Electronic Supplementary Material to: Simulation of the Ecosystem Productivity Responses to Aerosol Diffuse Radiation Fertilization Effects over the Pan-Arctic during 2001–19*

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Table S1. Summary of sensitivity experiments.

ID	Name	Model	Input	Output
1	GC_ALL	GEOS-Chem	Monthly CEDS and natural emissions	Monthly 3-D aerosol concentrations
2	GC_NAT	GEOS-Chem	Natural emissions alone	Monthly 3-D aerosol concentrations
3	CRM_ALL	CRM	Aerosol profiles from GC_ALL with cloud profiles from CERES	Hourly diffuse and direct PAR Monthly AOD
4	CRM_NAT	CRM	Aerosol profiles from GC_NAT with cloud profiles from CERES	Hourly diffuse and direct PAR Monthly AOD
5	CRM_NOA	CRM	No aerosol profiles with cloud profiles from CERES	Hourly diffuse and direct PAR Monthly AOD
6	CRM_ALL_CLR	CRM	Aerosol profiles from GC_ALL without cloud	Hourly diffuse and direct PAR Monthly AOD
7	CRM_NAT_CLR	CRM	Aerosol profiles from GC_NAT without cloud	Hourly diffuse and direct PAR Monthly AOD
8	CRM_NOA_CLR	CRM	No aerosol profiles without cloud	Hourly diffuse and direct PAR
9	YIBS_ALL	YIBs	PAR from CRM_ALL	Monthly NPP/LAI
10	YIBS_NAT	YIBs	PAR from CRM_NAT	Monthly NPP/LAI
11	YIBS_NOA	YIBs	PAR from CRM_NOA	Monthly NPP/LAI
12	YIBS_ALL_CLR	YIBs	PAR from CRM_ALL_CLR	Monthly NPP/LAI
13	YIBS_NAT_CLR	YIBs	PAR from CRM_NAT_CLR	Monthly NPP/LAI
14	YIBS_NOA_CLR	YIBs	PAR from CRM_NOA_CLR	Monthly NPP/LAI
15	YIBS_CLIM_FIX	YIBs	The same as YIBS_ALL but all meteorology fixed at 2001	Monthly NPP/LAI
16	YIBS_TAS_FIX	YIBs	The same as YIBS_ALL but temperature fixed at 2001	Monthly NPP/LAI

*The online version of this article can be found at https://doi.org/10.1007/s00376-023-2329-x.

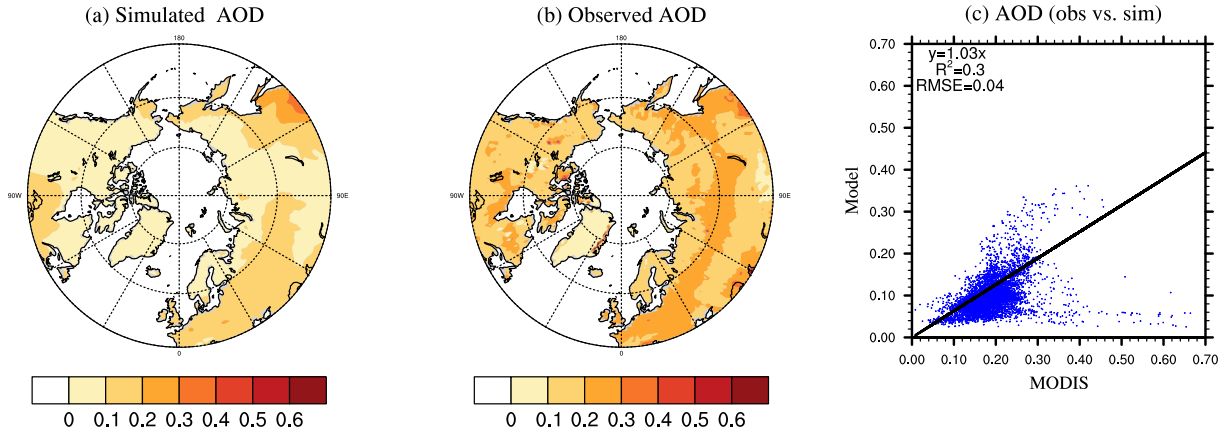

Fig. S1. Evaluations of AOD between simulations and observations. Simulated AOD are derived by the CRM model using original aerosol profiles from GEOS-Chem model.

