

Figure S1: Spatial distribution of the the cloud droplet number concentration (CDNC) burden from the CTL fixed SST and coupled model simulation (top panel) and and the corresponding CDNC burden changes from the NOBCAIE run  $((1-NOBCAIE/CTL)*100)$  (bottom panel).

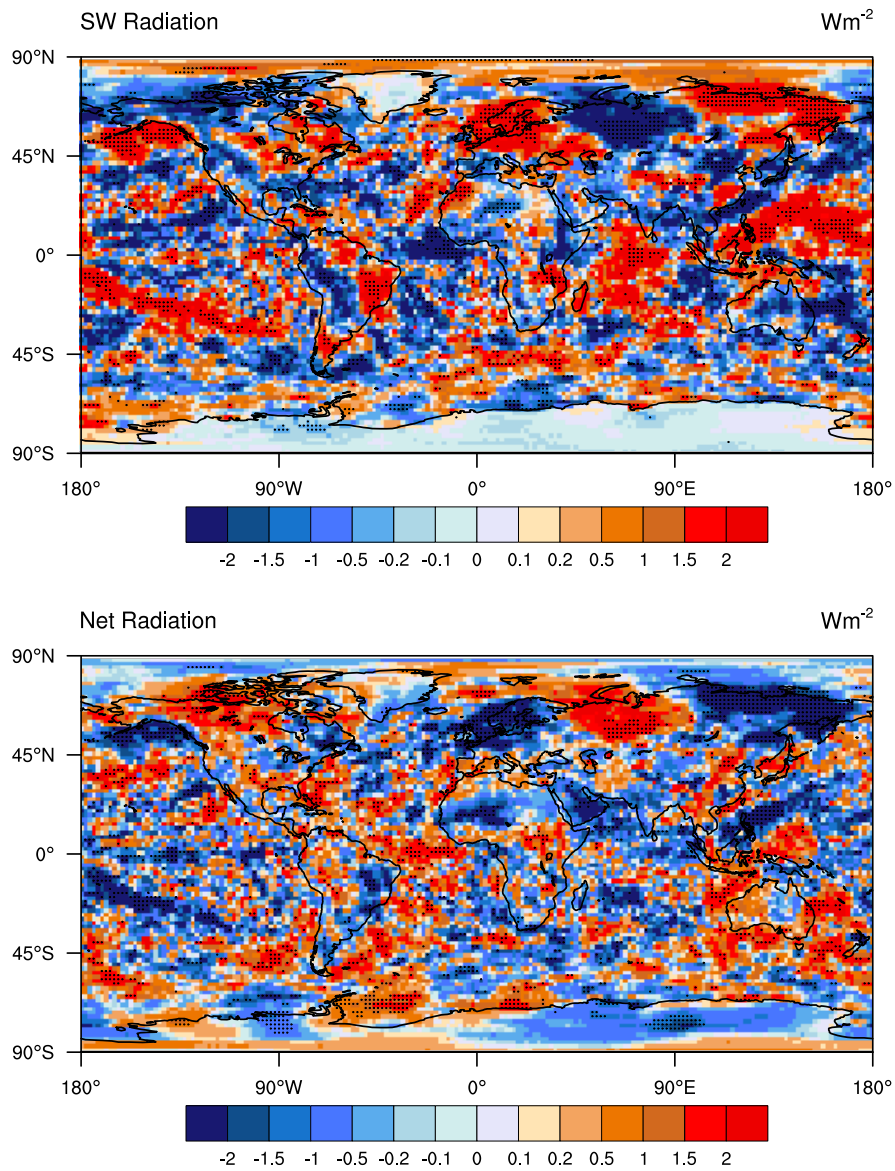


Figure S2: Spatial distribution of changes (CTL-NOBCAIE) in short-wave radiation ( $W m^{-2}$ ) (top panel) at top of the atmosphere (TOA) and net (short wave + long wave) radiation ( $W m^{-2}$ ) at TOA (bottom panel) from the prescribed SST simulations. Black dots indicate the grid points where the change is statistically significant at the 90% confidence level.

