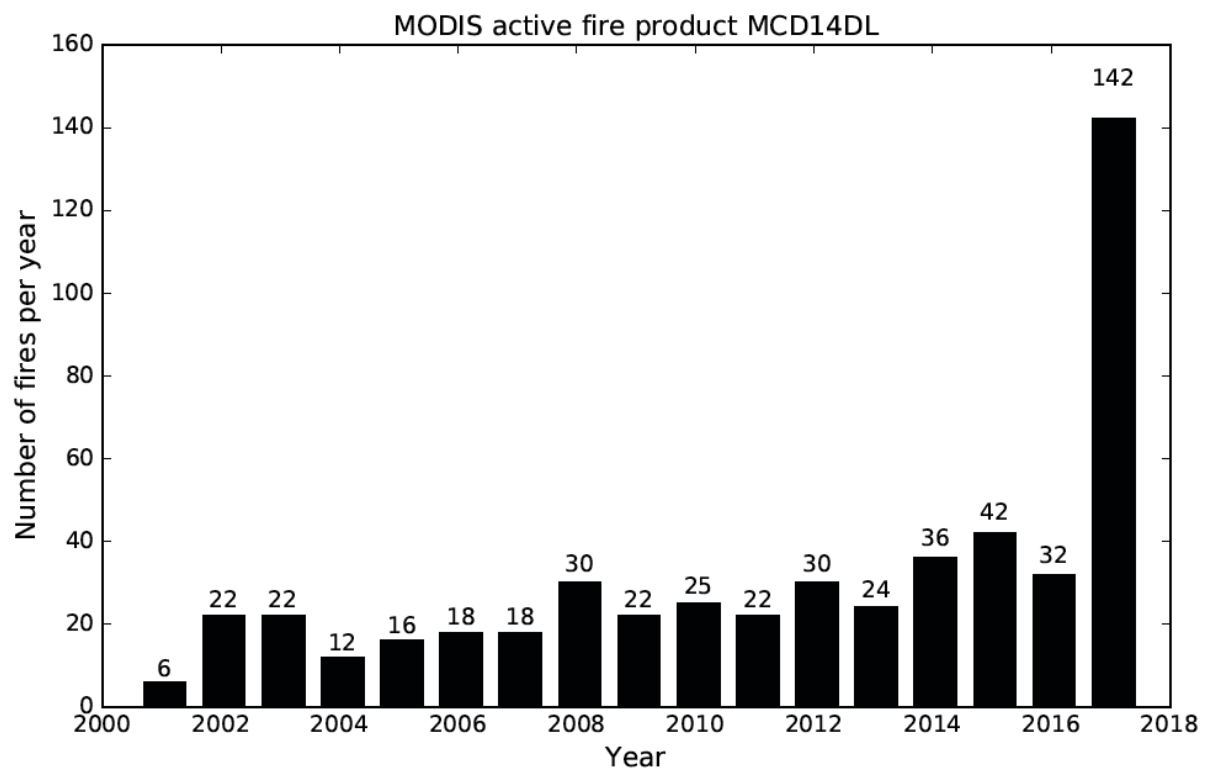


*Supplement of*

## Open fires in Greenland in summer 2017: transport, deposition and radiative effects of BC, OC and BrC emissions

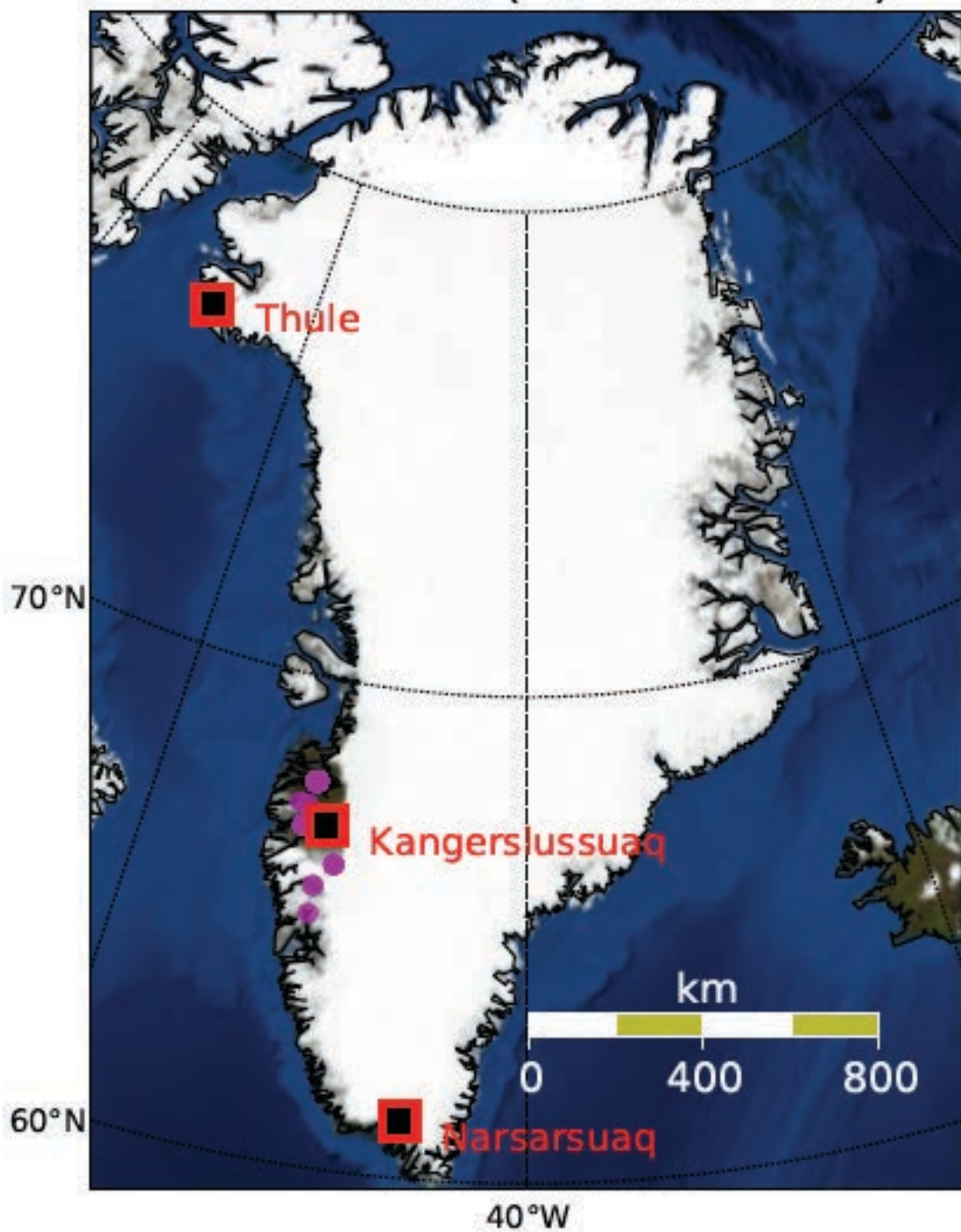
