global: absolute difference surface concentration of SO4 – no-so4 surface flux surface flux surface concentration surface concentration of BC - no-so4 of SO2 - no-so4 of BC - no-so4 of SO2 - no-so4 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ 1.2e mmrbc (kg kg – 1) mmrso4 (kg kg-1) əmiso2 (kg m⁻² s⁻¹ so2 (kg kg-1) 0.0e+00 2.3e-20 1.0e-13 -7 2e-20 7.5e-12 0.0e+00 -5.0e 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 – no-so4 upwelling shortwave flux at TOA – no–so4 upwelling clear-sky longwa flux at TOA - no-so4 net radiative flux incident shortwave flux at TOA - no-so4 at TOA - no-so4 2e-01 0.0e+00 0e+00 rsut (W m⁻² rlut(Wm-2)rsdt (Wm-2)rsut (Wm-2)0e+00 rlutcs (W m--2e-0 -1e-01 rlt + -2e-01 -8 0e-02 -4e-01 -2e-01 _4e_01 -1.2e-0 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year Year upwelling clear–sky shortwa flux at TOA – no–so4 clear-sky net radiative flux at TOA - no-so4 implied cloud response at TOA – no-so4 dry deposition rate of BC – no-so4 wet deposition rate of BC – no–so4 + rsut - rlutcs - rsutcs (W m⁻²) 1e-01 rlutcs + rsutcs (W m⁻²) 8.2e-16 wetbc (kg $\mathrm{m}^{-2} \mathrm{s}^{-1}$) $drybc (kg m^{-2} s^{-1})$ rsutcs (W m-2) -5.0e-02 -1e-01 -1.0e-01 -2e-01 -1e-01 -6.3e-16 -3e-01 芦 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 total deposition rate of BC – no–so4 dry deposition rate of SO2 – no-so4 wet deposition rate of SO2 – no–so4 dry deposition rate of SO4 – no-so4 wet deposition rate of SO4 – no-so4 1.3e-15 0.0e+00 $drybc + wetbc (kg m^{-2} s^{-1})$ 8.6e wetso2 $(kg m^{-2} s^{-1})$ dryso2 $(kg m^{-2} s^{-1})$ wetso4 (kg m⁻² s⁻¹) dryso4 $(kg m^{-2})$ -8.0e-14 4.0e-16 8 Oe--6.9e-1 6.0e-14 -5.4e-162000 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 – no–so4 ambient aerosol optical total cloud cover convective cloud cover (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3thickness at 550nm - no-se percentage - no-so4 percentage - no-so4 1.5e-14 0.0e+00 1.0e-14 expression(clt~(%) -2.5e-02 0.0e+0.0 $(kg m^{-2} s^{-1})$ -5.0e-02 0.0e+00 -5.0e-15 -7.5e-02 -5 0e-02 -1.0e-14 200@001200220032004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year CAM-ATRAS E3SM GISS modelE OsloCTM3 CESM **GEOS** MIROC-SPRINTARS UKESM1 CESM2 GFDL-ESM4 NorESM2