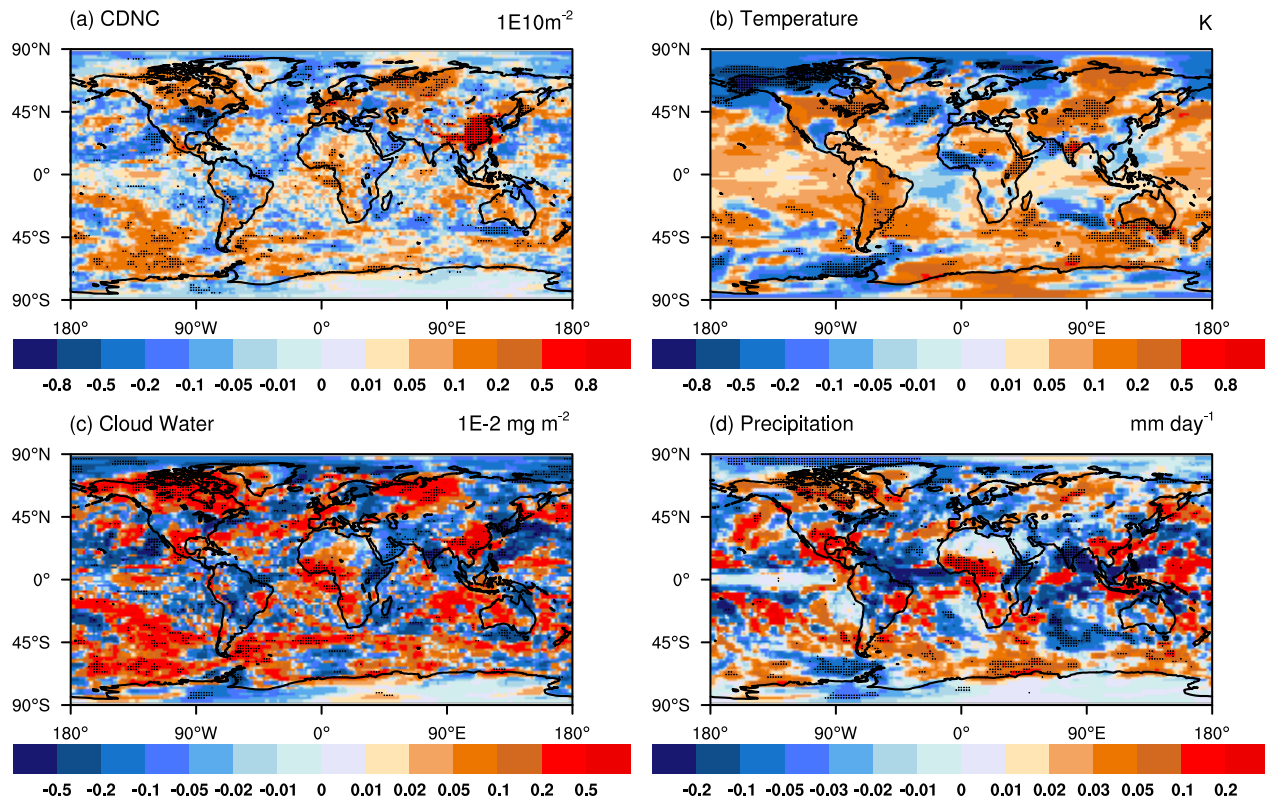


Figure S3: Responses from no anthropogenic BC emission (NOBC) perturbation, estimated as (CTL-NOBC), for (a) CDNC burden ( $10^{10} m^{-2}$ ), (b) surface temperature (K), (c) vertically integrated cloud water ( $mg m^{-2}$ ) and (d) total rainfall ( $mm day^{-1}$ ) from the coupled model simulations. Black dots indicate the grid points where the change is statistically significant at the 95% confidence level.

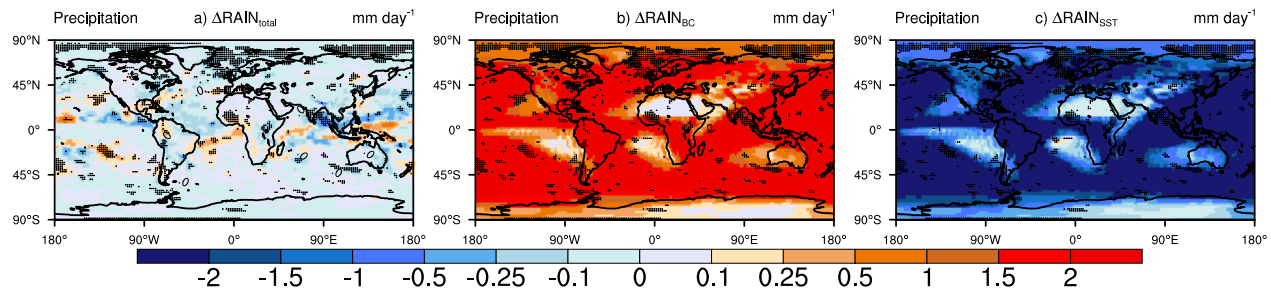


Figure S4: Spatial distribution of the annual-mean response of precipitation flux ( $\text{mm day}^{-1}$ ) to (a) total BC indirect effects (RAINTOTAL), (b) BC indirect effects alone (RAINBC) and (c) BC indirect effect-induced SST feedbacks (RAINSST=RAINTOTAL - RAINBC). Black dots indicate the grid points where the change is statistically significant at the 95% confidence level.