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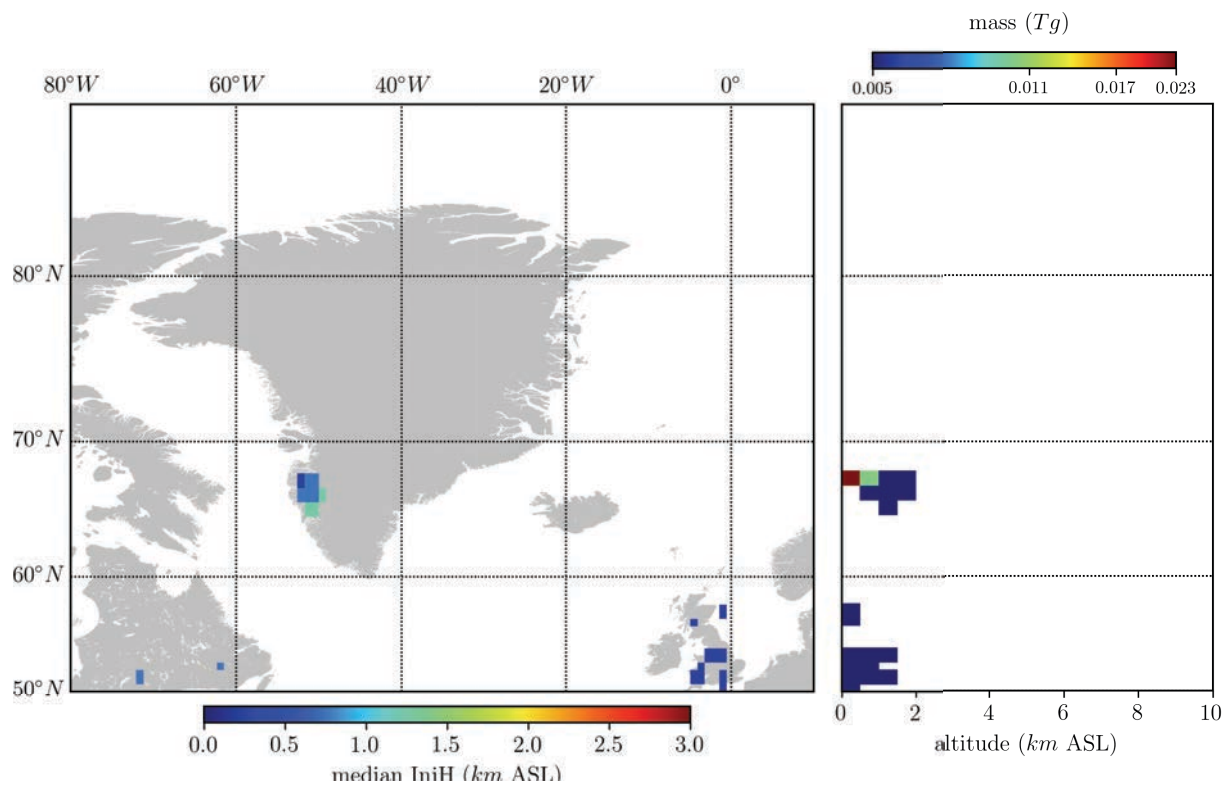