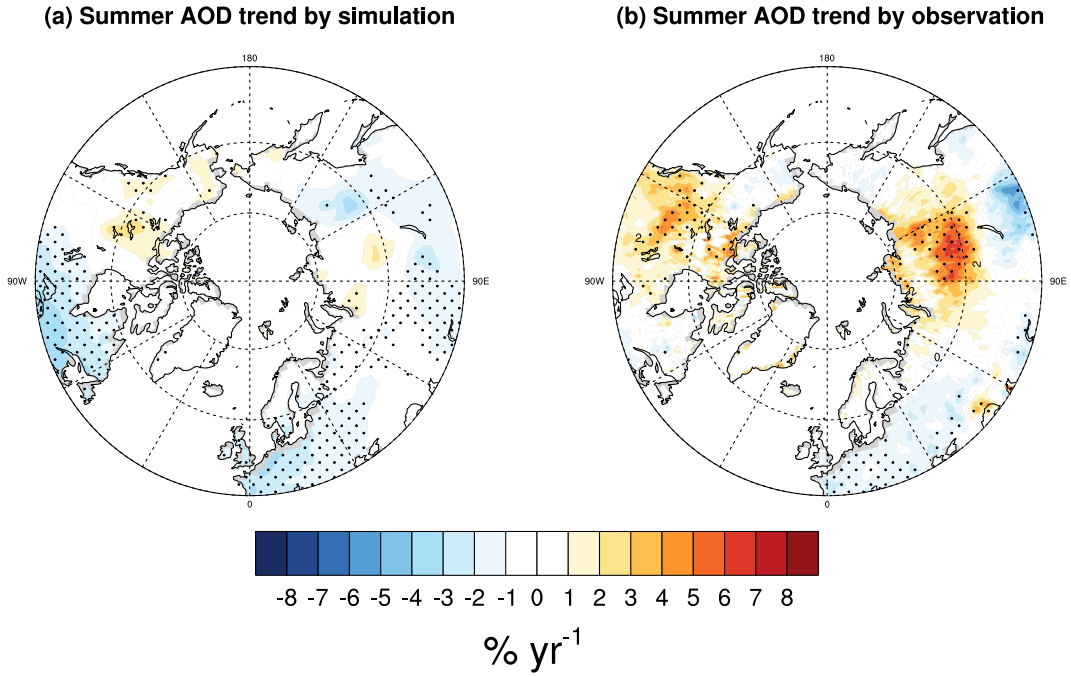

Fig. S2. Comparison of (a) simulated and (b) observed AOD trends during 2001–19. Simulations are performed by the CRM model using original aerosol profiles from GEOS-Chem model. Observed AOD are from the MODIS product.

