## global: absolute difference surface flux of BC – so2–at–height surface flux surface concentration surface concentration surface concentration of SO2 - so2-at-height of SO4 - so2-at-height of SO2 - so2-at-height 8.0e-20 0.0e+00 2.0e-10 5.0e-20 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ emiso2 $(kg m^{-2} s^{-1})$ mmrso4 (kg kg – 1) nmrbc (kg kg – 1) so2 (kg kg 1.9e-20 1 0e-10 -1.2e-20 0e+00 5 0e-11 2002 2003 2002 2003 2002 2003 2002 2003 2002 2003 2001 2001 2001 2001 2001 Year Year Year Year Year net radiative flux at TOA – so2–at–height upwelling longwave flux at TOA – so2–at–height upwelling shortwave flux at TOA – so2–at–height incident shortwave flux at TOA – so2–at–height upwelling clear-sky longway flux at TOA - so2-at-heig 0e+00 1e-01 $rlut + rsut (W m^{-2})$ 4e-08 m-2rlut (W m – 2) rsdt(Wm-2)rsut(Wm-2)5e-02 rlutcs (W 0e+00 0e+00 4e-08 -3e-01 -4e-01 2002 2003 2003 2002 2003 2003 2003 2001 2004 2001 2002 2001 2001 2002 2001 2002 Year Year Year Year Year upwelling clear-sky shortway clear-sky net radiative implied cloud response dry deposition rate wet deposition rate flux at TOA – so2-at-heigh flux at TOA - so2-at-heigh at TOA - so2-at-height of BC - so2-at-height of BC - so2-at-height 0e+00 rsut - rlutcs - rsutcs (W 1e-01 lutcs + rsutcs (W $m^{-2}$ 6.9e-16 $drybc (kg m^{-2} s^{-1})$ wetbc $(kg m^{-2} s^{-1})$ 3.3e-16 rsutcs (W m-2) -2e-01 -2e-01 3.2e-16 -3e-01 -4e-01 -5e-01 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2001 2002 2003 Year Year Year Year Year dry deposition rate of SO4 – so2–at–height wet deposition rate of SO4 – so2–at–height total deposition rate dry deposition rate wet deposition rate of BC - so2-at-height of SO2 - so2-at-height of SO2 - so2-at-height 7.6e-16 -5.0e-13 $drybc + wetbc (kg m^{-2} s^{-1})$ 2.0e-12 wetso4 $(kg m^{-2} s^{-1})$ 4.3e-16 wetso2 $(kg m^{-2} s^{-1})$ $dryso4 (kg m^{-2} s^{-1})$ dryso2 (kg m<sup>-2</sup> s<sup>-1</sup> 1.5e-12 1.1e-16 2e-13 -1.5e-12 5.0e-13 0e+00 -1.8e-12 2002 2003 2002 2003 2002 2003 2002 2003 2002 2003 Year Year total deposition rate ambient aerosol optical total cloud cover convective cloud cover (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3of S - so2-at-height thickness at 550nm - so2-at-h percentage - so2-at-heigh percentage - so2-at-height 0.0e+00 expression(clt~(%) $(kg m^{-2} s^{-1})$ -2.5e-02 2e+35 0e+00 -5e-02 -7.5e-02 -1e-13 0e+00 2001 2002 2003 2004 2002 2003 2002 2003 Year Year Year Year **UKESM** CESM1 GISS MIROC **GFDI** E3SM CESM2 NorESM2 OsloCTM3 **GEOS**