**Figure S 1.** Annual number of active fires over Greenland during the last 17 years as seen from NASA's MODIS satellite (product MSC14DL).

## Active fires and AOD stations in Greenland (AUGUST 2017)

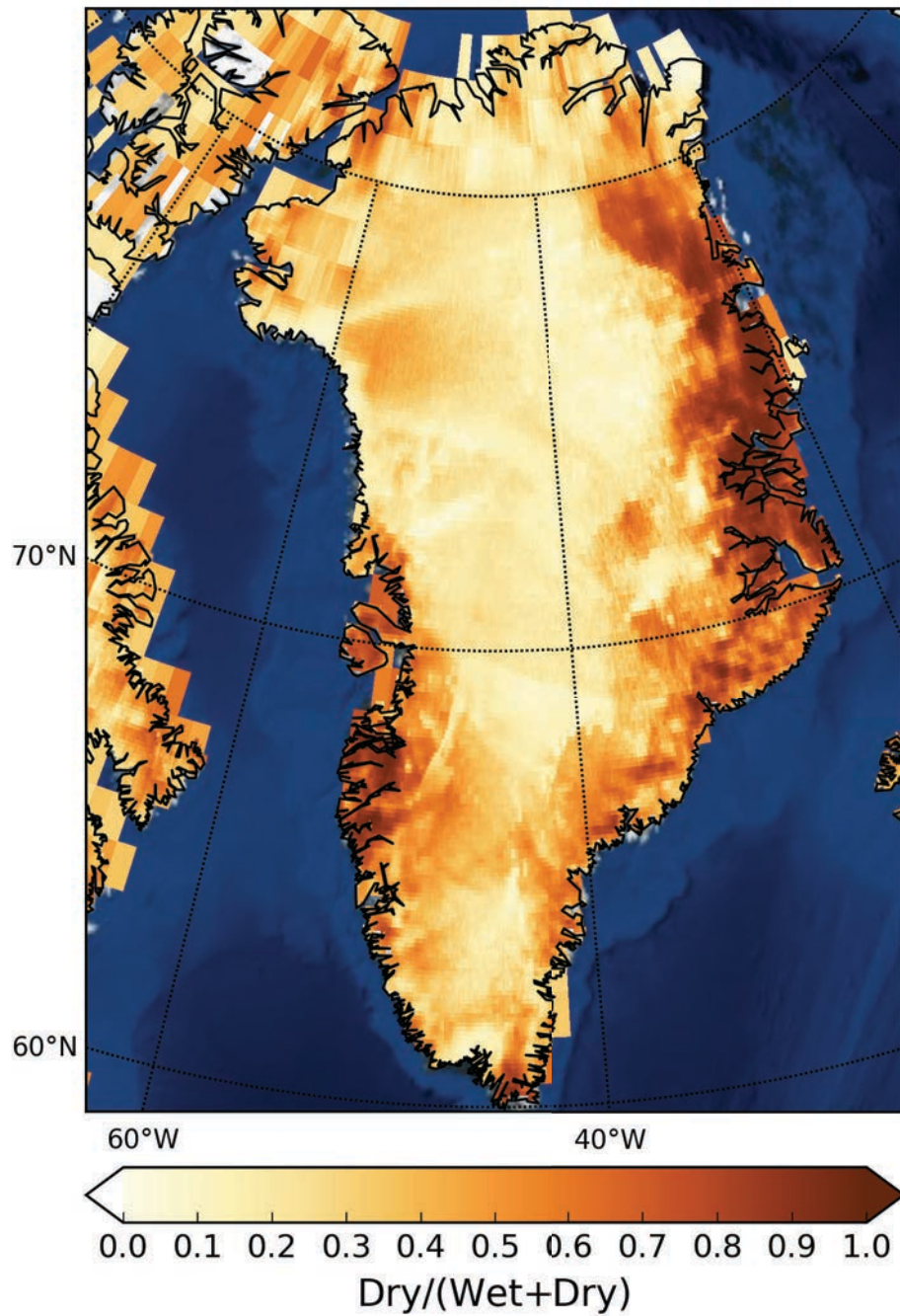


**Figure S 2.** Fire dynamics in Greenland for the August 2017 fires according to MODIS (magenta dots show active fire hot spots from the MODIS MCD14DL product). Locations of stations with AOD measurements from AERONET are also shown.



