GC33F-04 Simulations of Forest Structure and Biomass across Russia for Biomass Estimation under a Changing Climate.

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An important innovation in understanding the interactions among physical of forests and measurement of forest state is the potential deployment of active (RADAR and LiDAR) satellite reconnaissance systems. We investigate the potential gain in predictive capability of structural measures determined by these instruments. Observations and model results have identified climate change as a driver of structural and compositional change in forest of Russia, which may affect climate patterns beyond the region. Using an individual-tree-based model (UVAFME) for forests at 31,000+ grid points of a 22 km×22 km grid across Russia, we inspected the relationships between above-ground biomass and structural measures including maximum tree height and Lorey's height (average height for each tree weighted by basal area). At each of the grid points 200 independent 0.1hectare plots were simulated for 100 years using two climate change scenarios following a 500-year spin-up to produce a mature forest. Other simulations project the change of a forest-landscape mosaic with equal proportions of 0, 25, 50, 75 and 100 year-old stands to mimic a heterogeneous landscape mosaic typical of reoccurring wildfires. Qualitatively, maximum height and Lorey's height seem particularly useful in detecting forest change in the vicinity of forest transitions with other ecosystems. Quantitatively, maximum height and Lorey's height account for a large component of the variability in forest biomass. Results of exponential regression between height measurements and biomass show that r^2 values can exceed 0.75. Lorey's height is more capable in this regard. The relationship between these measures of height and biomass can be improved with classification of forests into types. For example, Russian forest dominated by the tall, large diameter pines (*Pinus koraiensis, P. sibirica, P. sylvestris*) can have exceptional biomass compared to other forests across Russia, and produced biomass and height values higher relative to the other forests. Patterns of change in biomass in response to climate change across the region complement the response of height, but highlight the need to look at multiple structural measurements. These results demonstrate the utility of linking predictive modelling with this innovative technology.

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