GC33F-05: Doubling of the Russian Fire Return Interval: Implications for Forest Biomass and Composition

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The Russian boreal forest has experienced significant warming over the past several decades and this trend is expected to continue. This warming has the capacity to alter dominant vegetation and biomass dynamics through shifts in competition dynamics, a change in treeline and an increased fire disturbance regime. Historical fire return interval is calculated for the Russian ecoregions and applied to 31,010 points of a 22 x 22 km^2 grid. Using an individual tree based forest gap model, UVAFME, biomass and species dynamics are simulated for multiple scenarios: without fire, with historical fire probabilities, a doubling of probabilities across the region, and the combined effect of fire with an altered climate. Fire disturbance within the model is a randomly occurring event with a variable intensity that alters the seedling bank and kills trees according to unique species fire tolerance parameters. Results from the simulation scenarios are compared to assess changes in biomass, species composition, and age structure 500 years after bare ground initiation. At the end of simulation, results which include fire disturbance show an increase in biomass across the region compared to simulation without fire. This increase in biomass in the simulations with fire disturbance is associated with an overall decrease in the age of the forest to younger more productive stands. The doubling of the fire return interval maintains a higher percentage of the needle leaf deciduous larch across Siberia. With altered climate, the region experiences an overall decrease in biomass and a shift in composition towards early successional deciduous species. These results reinforce the importance of the inclusion of complex competition and age structure in evaluating forest response to disturbance and changing climate.