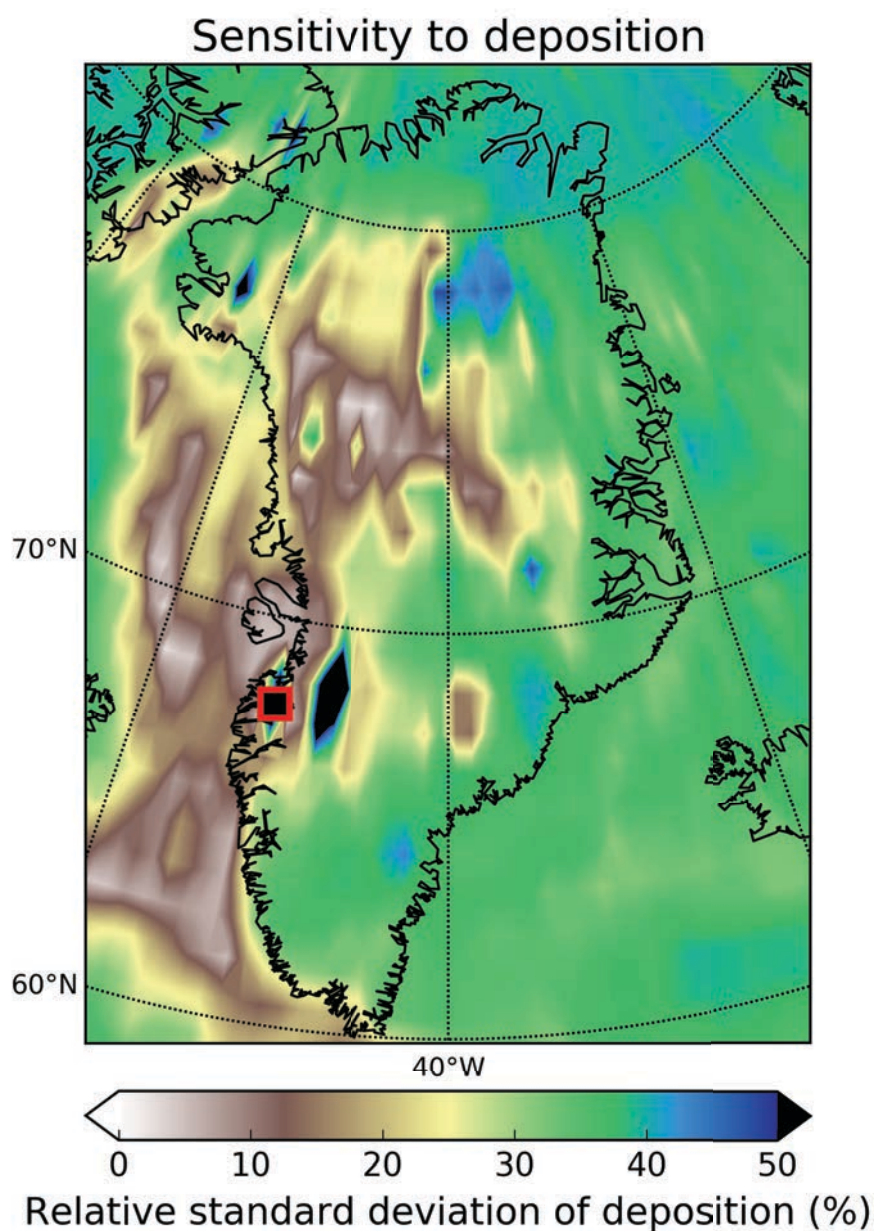
**Figure S 3.** Median injection heights (km above sea level – ASL; left panel) and distribution of longitudinally integrated burned biomass (Tg) as a function of injection altitude (right panel) calculated by PRMv2 for the period between 31 July and 21 August 2017.

