global: absolute difference surface concentration of SO4 – high–so4 surface concentration of SO2 – high–so4 surface flux surface flux surface concentration of BC - high-so4 of SO2 - high-so4 of BC - high-so4 1.0e-10 0e+00 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ mmrbc (kg kg-1) əmiso2 (kg m⁻² s⁻¹ mmrso4 (kg kgso2 (kg kg-1) -2.0e-11 -1 2e-19 -3 0e-11 0e+00 -2.1e-19 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year upwelling longwave flux at TOA – high–so4 upwelling shortwave flux at TOA – high–so4 upwelling clear-sky longway flux at TOA - high-so4 net radiative flux incident shortwave flux at TOA - high-so4 at TOA – high–so4 1.5e-01 0e+00 0e+00 1e-07 1.0e-01 $rsut(W m^{-2})$ rlut(Wm-2)rsut (Wm-2)5e-08 rsdt (Wm-2)5.0e-02 rlutcs (W m--2e-0 -2e-01-5e-02 0.0e+00 rlut + -5e-08 -5.0e-02 -4e-0'-1e-01-1e-07 -1.0e-01 2000 2001 2002 2003 2004 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2000 2001 2000 2001 Year Year Year Year upwelling clear-sky shortwa flux at TOA - high-so4 clear-sky net radiative flux at TOA - high-so4 implied cloud response at TOA – high–so4 dry deposition rate of BC – high–so4 wet deposition rate of BC – high–so4 rlutcs - rsutcs (W m⁻²) 1e-01 0.0e+00 0e+00 rsutcs (W m⁻²) -5.0e-02 wetbc $(kg m^{-2} s^{-1})$ rsutcs (W m-2) $drybc (kg m^{-2} s^{-1})$ 0e+00 -1e-01 -1.0e-01 -3.0e-16 -1.5e-0rlutcs + rsut – -2e-01 -2.0e-01 -3e-01 를 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year Year dry deposition rate of SO2 – high–so4 total deposition rate of BC – high–so4 wet deposition rate of SO2 – high–so4 dry deposition rate of SO4 – high–so4 wet deposition rate of SO4 – high–so4 0.0e+00 $drybc + wetbc (kg m^{-2} s^{-1})$ 3.0e-13 2.0e wetso4 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ dryso2 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ wetso2 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ dryso4 (kg $\mathrm{m}^{-2}~\mathrm{s}^{-1}$ 2.0e-13 1.5e-13 -9.0e-14 1.0e-13 -4.6e-16 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year total deposition rate of S – high–so4 ambient aerosol optical total cloud cover convective cloud cover (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3percentage - high-so4 thickness at 550nm - high-s percentage - high-so4 -02 expression(clt~(%) 2e-14 -2.5e-02 $(kg m^{-2} s^{-1})$ 0e+000e+00 1e-02 -1e-01 -7.5e-02 0e+00 20002001200220032004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year

CAM-ATRAS

CESM

CESM2

E3SM

GEOS

GFDL-ESM4

GISS modelE

NorESM2

MIROC-SPRINTARS

OsloCTM3

UKESM1