

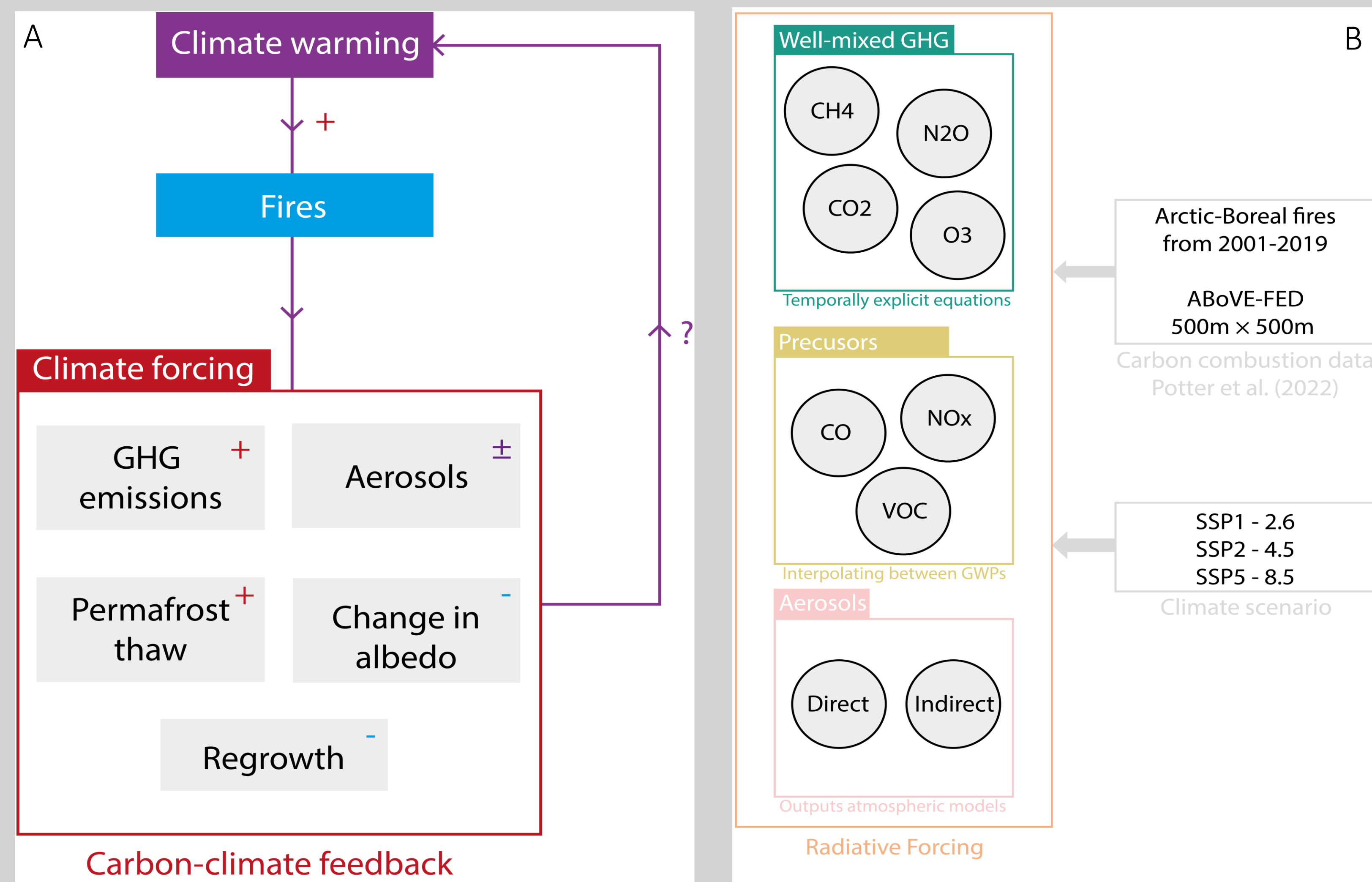
# Integrated Climate Radiative Forcing from Arctic-boreal Fires