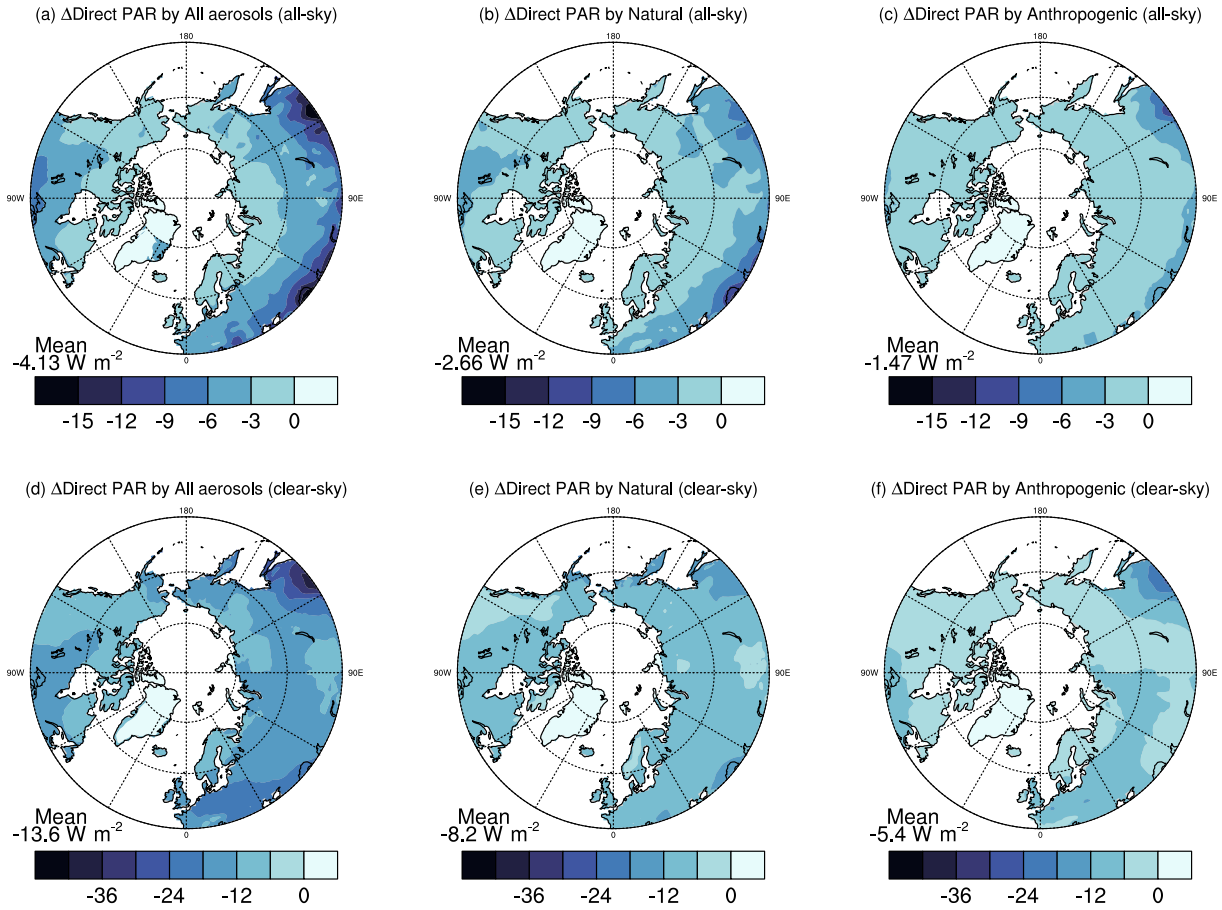

Fig. S3. Simulated changes of direct PAR (W m^{-2}) caused by all, natural, and anthropogenic aerosols under all (a–c) and clear (d–f) sky conditions. The average change in PAR is listed on each panel.

