## so2-at-height: absolute difference surface flux of BC – sea surface flux surface concentration surface concentration surface concentration of SO2 - sea of BC - sea of SO4 - sea of SO2 - sea 6.9e-21 kg-1) $\Delta$ emibc (kg m<sup>-2</sup> s<sup>-1</sup>) $\Delta$ emiso2 (kg m $^{-2}$ s $^{-1}$ ∆ mmrbc (kg kg − 1) $\Delta so2 (kg kg - 1)$ 0e+00 ∆ mmrso4 (kg l 1e-13 5.0e-22 0e+00 2e-14 -2 7e-21 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 upwelling longwave flux at TOA – sea upwelling shortwave flux at TOA – sea upwelling clear-sky longwav flux at TOA - sea incident shortwave flux net radiative flux at TOA - sea at TOA - sea 1e-0 1e-01 0e+00 ∆ rlut + rsut (W m<sup>-</sup> $\Delta$ rlutcs (W m-2) $\Delta$ rlut (W m – 2) Ę rsdt (W mrsut (W I 0e+00 0e+00 -5e-02-1e-07 -4e-0 -1e-01 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 clear-sky shortway flux at TOA - sea clear-sky net radiative rsutcs (W m<sup>-2</sup>) implied cloud response dry deposition rate wet deposition rate flux at TOA - sea at TOA - sea of BC - sea of BC - sea $m^{-2}$ 7.7e-16 1.1e-15 00+00 0e+00 wetbc (kg $m^{-2} s^{-1}$ ) $\Delta$ rsutcs (W m – 2) drybc (kg $m^{-2} s^{-1}$ rsutcs (W 0e+00 -2e-01 rlutcs -1e-01 -3e-01 -3e-01 rsut -4e-01 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 dry deposition rate of SO2 – sea dry deposition rate of SO4 – sea wet deposition rate of SO4 – sea total deposition rate wet deposition rate of BC - sea of SO2 - sea $\Delta$ drybc + wetbc (kg m<sup>-2</sup> s<sup>-1</sup> 1.6e-15 dryso2 (kg m<sup>-2</sup> s<sup>-'</sup> wetso2 (kg $m^{-2}$ s $^-$ ∆ dryso4 (kg m<sup>-2</sup> wetso4 (kg m<sup>-2</sup> 1.8e-16 0e+00 5.0e-13 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 dryso2 + wetso2)/2 + (dryso4 + wetso4)/3Year Year Year total deposition rate ambient aerosol optical total cloud cover - sea convective cloud cover - sea surface cloud cover - sea of S - sea thickness at 550nm - sea 1e-01 0e+00 ∆ cltc (percent) ∆ clt (percent) ∆ cl (percent $(kg m^{-2} s^{-1})$ -2e-02-4e-021e+35 -6e-02 0e+00 20002001200220032004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year Year ice water path - sea surface concentration column mass burden column mass burden column mass burden of SO4 - sea of DMS - sea 8e-07 1.5e-12 $\Delta$ loadso4 (kg m<sup>-2</sup>) $\Delta\,\mathrm{clivi}\,\left(\mathrm{kg}\;\mathrm{m}^{-2}\right)$ $\Delta$ dms (kg kg – 1) $loadbc (kg m^{-2})$ $\Delta$ loadso2 (kg m $^{-2}$ 1e-04 2e-07 4e-07 0e+00 5.0e-13 -8.0e 2e-07 -1e-04 -2e-04 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

CESM2

**GEOS** 

**GFDL** 

MIROC

NorESM2

**UKESM**