Reference - absolute SH-land averages surface flux of BC – SH–land surface flux of SO2 – SH–land surface concentration of BC – SH–land surface concentration of SO4 – SH–land surface concentration of SO2 – SH–land $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ emiso2 $(kg m^{-2} s^{-1})$ mmrso4 (kg kg mmrbc (kg kg so2 (kg kg⁻¹ 8.0e-10 1.10e-12 1.05e-12 1.00e-12 2002 2001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2003 Year Year Year Year Year shortwave flux at TOA -SH-land longwave flux at TOA -SH-land net radiative flux at TOA –SH–land incident shortwave flux at TOA – SH–land clear-sky longwave flux at TOA - SH-land -340 337 -242.5 rlut + rsut $(W m^{-2})$ rlutcs $(W m^{-2})$ rlut $(W m^{-2})$ $rsut (W m^{-2})$ $rsdt (W m^{-2})$ -220 -350 335 -247.5 -225 -360 334 -250.0 -140 -230 -370 2001 2003 2001 2003 2001 2003 2001 2003 2003 Year Year Year Year Year dry deposition rate of BC – SH–land wet deposition rate of BC - SH-land clear-sky shortwave clear-sky net radiative implied cloud response flux at TOA - SH-land flux at TOA - SH-land at TOA - SH-land rlut + rsut – rlutcs – rsutcs (W m^{-2}) -320 rlutcs + rsutcs (W m⁻²) wetbc (kg m⁻² s⁻¹) $\rm rsutcs \, (W \, m^{-2})$ drybc (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ -20 -330 -85 -40 -335 2002 2003 2001 2002 2003 2001 2003 2001 2002 2003 2001 2001 2003 Year Year Year Year Year dry deposition rate of SO4 – SH–land wet deposition rate of SO4 – SH–land total deposition rate dry deposition rate wet deposition rate of BC - SH-land of SO2 - SH-land of SO2 - SH-land $drybc + wetbc (kg m^{-2} s^{-1})$ wetso2 $(kg m^{-2} s^{-1})$ $dryso2 (kg m^{-2} s^{-1})$ $dryso4 (kg m^{-2} s^{-1})$ wetso4 $(kg m^{-2} s^{-1})$ 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 Year Year total deposition rate of S – SH–land ambient aerosol optical convective cloud cover total cloud cover (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3thickness at 550nm percentage - SH-land percentage - SH-land 64 60 $(kg m^{-2} s^{-1})$ od550aer clt (%) 8 0.12 cltc 0.09 52 2001 2002 2003 2004 2002 2003 2002 2003 2004 2002 2003 2001 2004 2001 2001 2004 Year Year Year Year

CFSM1

CESM2

F3SM

GEOS

GFDI

GISS

MIROC

NorESM2

OsloCTM3

UKESM