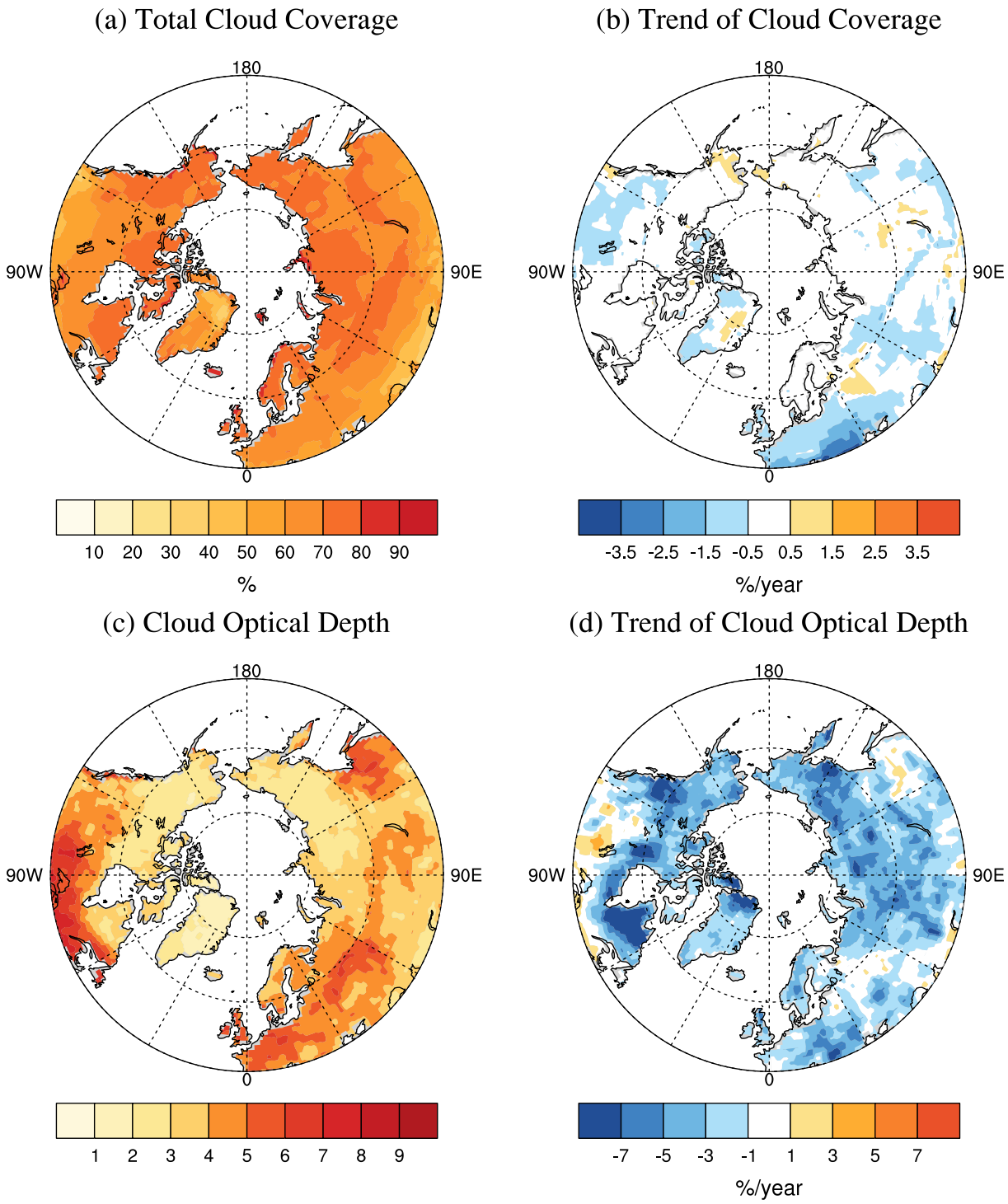

Fig. S4. The annual mean (a), trends (b) of cloud amount and mean (c) and trend of cloud optical depth (d) during 2001–19. The monthly cloud amount is adopted from CERES SYN1deg products.

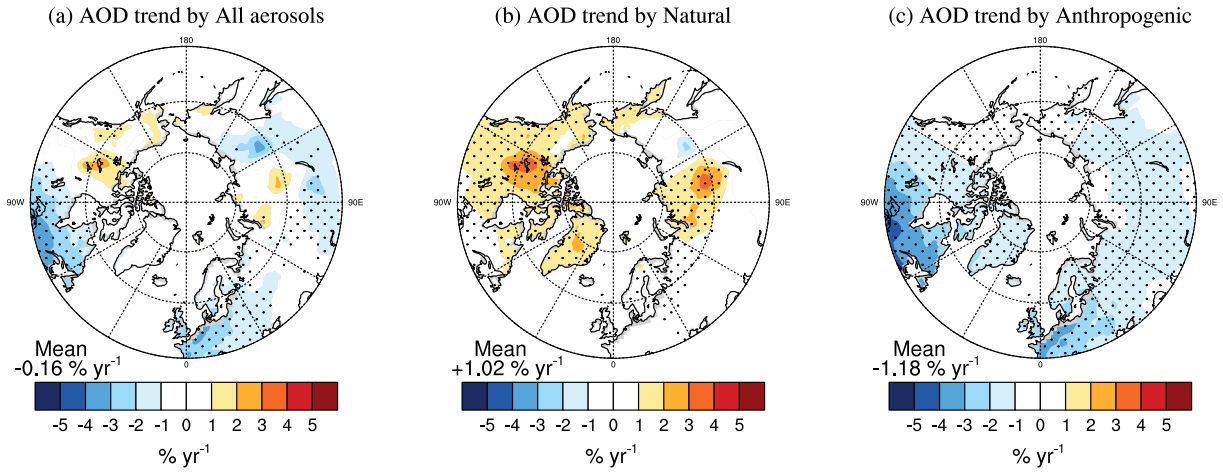

Fig. S5. Simulated annual trends of aerosol optical depth (AOD) from (a) all, (b) natural and (c) anthropogenic aerosols during 2001–19. The mean trend is shown on each panel. Significant trends ($p < 0.05$) are shown with dotted area.

