in precipitation is more complicated, increasing on average 10% in middle latitudes and decreasing 10–20% in the south, promoting local drying in already dry landscapes.
Our goal was to summarize results of research we have done for the last decade in the context of climate warming and its consequences for biosystems in Central Siberia. We modeled climate change effects on vegetation shifts, on forest composition and agriculture change, on the insect Siberian moth (Dendrolimus suprans sibiricus Tschetv) and pathogene (Lophodermium pinastri Chev) ranges in Central Siberia for a century (1960-2050) based on historical climate data and GCM-predicted data.
Principal results are:
In the warmer and drier climate projected by these scenarios, Siberian forests are predicted to decrease and shift northwards and forest-steppe and steppe ecosystems are predicted to dominate over 50% of central Siberia due to the dryer climate by 2080. Permafrost is not predicted to thaw deep enough to sustain dark (Pinus sibirica, Abies sibirica, and Picea obovata) taiga. Over eastern Siberia, larch (Larix dahurica) taiga is predicted to continue to be the dominant zonobiome because of its ability to withstand continuous permafrost. The model also predicts new temperate broadleaf forest and forest-steppe habitats;
At least half of central Siberia is predicted to be climatically suitable for agriculture at the end of the century although potential croplands would be limited by the availability of suitable soils agriculture in central Siberia would likely benefit from climate warming Crop production may twofold increase as climate warms during the century; traditional crops (grain, potato, maize for silage) could be gradually shifted as far as 500 km from the south northwards (about 50-70 km per decade) and new crops (maize for grain, apricot, grape, gourds) may be introduced in the very south depending on winter conditions and would necessitate irrigation in a drier 2080 climate;
The environment for the Siberian moth may considerably shrink in the future leaving suitable habitats only in highlands of mountains and the north of Eurasia. The moth habitats also depend on migration rates of tree species Larix spp., Abies sibirica, and Pinus sibirica being main food resources. Siberian moth may not be considered as a threat in climates with mild winter because larvae require continuos continental type winters. Needle-cast of Pinus sylvestris caused by Lophodermium pinastri Chev. was found to be strongly related to precipation including snow depth. In a predicted dryer climate, it would shift northwards followed sufficient water.