bc-no-season: absolute difference surface flux of BC – land surface flux of SO2 – land surface concentration of BC – land surface concentration of SO4 – land surface concentration of SO2 – land 3.0e-15 2.5e-12 0e+00 1.2e-10 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ emiso2 (kg $\mathrm{m}^{-2} \mathrm{s}^{-1}$ 0.0e+0.0mmrbc (kg kg $^{-1}$) mmrso4 (kg kg⁻¹ $m so2~(kg~kg^{-1}$ -2.5e-12 4 0e-11 -2e-09 -9.9e-16 -5.0e-12 0.0e+00 0e+002001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2002 2003 Year Year Year Year Year net radiative flux at TOA – land incident shortwave flux at TOA – land clear-sky longwave flux at TOA - land longwave flux at TOA shortwave flux at TOA land land 0.75 1.0e-07 0.0 rlut + rsut $(W m^{-2})$ rlutcs $(W m^{-2})$ rlut $(W m^{-2})$ $rsut (W m^{-2})$ $rsdt (W m^{-2})$ 0.50 -0.1 -0.1 0.2 0.25 0.0e+00 -0.2 -0.2 0.0 0.00 -5.0e-08 2001 2003 2001 2003 2001 2003 2002 2003 2001 2003 Year Year Year Year Year clear-sky shortwave clear-sky net radiative implied cloud response dry deposition rate wet deposition rate flux at TOA - land flux at TOA - land at TOA - land of BC - land of BC - land 4.1e-15 rlut + rsut - rlutcs - rsutcs (W m⁻²) 0.05 0.8 0.00 rlutcs + rsutcs (W m^{-2}) 2.7e-16 0.8 wetbc $(kg m^{-2} s^{-1})$ 0.6 drybc (kg m $^{-2}$ s $^{-1}$) $\rm rsutcs \ (W\ m^{-2})$ -0.05 0.4 -3.6e-15 0.2 2e-14 -0.15 0.0 -0.20 2003 2001 2002 2003 2001 2002 2003 2001 2003 2001 2003 2002 2001 Year Year Year Year Year dry deposition rate of SO4 – land wet deposition rate of SO4 – land total deposition rate dry deposition rate wet deposition rate of BC - land of SO2 – land of SO2 – land 8e-14 $drybc + wetbc (kg m^{-2} s^{-1})$ 1e-14 wetso2 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$) $dryso2 (kg m^{-2} s^{-1})$ $dryso4 (kg m^{-2} s^{-1})$ wetso4 (kg m⁻² s⁻¹) 0e+00 4e-14 1e-14 0e+00 0e+00 -1e-14 2001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 Year Year total deposition rate of S – land convective cloud cover ambient aerosol optical total cloud cover (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3thickness at 550nm - land percentage - land percentage - land 0.1 0.00 2.0e-13 -0.05 0.0 $(kg m^{-2} s^{-1})$ -0.04 clt (%) -0.10 -0.08 -0.1 5.0e-14 -0.2 2001 2002 2003 2004 2003 2002 2003 2001 2002 2004 2001 2004 2001 2002 2003 2004 Year Year Year Year

CFSM1

CESM2

F3SM

GEOS

GFDI

GISS

MIROC

NorESM2

OsloCTM3

UKESM