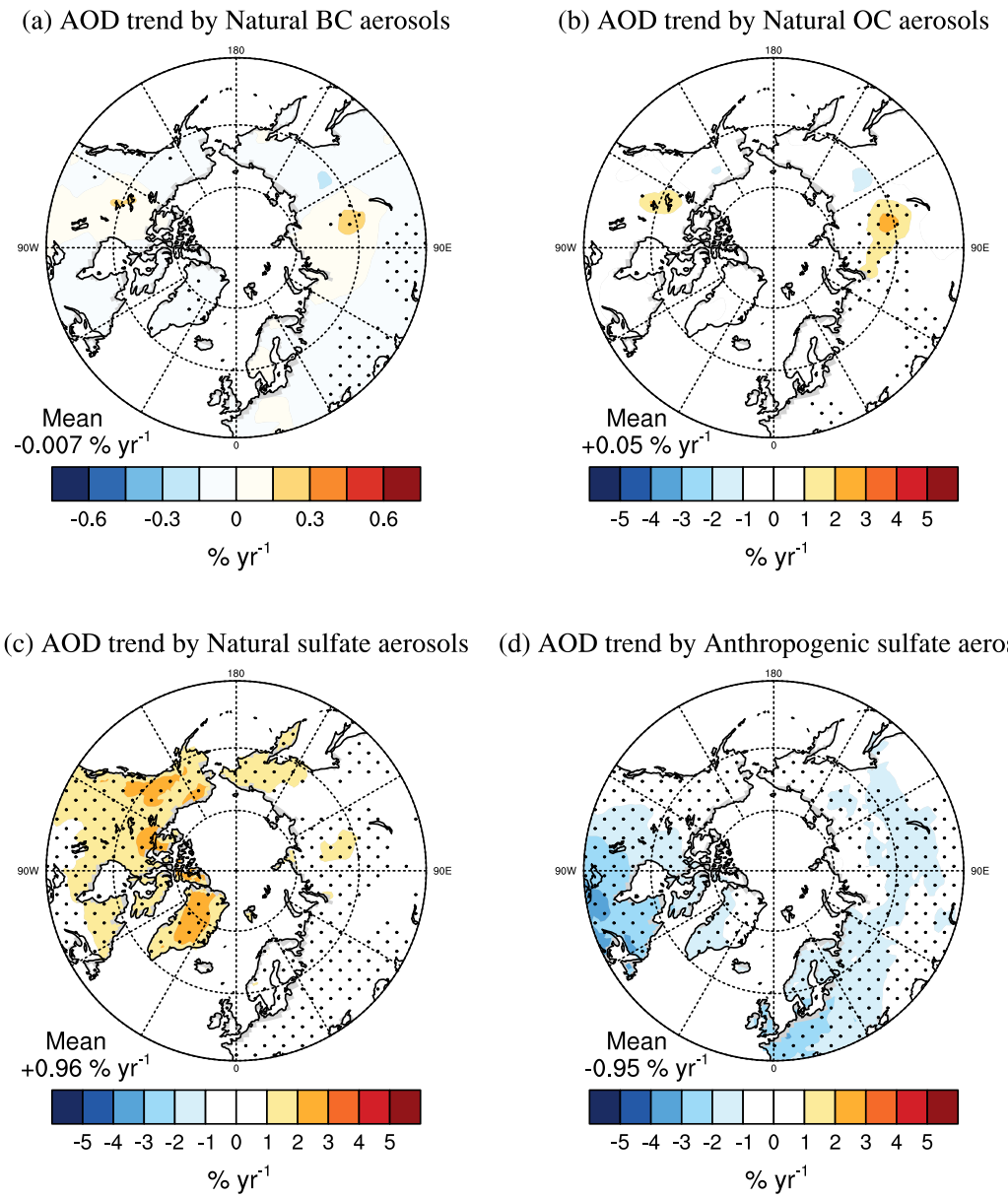

Fig. S6. Simulated annual AOD trends from natural aerosols of (a) BC, (b) OC, (c) sulfate and (d) anthropogenic sulfate aerosols. Significant trends ($p < 0.05$) are shown with dotted area.

