Using satellite-derived data to estimate mean fire return intervals in Siberia

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Siberia is a significant region to monitor for initial signs of climate change because it is located in a region where some of the largest temperature increases from climate change are expected. Atmosphere-Ocean General Circulation Models are in agreement that warming in Northern Eurasia is expected to be 40% greater than the global mean in both the summer and winter seasons. Under current climate change scenarios, fire frequency, area burned, fire season length and fire weather severity are expected to increase in boreal regions, particularly in Siberia. Because temperatures have already increased across Siberia in the last decades, it follows that the interval between fire occurrences should decrease. In this study, evidence of fire-induced, climate-related change is investigated in boreal Siberia by comparing calculated mean fire return intervals with published fire return intervals. Fire return intervals are expected to decrease, resulting in a forest mosaic that is younger and more deciduous. Satellite-based data is used to estimate area burned, which is overlaid on an ecoregion map to calculate area burned in unique ecoregions across Siberia. Area burned data from 1995 through 2002 are used to calculate mean fire return intervals for each ecosystem, as well as an average boreal forest mean fire return interval. Results from this investigation show that fire return intervals are either equivalent to or greater than the expected fire return intervals, which was not the predicted result. However, both an underestimation in area burned and the minimal number of years analyzed could result in anomalous fire return intervals. Interestingly, the expected percentage of young stands, which is calculated based on the estimated average boreal forest fire return interval (159 years), is similar to published estimates of the percentage of existing young stands (6.5%). This provides supporting evidence for the validity of the calculated mean fire return interval. More importantly, the satellite-based mean fire return interval presented here provides a baseline value from which future spatial and temporal comparisons of fire-induced land cover change can be compared..