Intensifying fire regimes in the arctic-boreal zone: recent changes, global implications, and possible solutions

Brendan Rogers⁷, Molly Elder⁵, Peter Frumhoff⁴, Thomas Gasser⁶, Elena Kukavskaya⁵, Erin MacDonald⁴, Michelle Mack⁵, Susan Natali⁴, Carly Phillips⁶, Rebecca Scholten⁴, Rachael Treharne⁴, Sander Veraverbeke⁶, and Xanthe Walker⁶

¹Woodwell Climate Research Center, Falmouth, United States of America
²The Fletcher School of Law and Diplomacy, Tufts University, Medford, United States of America
³Union of Concerned Scientists, Cambridge, United States of America
⁴International Institute for Applied Systems Analysis, Laxenburg, Austria
⁵V.N. Sukachev Institute of Forest, Siberian Branch of the Russian Academy of Sciences, Krasnoyarsk, Russia
⁶Center for Ecosystem Science and Society, Northern Arizona University, Flagstaff, United States of America
⁷Pacific Institute for Climate Solutions, University of Victoria, Victoria, Canada
⁸Faculty of Science, Vrije Universiteit Amsterdam, Amsterdam, the Netherlands

Across much of the high latitudes, wildfires have been increasing in frequency, area burned, and severity in response to longer fire seasons, more severe fire weather, and increased ignitions. These fires not only affect the tundra and boreal forests they burn, but also global climate due to the high levels of carbon emitted during combustion that take decades to re-aggrade. Carbon emissions from high latitude fires are generally not included in global models that inform policy nor emissions reductions commitments from relevant countries. In this presentation we describe recent progress and critical unknowns related to intensifying fire regimes in high latitude ecosystems, with a particular focus on (i) trends in burned area and large fire years; (ii) changing ignitions sources including lightning, human, and overwintering fires; (iii) patterns and drivers of carbon emissions, including interactions with permafrost; (iv) implications for global carbon budgets; and (v) potential climate mitigation through increased resources for carbon-focused fire management.