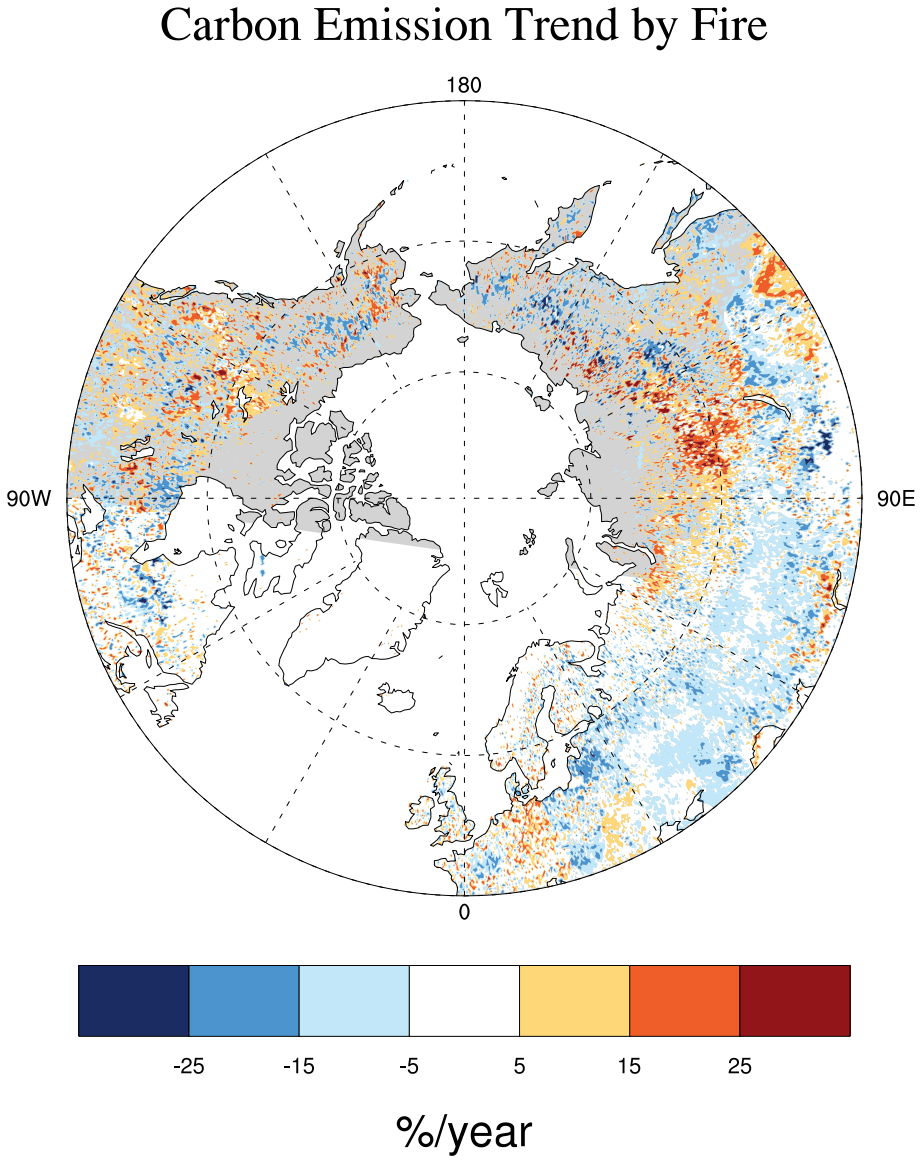

Fig. S7. Annual trends of fire-induced carbon emissions during 2001–19.