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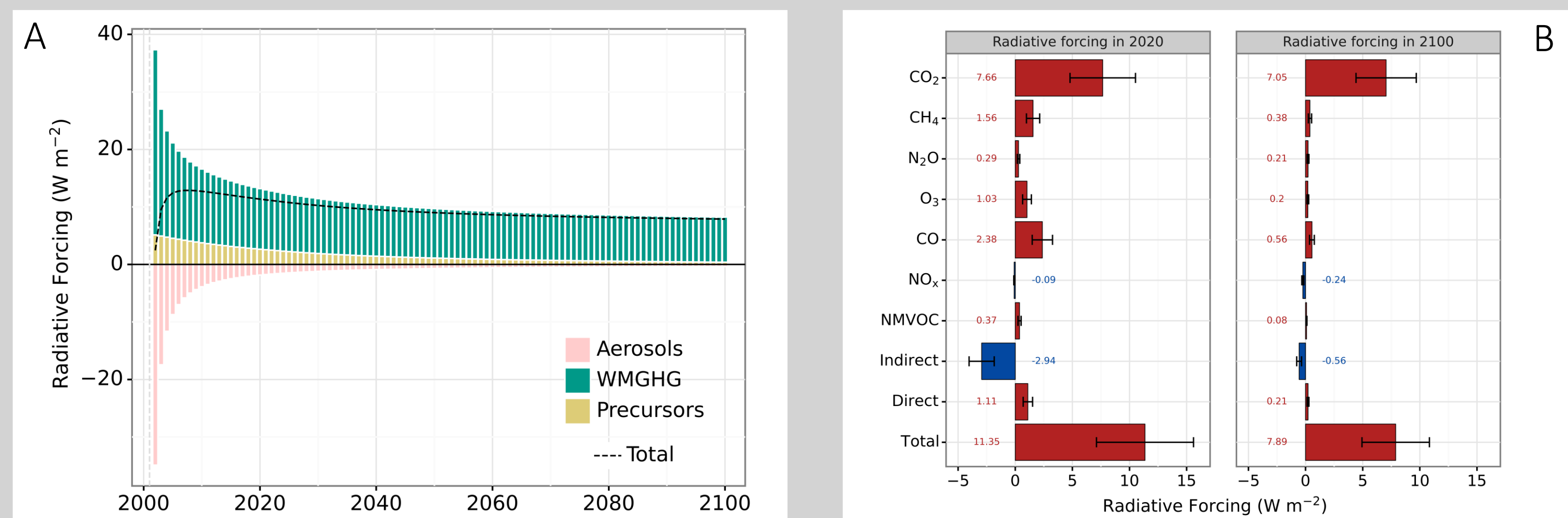
## Net climate forcing from fires

Fire is a major disturbance mechanism in arctic-boreal ecosystems and results in warming and cooling feedbacks to the climate system. Here we present a framework to quantify, map, and predict the dominant climate forcings from fires across the ABoVE domain at 500m.