## Dry to total deposition ratio from the Greenland fires

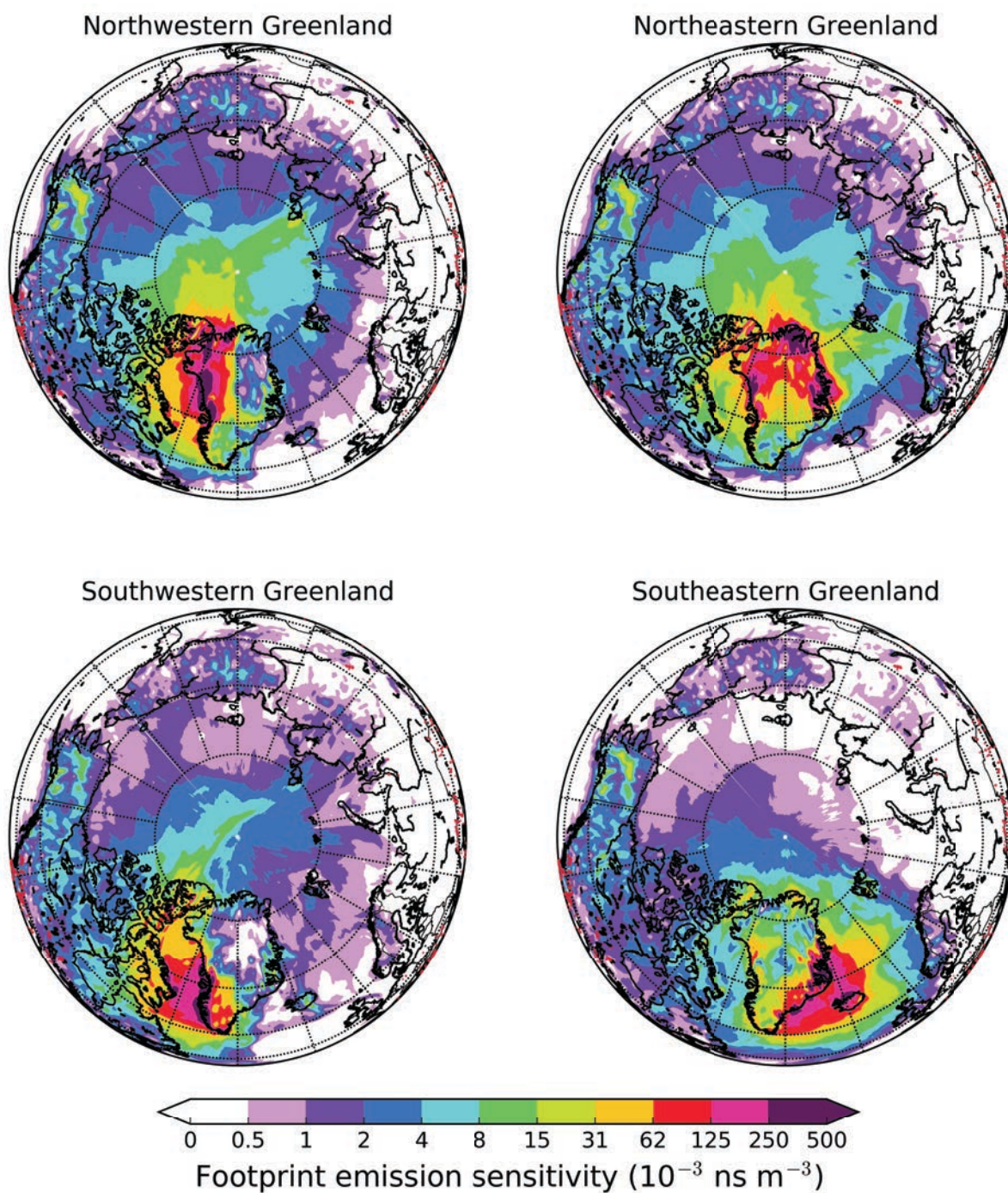


**Figure S 4.** Dry to total deposition ratio (example for BC) from the 2017 peat fires over Greenland.



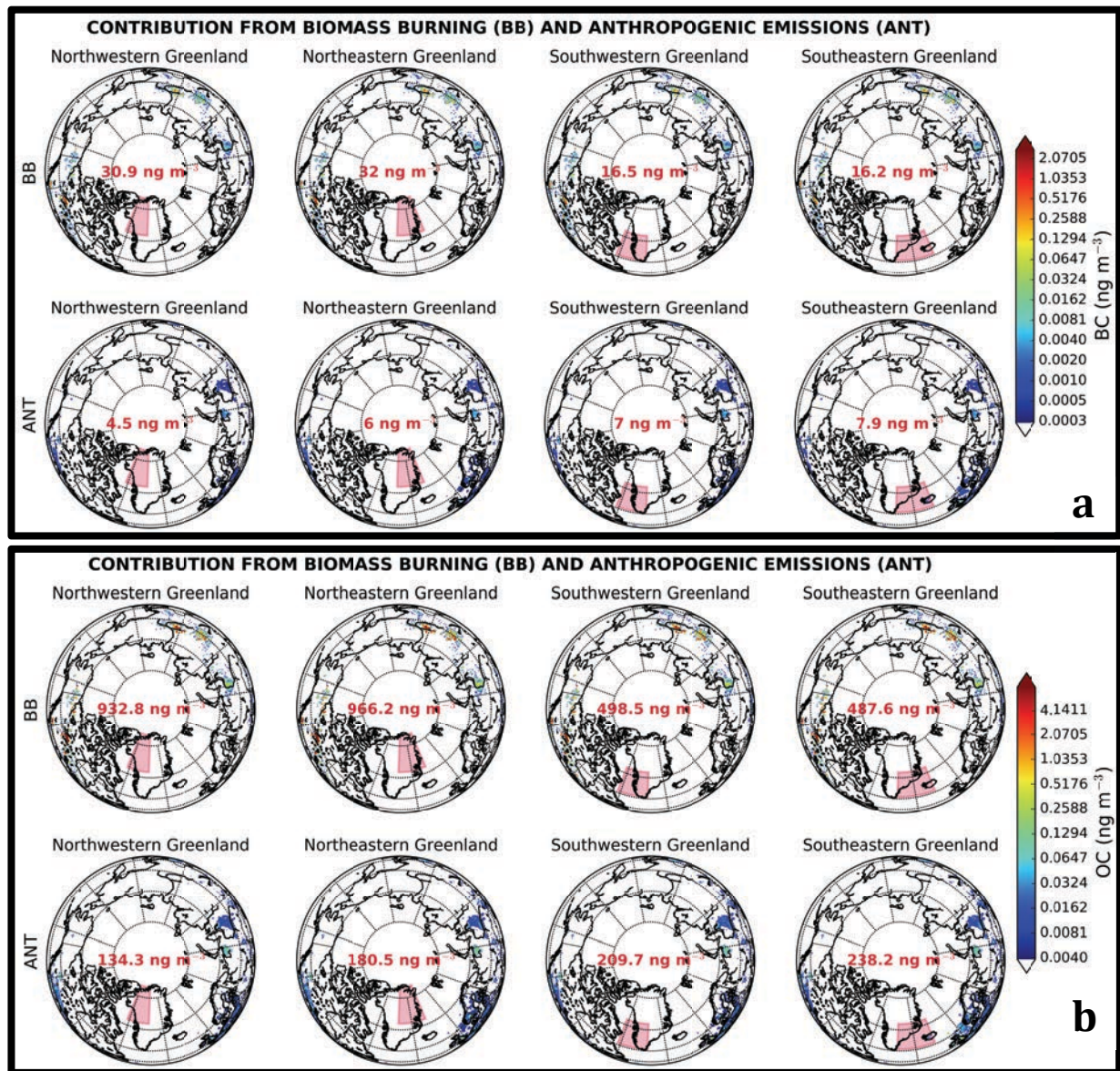


**Figure S 5.** Relative standard deviation of deposited mass (example for BC) for different assumed size distributions normalized against the results from our reference size distribution with a logarithmic mean diameter of  $0.25\ \mu\text{m}$ . Particle size distributions with aerodynamic mean diameters of 0.1, 0.25, 0.5, 1, 2, 4,  $8\ \mu\text{m}$  and a logarithmic standard deviation of 0.3 were simulated.



