Reference - absolute NH-land averages surface concentration of BC – NH–land surface concentration of SO4 – NH–land surface flux of BC - NH-lan surface flux of SO2 - NH-lar surface concentration of SO2 – NH–land 1.9e-12 3 0e-11 emibc (kg m-2 s-1) emiso2 (kg m-2 s-1) mmrso4 (kg kg-1) nmrbc (kg kg-1) so2 (kg kg-1) 20_09 2001 2002 2003 2001 2003 2001 2003 2001 2002 2003 2001 2002 2003 Year Year Year Year Year upwelling shortwave flux at TOA – NH–land upwelling longwave flux at TOA – NH–land incident shortwave flux at TOA – NH–land upwelling clear-sky longwave flux at TOA - NH-land net radiative flux at TOA - NH-la 323.0 240 350 rlut + rsut (W m-2) 322.5 rlutcs (W m-2) rsut (W m-2) rsdt (W m-2) rlut (W m-2) 346 322.0 257 342 253 2001 2003 2001 2003 2001 2003 2001 2003 2001 2003 Year Year Year Year Year dry deposition rate of BC – NH–land wet deposition rate of BC – NH–land upwelling clear-sky shortwave clear-sky net radiative total deposition rate flux at TOA - NH-land flux at TOA - NH-land of BC - NH-land 80 1.25e-12 drybc + wetbc (kg m-2 s-1) rlutcs + rsutcs (W m-2) 335 drybc (kg m-2 s-1) wetbc (kg m-2 s-1) rsutcs (W m-2) 1.00e-12 330 1.2e-12 70 325 1.0e-12 65 8 0e-13 2003 2003 2001 2002 2003 2001 2003 2001 2003 2001 2002 2002 Year Year Year Year Year (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3 (kg m-2 s-1) dry deposition rate of SO4 – NH–land wet deposition rate of SO4 – NH–land total deposition rate of S – NH–land wet deposition rate of SO2 – NH–land dry deposition rate of SO2 - NH-land 1.2e-1 dryso2 (kg m-2 s-1) wetso4 (kg m-2 s-1) wetso2 (kg m-2 s-1) dryso4 (kg m-2 s-1) 1.50e-11 1.0e-1 3.0e-12 8.0e-12 1.00e-11 6.0e-12 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2001 2002 2003 2004 Year Year Year Year ambient aerosol optical thickness at 550nm – NH–land convective cloud cover total cloud cover percentage - NH-land 0.25 60 od550aer cltc (%) 0.20 clt (%) 10 2002 2003 2002 2003 2004 2002 2003 2004 2001 2001 2001 2004 Year Year Year

CFSM1

CESM2

F3SM

GEOS

GFDI

GISS

MIROC

NorESM2

OsloCTM3

UKESM