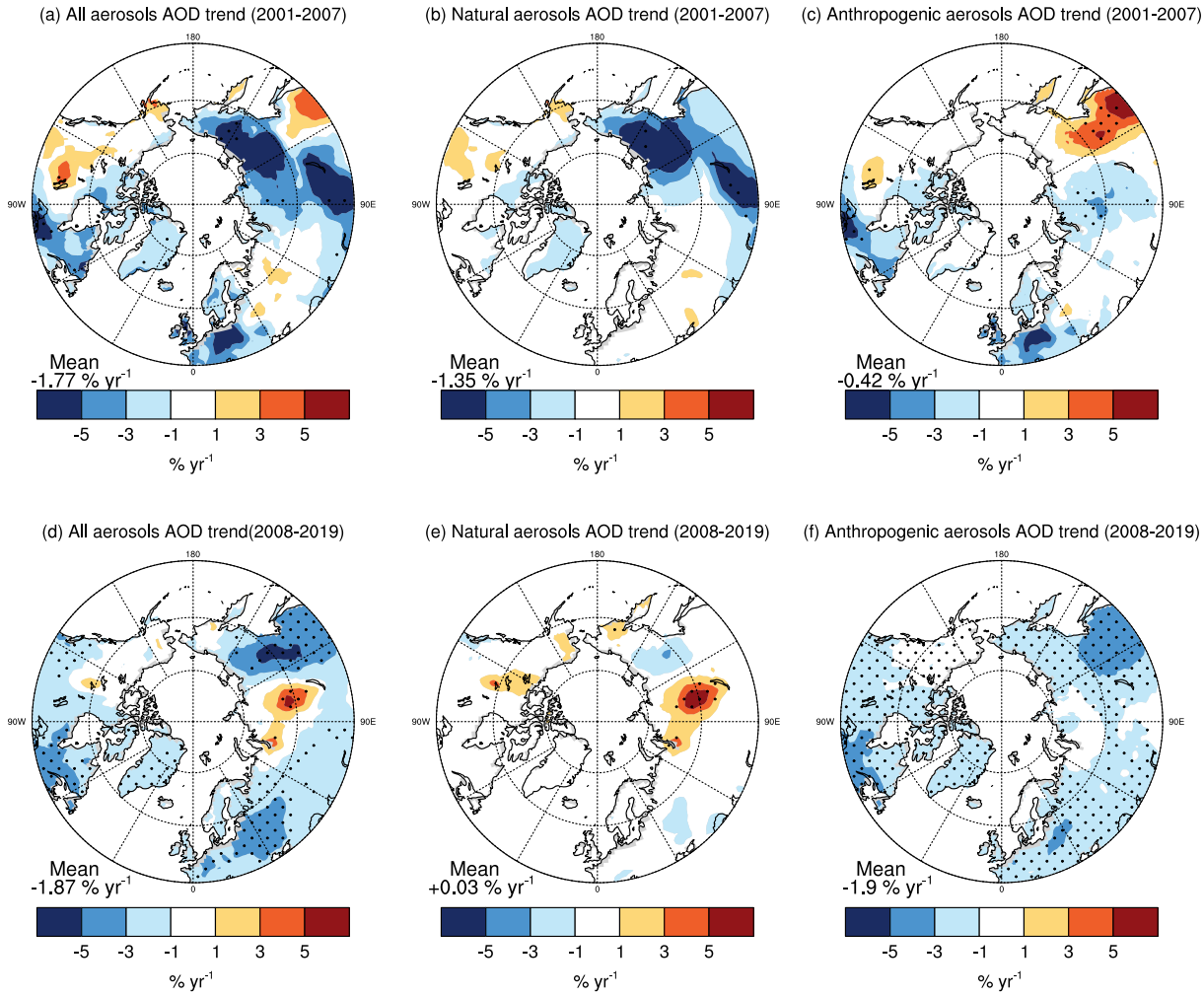

Fig. S8. Simulated annual trends of aerosol optical depth (AOD) from all, (b) natural and anthropogenic aerosols during 2001–07 (a–c) and 2008–19 (d–f). The mean trend is shown on each panel. Significant trends ($p < 0.05$) are shown with dotted area.

