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Forest Forecasting with Multiple Ecosystem Models in the Boreal forests of Russia

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Forest modeling is an important tool in forecasting land cover response to changing climate and disturbance patterns, and individual tree species are an essential piece. Global simulations have demonstrated profound potential for future climate to impact the distribution of terrestrial ecosystems and individual species. A large scale bioclimatic model (RuBCliM) and a detailed individual based forest gap model (UVAFME) were used to simulate the forests across Russia for current as well as future climate for the A1B scenario from the NCAR CCSM and GEOS CCM. RuBCliM utilizes climate indices to indicate presence and response of the forest to changing conditions over time. UVAFME utilizes climate and site conditions with direct competition between individual trees within a mixed species forest to track forest response over time. Following assessment of modelling for current climate against inventory data, the models are used to forecast the effects of changing climate on the distribution of forests and species. Comparisons measured with Kappa statistic between the models and forest species distribution as shown by the models and inventory data indicates fair to good agreement for species of Pinus slyvestris, Abies sibirica, Picea spp., Pinus sibirica, and Larix spp. (Kappa values from 0.58 to 0.45). For future climate conditions both models indicate a dramatic shift in the dominant biomes of the region and a significant change in biomass in response to changing climate conditions for the NCAR CCSM scenario. Agreement between these different modelling techniques provides increased confidence in the projected forest response to changing climate.