PREREAL: Improving PREdictability of circumboREAL forest fire activity and its ecological and socio-economic impacts through multi-proxy data comparisons

Call: Climate Predictability and Inter-Regional Linkages
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The ability to predict forest fire activity at monthly, seasonal, and above-annual time scales is critical to mitigate its impacts, including fire-driven dynamics of ecosystem and socio-economic services. Fire is the primary driving factor of the ecosystem dynamics in the boreal forest, directly affecting global carbon balance and atmospheric concentrations of the trace gases including carbon dioxide. Resilience of ocean-atmosphere system provides potential for advanced detection of upcoming fire season intensity. There is a strong potential in using a large body of paleo- and dendrochronological reconstructions to improve predictability of weather extremes such periods of regionally increased fire activity. We propose that joint analyses of historical fire proxies (fire scars and charcoal in the lake sediments) with independently obtained proxies of climate variability and vegetation cover should contribute towards better knowledge of modern climate drivers of forest fires and predictability of fire activity at multiple temporal scales. In this project we will identify climatic drivers controlling boreal fire activity and its predictability at monthly, seasonal and annual timescales by relying on analyses of multiple proxies of modern and historic fire activity, and climate-ocean variability. We will also provide monthly to century-scale predictions of future fire activity and to translate these into impacts on ecosystem services and metrics of socio-economic performance. We argue that capitalizing on multi-proxy data comparisons should improve predictability of fire activity via (a) a large overlap between climate and fire proxies, which dramatically extends the period covered by instrumental observations and improves robustness of analyses, (b) a more realistic translation of fire hazard metrics into actual fire activity, and (c) a better separation of low vs. high frequency variability in the fire activity, an important aspect in the modeling of the future trends in fire activity.