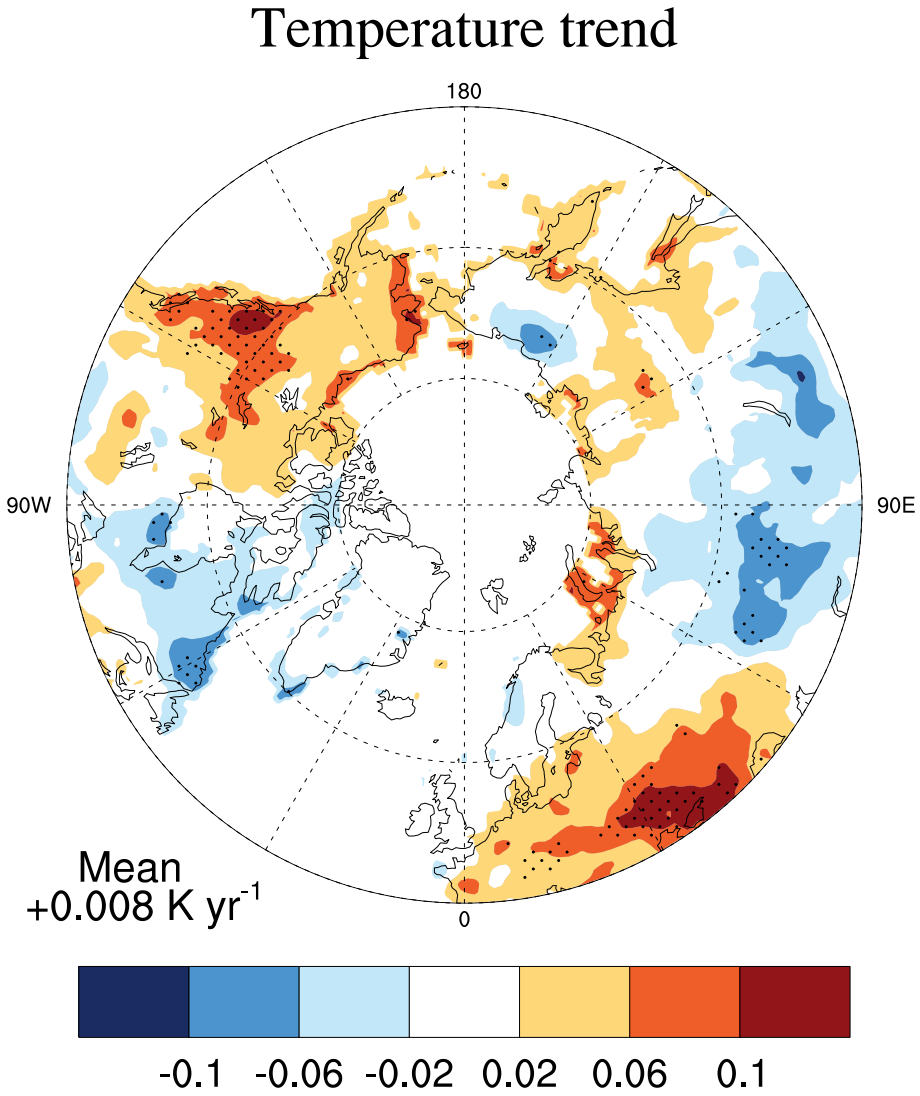

Fig. S9. Trends of temperature (K yr^{-1}) for growing seasons during 2001–19. Significant trends ($p < 0.05$) are shown with dotted area.

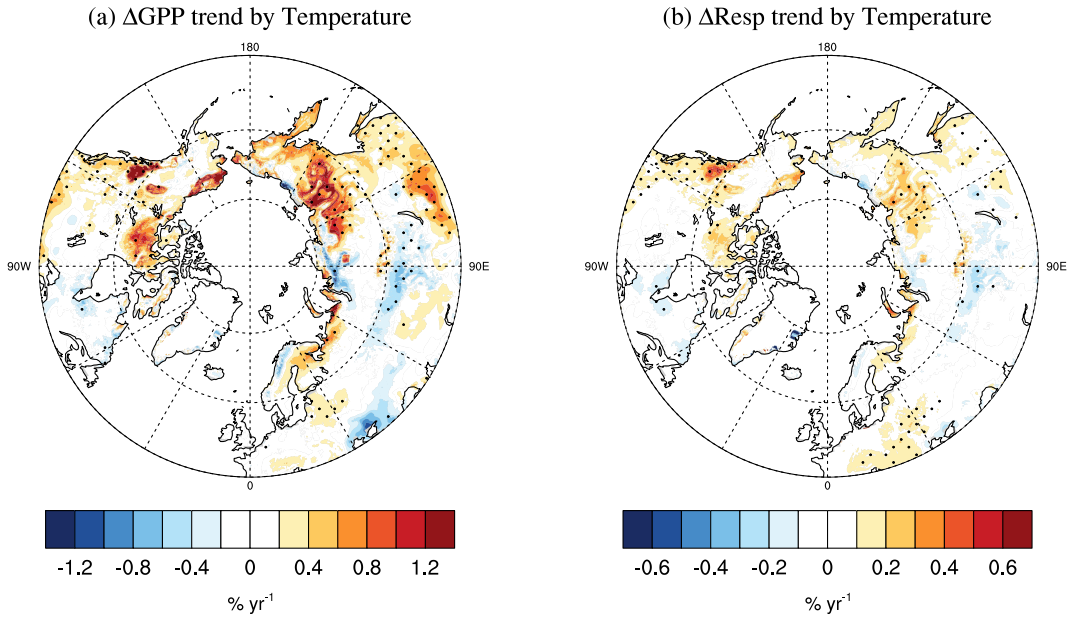

Fig. S10. Simulated trends of (a) GPP and (b) autotrophic respiration (% yr^{-1}) induced by changes in temperature alone during 2001–19. Significant trends ($p < 0.05$) are shown with dotted area.