Cross-scale controls on carbon emission from boreal mega-fires
2018, Global Change Biology (ABoVE Project Mack-01)

**Background:** Changes to the boreal forest fire regime are expected to strongly increase combustion emissions of carbon (C) which could alter regional C balance and positively feedback to climate warming. In order to accurately estimate C emissions and thereby better predict future climate feedbacks, there is a need to understand the major sources of heterogeneity that impact C emissions at different scales.

**Analysis:** We assessed both aboveground and soil organic layer C combustion at 211 burned plots in the NWT, Canada after an unprecedentedly large area burned in 2014. Our goal was to determine the major drivers in total C emissions, as well as to develop a high spatial resolution model using remote sensing to scale emissions in understudied regions of the boreal forest.

**Significance:** Our results highlight the need for regionally specific calibrations that account for spatial heterogeneity in order to accurately model emissions at a continental scale.

**Findings**

**Field Data**
Black spruce stands located at landscape positions with intermediate drainage contribute the greatest to C emissions relative to other stands types and/or landscape positions.

**Remote Sensing**
We estimated a total of 94.3 Tg C emitted from 2.85 Mha of burned area across the entire 2014 NWT fire complex. This mega-fire year in the NWT offset half of Canada’s annual terrestrial Net Ecosystem Production.