## so2-at-height: absolute difference surface flux of BC – global surface concentration of SO4 – global surface concentration of SO2 – global surface concentration surface flux of SO2 - global of BC - global $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ 0e+00 $^{2}$ = $^{2}$ = $^{-1}$ mmrbc (kg kg – 1) mmrso4 (kg kgso2 (kg kg-1) 2.4e-20 1e-13 -3.5e-20 0e+00 -9.4e-20 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 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 – global upwelling shortwave flux at TOA – global incident shortwave flux upwelling clear-sky longway flux at TOA - global net radiative flux at TOA – global at TOA – global 0e+00 0e+00 1e-01 -1e-01 4e-02 $rsut(W m^{-2})$ rlutcs (W m-2) -1e-01 rlut(Wm-2)rsut (Wm-2)rsdt (Wm-2)5e-02 0e+00 -3e-01 -4e-0 -4e-02 -5e-02 -4e-01 -1e-07 -5e-01 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2000 2001 Year Year Year clear-sky net radiative flux at TOA - global implied cloud response at TOA – global upwelling clear-sky shortway flux at TOA - global dry deposition rate of BC – global wet deposition rate of BC – global rlutcs - rsutcs (W m<sup>-2</sup>) 0e+00 0e+00 1e-0 rsutcs (W m<sup>-2</sup>) wetbc (kg $\mathrm{m}^{-2} \mathrm{s}^{-1}$ ) $drybc (kg m^{-2} s^{-1})$ rsutcs (W m-2) -2e-01 0e+00 -3e-01 -1e-0 -4e-01 + rsut --5e-01 큳 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 dry deposition rate of SO2 – global total deposition rate of BC – global wet deposition rate of SO2 – global dry deposition rate of SO4 – global wet deposition rate of SO4 – global 7.6e-16 4e-13 $drybc + wetbc (kg m^{-2} s^{-1})$ 4.3e wetso4 $(kg m^{-2} s^{-1})$ vetso2 (kg $m^{-2}$ s<sup>-1</sup> dryso4 (kg $m^{-2}$ s<sup>-1</sup> dryso2 (kg m<sup>-2</sup> s<sup>-</sup> 2e-13 1.0e-12 5.0e-13 -5.3e-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 – global ambient aerosol optical total cloud cover convective cloud cover (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3thickness at 550nm – globa percentage – global percentage - global 2e-13 0.0e+00 3e+35 expression clt (%) $(kg m^{-2} s^{-1})$ 양 -2.5e-02 2e+35 expression 0e+00 1e+35 -7.5e-02 20002001200220032004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2001 2002 2003 2004 2000 Year Year Year Year

CAM-ATRAS

CESM

CESM2

E3SM

**GEOS** 

GFDL-ESM4

GISS modelE

NorESM2

MIROC-SPRINTARS

OsloCTM3

UKESM1