BC Emissions (g C m⁻² yr⁻¹)

3 **Figure S1.** Spatial distribution of annual anthropogenic emissions (g C m^{-2} yr^{-1}) of
4 black carbon (BC) averaged over 2008–2012. The geographical source regions for
5 emission perturbations in this study are the Arctic (ARC; 60–90°N) and mid-latitudes
6 (MID; 28–60°N).
7

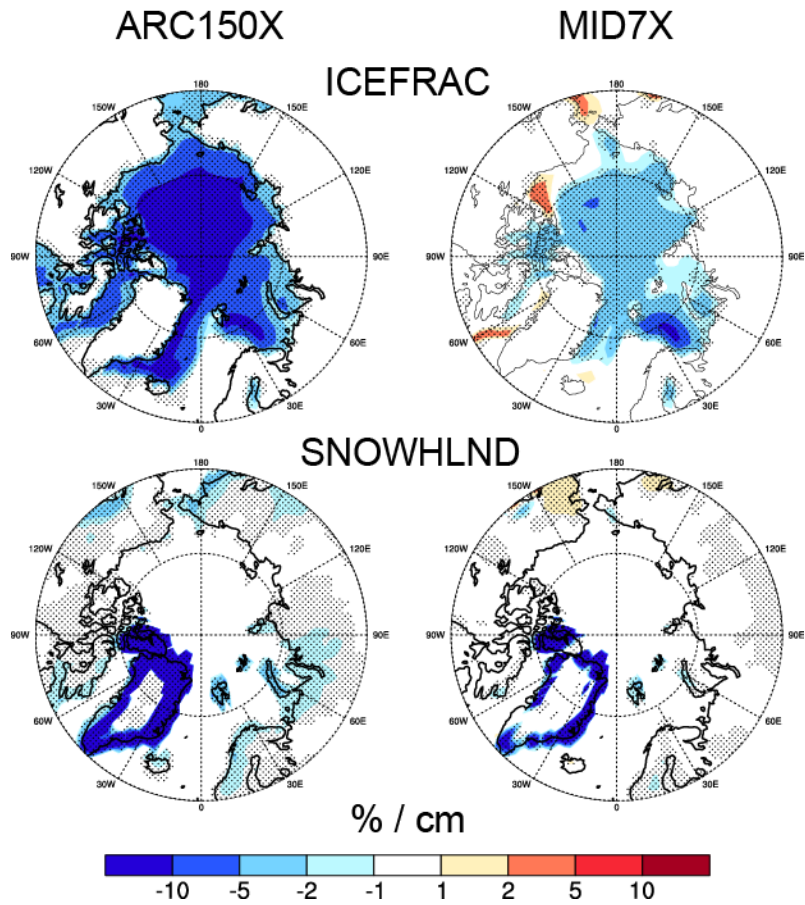



Figure S2. Changes in annual and zonal mean fraction of surface area covered by sea-ice (ICEFRAC, %, top) and water equivalent snow depth over land (SNOWHLND, cm, bottom) for ARC150X (left) and MID7X (right) compared to PD.

