Reference - absolute NH-land averages surface concentration of BC – NH–land surface flux of BC - NH-lan surface flux of SO2 - NH-lar surface concentration of SO4 – NH–land surface concentration of SO2 – NH–land 1.9e-12 3 0e-11 5e-09 emibc (kg m-2 s-1) emiso2 (kg m-2 s-1) mmrso4 (kg kg-1) nmrbc (kg kg-1) 3e-09 so2 (kg kg-1) 2e-09 20-09 2001 2002 2003 2001 2003 2001 2003 2001 2002 2003 2001 2002 2003 Year Year Year Year Year upwelling longwave flux at TOA – NH–land upwelling shortwave 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 323.0 240 257 350 112 rlut + rsut (W m-2) 322.5 rlutcs (W m-2) rsut (W m-2) rsdt (W m-2) rlut (W m-2) 110 346 322.0 255 108 342 254 106 2001 2002 2003 2001 2003 2001 2002 2003 2001 2003 2001 2003 Year Year Year Year Year dry deposition rate of BC – NH–land total deposition rate of BC – NH–land upwelling clear-sky shortwave clear-sky net radiative wet deposition rate flux at TOA - NH-land flux at TOA - NH-land of BC - NH-land 332.5 drybc + wetbc (kg m-2 s-1) rlutes + rsutes (W m-2) 330.0 drybc (kg m-2 s-1) rsutcs (W m-2) 72 wetbc (kg m-2 4e-13 325.0 68 322.5 2003 2001 2002 2001 2003 2001 2003 2001 2003 2001 2002 2003 Year Year Year Year Year (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3 (kg m-2 s-1)dry deposition rate of SO4 – NH–land total deposition rate of S – NH–land wet deposition rate of SO4 – NH–land dry deposition rate wet deposition rate of SO2 - NH-land of SO2 - NH-land 3.0e-11 3.5e-12 dryso2 (kg m-2 s-1) wetso2 (kg m-2 s-1) dryso4 (kg m-2 s-1) (kg m-2 s-1 1.0e-1 3.0e-12 2 0e-11 8.0e-12 2.5e-12 6.0e-12 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 Year Year Year Year Year ambient aerosol optical convective cloud cover percentage – NH–land total cloud cover thickness at 550nm - NH-land 0.25 60 0.20 od550aer % clt (%) 0.15 cltc 0.10 50 0.05 2002 2003 2002 2003 2004 2001 2002 2003 2004 2001 2004 2001 Year Year Year

OsloCTM3

CESM1

E3SM

GFDI

GISS

MIROC

NorESM2