GC31B-1172: Projected Impacts of 21st Century Climate Change on Potential Habitat for Vegetation and Forest Types in Russia

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Global GCMs have demonstrated profound potential for projections to affect the distribution of terrestrial ecosystems and individual species at all hierarchical levels. We modeled progression of potential Russian ecotones and forest-forming species as the climate changes. Large-scale bioclimatic models were developed to predict Russian zonal vegetation (RuBCliM) and forest types (ForCliM) from three bioclimatic indices (1) growing degree-days above 5 degrees C; (2) negative degree-days below 0 C ; and (3) an annual moisture index (ratio of growing degree days to annual precipitation). The presence or absence of continuous permafrost was explicitly included in the models as limiting the forests and tree species distribution. All simulations to predict vegetation change across Russia were run by coupling our bioclimatic models with bioclimatic indices and the permafrost distribution for the baseline period and for the future 2020, 2050 and 2100 simulated by 3 GCMs (CGCM3.1, HadCM3 and IPSLCM4) and 3 climate change scenarios (A1B, A2 and B1).

Under these climate scenarios, it is projected the zonobiomes will shift far northward to reach equilibrium with the change in climate. Under the warmer and drier projected future climate, about half of Russia would be suitable for the forest-steppe ecotone and grasslands, rather than for forests. Water stress tolerant light-needled taiga would have an increased advantage over water-loving dark-needled taiga. Permafrost-tolerant *L. dahurica* taiga would remain the dominant forest across permafrost. Increases in severe fire weather would lead to increases in large, high-severity fires, especially at boundaries between forest ecotones, which can be expected to facilitate a more rapid progression of vegetation towards a new equilibrium with the climate.

Adaptation to climate change may be facilitated by: assisting migration of forests by seed transfers to establish genotypes that may be more ecologically suited as climate changes; and the introduction of suitable agricultural crops that may be potentially adapted to a warmer climate in the expected steppe and forest-steppe.