so2-at-height: percent difference surface flux of SO2 – NH–land surface concentration of BC – NH–land surface flux of BC – NH–land surface concentration of SO4 – NH–land surface concentration of SO2 – NH–land -20% 30% -30% 1e-05% ∆ emibc ∆ emiso2 ∆ mmrbc ∆ mmrso4 20% $\Delta so2$ 40% 2% 0% 10% -60% 0% _70% 0% 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2001 2002 2003 Year Year Year Year Year net radiative flux at TOA – NH–land clear-sky longwave flux at TOA - NH-land longwave flux at TOA shortwave flux at TOA incident shortwave flux NH-land NH-land at TOA - NH-land 0.6% 0.1% 0.6% 0.05% Δ (rlut + rsut) 2e-08% 0.4% ∆ rlut ∆ rsut -0.04% 1e-08% 0% -0.06% 0% -0.05% -0.08% 0% -1e-08% 0% 2001 2003 2001 2003 2001 2003 2001 2002 2003 2002 2003 Year Year Year Year Year dry deposition rate of BC – NH–land clear-sky shortwaveflux clear-sky net radiative implied cloud response wet deposition rate at TOA - NH-land flux at TOA - NH-land at TOA - NH-land of BC - NH-land 1.5% 1.5% rsutcs 0.5% 0.6% Δ (rlutcs + rsutcs) (rlut + rsut - rlutcs -0.4% ∆ rsutcs △ wetbc △ drybc 0.2% -0.4% 0.5% 0.5% 0% -0.6% -0.5% -0.2%-0.8% 0% 0% -0.4%2001 2003 2001 2003 2001 2003 2001 2003 2001 2003 Year Year Year Year Year total deposition rate of BC – NH–land dry deposition rate of SO4 – NH–land wet deposition rate of SO4 – NH–land dry deposition rate wet deposition rate of SO2 - NH-land of SO2 - NH-land 0.3% 40% 30% 0.2% ∆ (drybc + wetbc) 30% 30% ∆ wetso2 ∆ dryso4 ∆ wetso4 20% 0.1% 20% 20% 0% 10% 10% -0.1% -50% 0% 0% 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2004 Year Year total deposition rate of S – NH–land ambient aerosol optical convective cloud cover percentage – NH-land $\Delta (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3$ total cloud cover percentage - NH-land 2e+36% 0% 1.5e+36% ∆ od550aer 10% -0.1% -25% 1e+36% -0.2% 0% -0.3% 5e+35% -50% -10% -0.4% 0% 2002 2002 2003 2002 2003 2001 2003 2004 2001 2002 2003 2004 2001 2004 2001 2004 Year Year Year Year

OsloCTM3

UKESM

CFSM1

E3SM

GFOS

GISS

MIROC

NorESM2