no-so4: absolute difference surface flux of BC - land surface flux of SO2 - land surface concentration of BC – land surface concentration of SO4 - land 2 56-19 1e-12 1.4e-19 emibc (kg m-2 s-1) emiso2 (kg m-2 s-1) 5e-13 mmrbc (kg kg-1) mmrso4 (kg kg-1) -1.0e-10 5.0e-13 0e+00 2.9e-20 4.8e-13 -1.2e-10 -5e-13 -8.0e-20 4 6e-13 -1e-12 -1.4e-104.4e-13 -1.9e-19 2001 2003 2001 2003 2003 2001 2002 2002 2002 2001 2002 Year Year Year Year upwelling longwave flux at TOA – land upwelling shortwave flux at TOA – land surface concentration net radiative flux at TOA - land of SO2 - land 0.0 0.15 rlut + rsut (W m-2) so2 (kg kg-1) 8e-11 0.10 rlut (W m-2) rsut (W m-2) _0 1 0.05 -0.2 -0.2 0.00 -0.3 -0.05-0.3 2001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2002 Year Year Year Year upwelling clear-sky longwave flux at TOA - land upwelling clear–sky shortwave flux at TOA – land clear-sky net radiative flux at TOA – land incident shortwave flux at TOA - land -0.01 0.04 -0.02 2e-07 rlutcs + rsutcs (W m-2) -0.02 rsutcs (W m-2) rlutcs (W m-2) rsdt (W m-2) -0.04 0.02 1e-07 -0.03 -0.04 -0.060e+00 0.00 -0.05 -0.08 2001 2002 2004 2001 2004 2003 2004 2003 2004 2003 2002 2003 2001 2002 2001 2002 Year Year Year Year wet deposition rate of BC – land total deposition rate of BC – land dry deposition rate of SO2 – land dry deposition rate of BC - land 2.5e-15 1.5e-15 4.2e-15 drybc + wetbc (kg m-2 s-1) drybc (kg m-2 s-1) 1.1e-15 wetbc (kg m-2 s-1) 2.6e-16 dryso2 (kg m-2 s-1) 2.0e-13 -3.0e-16 -9.9e-16 -8.8e-16 -2.2e-15 1.0e-13 -6.0e-15 -3.5e-15 2001 2003 2004 2001 2003 2001 2003 2004 2003 2002 2002 2002 2001 2002 Year Year Year Year (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3 (kg m-2 s-1) wet deposition rate dry deposition rate wet deposition rate total deposition rate of SO2 - land of SO4 - land of SO4 - land of S – land wetso2 (kg m-2 s-1) dryso4 (kg m-2 s-1) -1.6e-13 0e+00 wetso4 (kg m-2 s-1) 1e-13 -1.5e-13 -2.0e-13 -1e-14 -2.4e-13 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2004 Year Year Year Year

CESM1

E3SM

GISS

MIROC

NorESM2