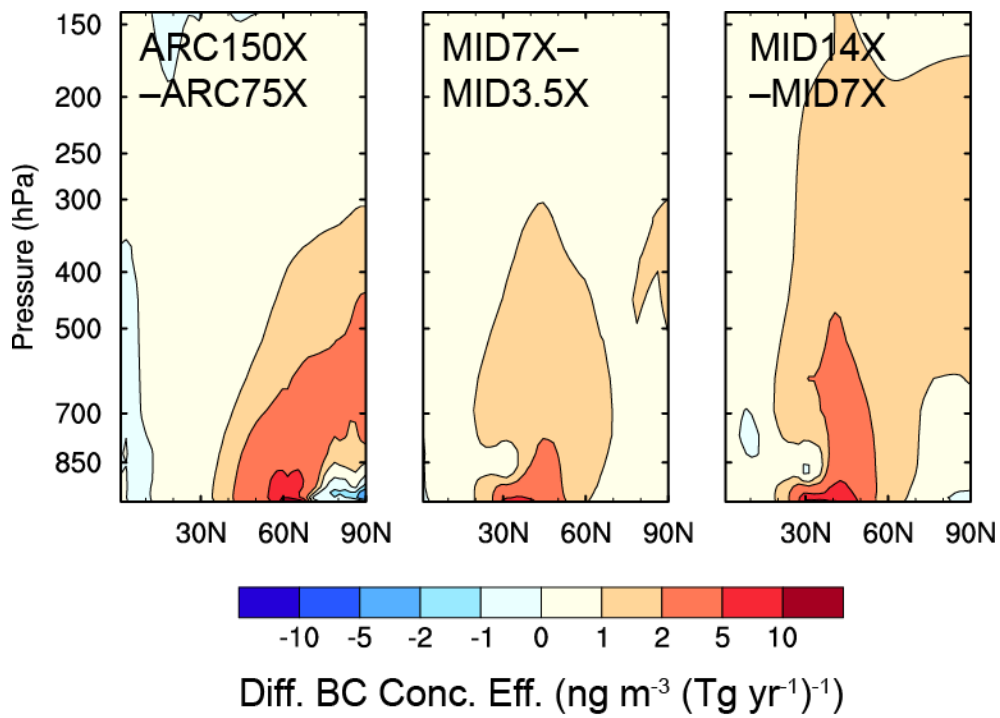
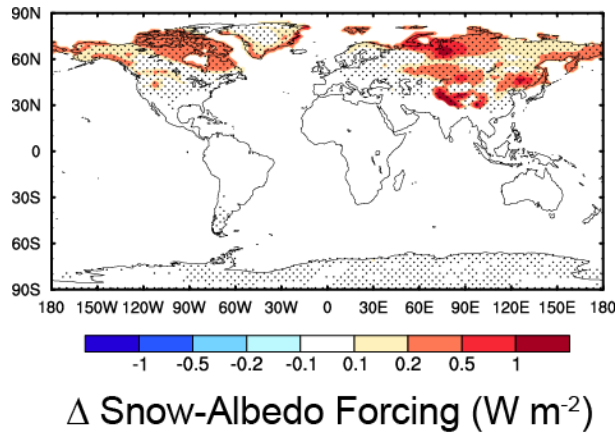
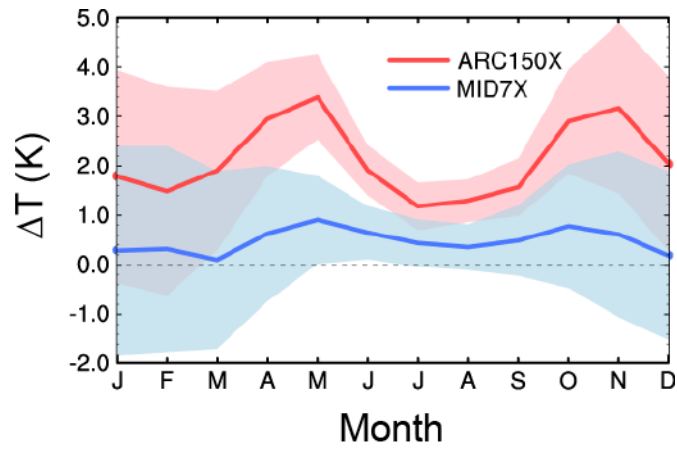



Figure S3. Differences in annual and zonal mean BC concentration efficiency (ng m^{-3} (Tg yr^{-1}) $^{-1}$) between ARC150X and ARC75X (left), MID7X and MID3.5X (middle), and MID14X and MID7X (Right).

22
23
24 **Figure S4.** Spatial distribution of snow/ice-albedo forcing of BC (W m^{-2}) between PD
25 and PI.
26
27
28
29

30
31
32 **Figure S5.** Changes in Arctic monthly mean surface temperature (K) for
33 ARC150X/MID7X compared to PD.
34