global: absolute difference surface flux surface flux surface concentration surface concentration of BC - so2-at-height of SO2 - so2-at-height of BC - so2-at-height of SO4 - so2-at-height of SO2 - so2-at-height 1.4e-19 Δ emibc (kg m⁻² s⁻¹) (kg kg - 1)emiso2 (kg m⁻² s^{-'} 2.0e-10 △ mmrbc (kg kg 0e+00 (kg kg-2.4e-20 _1e_12 ∆ mmrso4 1.0e-10 $\Delta so2$ (-6e-10 -3.5e-20 -8e-10 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 upwelling longwave flux at TOA – so2–at–height upwelling shortwave flux at TOA – so2–at–height upwelling clear-sky longway flux at TOA - so2-at-heigh net radiative flux incident shortwave flux at TOA - so2-at-height at TOA - so2-at-height 0e+001e-01 Ē Δ rlutcs (W m-2) Δ rlut (W m – 2) 4e-02 E ∆ rlut + rsut (W rsdt (W mrsut (W 0e+00 _3__01 -3e-01 -4e-0 -1e-0 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year upwelling clear-sky shortway flux at TOA - so2-at-heigh clear-sky net radiative flux at TOA - so2-at-heigh $(W \, m^{-2})$ implied cloud response dry deposition rate wet deposition rate at TOA - so2-at-height of BC - so2-at-height of BC - so2-at-height 1.1e-15 8.0e-16 Ē rsutcs 1e-01 Δ rsutcs (W m – 2) wetbc (kg m^{-2} s $^{-1}$ drybc (kg $m^{-2} s^{-1}$ rsutcs (W -1e-01 0e+00 rlutcs --3e-0 4e-01 -4e-01 rsut rlut + 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 total deposition rate of BC – so2–at–height dry deposition rate of SO2 – so2–at–height wet deposition rate of SO2 – so2–at–height dry deposition rate f SO4 – so2–at–height wet deposition rate of SO4 – so2–at–height Δ drybc + wetbc (kg m⁻² s⁻¹ 7.6e-16 Δ wetso2 (kg m $^{-2}$ s $^{-}$ Δ dryso4 (kg m⁻² s⁻ drvso2 (ka m⁻² s⁻ 4.3e-16 wetso4 (kg m⁻² 1.1e-16 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year dryso2 + wetso2)/2 + (dryso4 + wetso4)/3Year total deposition rate ambient aerosol optical total cloud cover - so2-at-he convective cloud cover - so2-atsurface cloud cover - so2-at-h of S - so2-at-height thickness at 550nm - so2-at-l ∆ cltc (percent) 0.0e+00∆ clt (percent) ∆ cl (percent $(kg m^{-2} s^{-1})$ 0e+00 -2.5e-02 1e+35 -1e-13 0e+00 20002001200220032004 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 ice water path - so2-at-heig surface concentration column mass burden column mass burden column mass burden so2-at-height of BC - so2-at-height of SO2 - so2-at-height of SO4 - so2-at-height $\Delta \log dso2 (kg m^{-2})$ 6e-07 Δ clivi (kg m $^{-2}$) loadbc (kg m⁻²) Δ loadso4 (kg m⁻²) ∆ dms (kg kg –1] 1e-04 5e-07 4e-07 0e+00 3e-07 2e-07 -1e-04 0e+00 1e-07 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year CAM5 E3SM **GISS** OsloCTM3 CESM1 GEOS MIROC **UKESM**

CESM2

GFDL

NorESM2