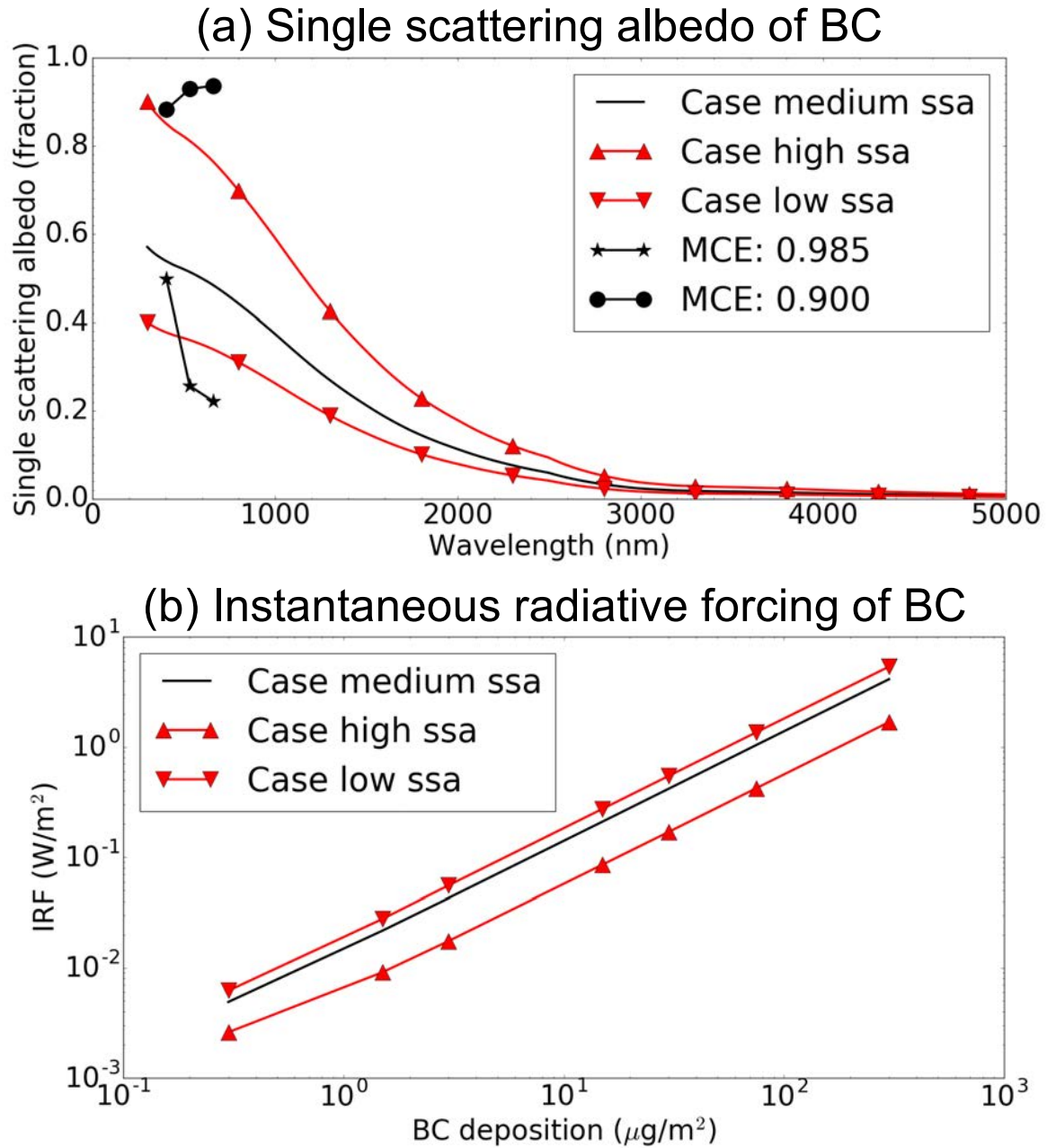
**Figure S 6.** Footprint emissions sensitivities for Northwestern, Northeastern, Southwestern and Southeastern Greenland for the period 31 July to 31 August 2017. Active fires from NASA's MODIS MCD14DL product are shown with red dots.





**Figure S 7.** Average contribution of biomass burning (upper panels) and anthropogenic emissions (lower panels) to surface concentrations of (a) BC and (b) OC in Northwestern, Northeastern, Southwestern and Southeastern Greenland (in ng m<sup>-3</sup> per grid cell). Numbers (in red) represent total concentrations in the studied domain, obtained by spatial integration over all source grid cells. Receptor areas in Greenland are highlighted by pink boxes.





**Figure S 7.** (a) The single scattering albedo (SSA) of BC as a function of wavelength for various modified combustion efficiencies (MCE). The star and dot marked lines are from the parameterization of Pokhrel et al. (2016). (b) The IRF as a function of BC deposited on the Ice Sheet. The calculations were made for cloudless conditions with a snow-covered surface for noon on 31 August 2017 at 65°N.