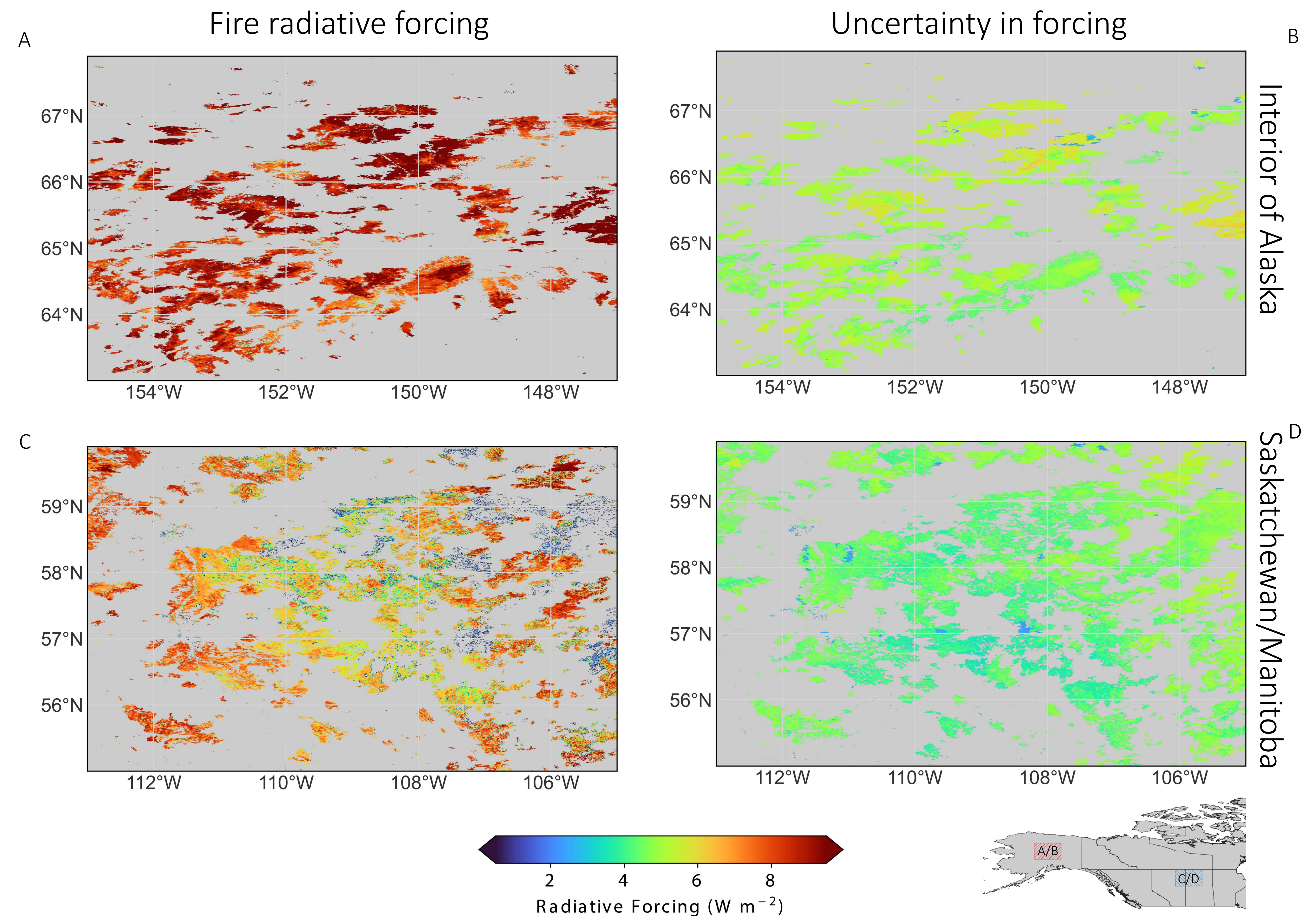
**Fig. 1** | (A) Schematic illustration of how climate warming influences the fire-vegetation feedback mechanisms and its interaction with the carbon-climate feedback loop in the Arctic-boreal ecosystems. (B) Radiative forcing framework for greenhouse gas emissions and carbonaceous aerosols. Positive or negative signs show direction of climate forcing.

## Radiative forcing from GHGs and Aerosols



**Fig. 2** | (A) Annual mean fire radiative forcing under climate scenario SSP2-4.5. (B) Cumulative mean post-fire radiative forcing in W m<sup>-2</sup> in 2020 and 2100 for the 2001 fire season. Blue bars indicate climate cooling and red bars climate warming. In both plots we assumed a total carbon combustion of 3.13 ± 1.20 kg C m<sup>-2</sup>.

## Spatial distribution of fire radiative forcing



**Fig. 3** | Spatial distribution of cumulative mean fire radiative forcing in 2100 under climate scenario SSP2-4.5 (left panels). Uncertainty in radiative forcing in W m<sup>-2</sup> (right panels). Panels show all fires between 2001 and 2017, while (A) and (B) represent part of the interior of Alaska and (C) and (D) the northern parts Saskatchewan and Manitoba.

## Next phases of research

- Integrating radiative forcing from post-fire albedo,
- Including post-fire regrowth trajectories based on fire severity,
- Accounting for emissions from fire-induced permafrost degradation,
- Investigation drivers of spatial variability in net radiative forcing from fires