NH-atlantic: absolute difference surface concentration of BC – high–so4 surface flux of BC – high–so4 surface flux of SO2 – high–so4 surface concentration of SO4 – high–so4 surface concentration of SO2 – high–so4 -2.5e+00 1e+00 0e+00 1e-05 1.0e+01 -1e+00 -3.0e+00 5e-06 -2e+00 ∆ mmrbc ∆ mmrso⁄ 7.5e+00 0e+00 -5e-06 -4e+00 -4.0e+00 5.0e+00 -1e-05 -5e+00 2002 2003 2002 2003 2003 2002 2003 2002 2003 2001 2001 2001 2002 2001 2001 Year Year Year Year Year upwelling longwave flux at TOA – high–so4 upwelling shortwave flux at TOA – high–so4 incident shortwave flux at TOA – high–so4 upwelling clear-sky longwav flux at TOA - high-so4 net radiative flux at TOA - high-so4 1e-02 4e-02 4e-01 5e-08 ∆ rlut + rsut ∆ rlutcs 0e+00 ∆ rsut 2e-01 0e+00 2e-01 0e+00 0e+00 0e+00 -4e-02 -2e-02 2002 2003 2003 2002 2003 2001 2002 2003 2001 2001 2002 2004 2001 2001 2002 2003 Year Year Year dry deposition rate of BC – high–so4 upwelling clear-sky shortwave clear-sky net radiative implied cloud response wet deposition rate flux at TOA - high-so4 flux at TOA - high-so4 at TOA - high-so4 of BC - high-so4 rlut + rsut - rlutcs - rsutcs 2.0e+00 ∆ rlutcs + rsutcs 1.5e+00 2e-01 2e-01 ∆ wetbc 1e-01 0e+00 0.0e+00 0e+00 2001 2002 2003 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2001 2003 Year Year Year Year Year wet deposition rate of SO4 – high–so4 total deposition rate of BC – high–so4 dry deposition rate of SO4 – high–so4 dry deposition rate wet deposition rate of SO2 - high-so4 of SO2 - high-so4 6e+00 -3.0e+00 2e+00 1.0e+01 ∆ wetso2 ∆ wetso4 ∆ dryso2 4e+00 ∆ dryso -3.5e+00-4e+00 2e+00 5.0e+00 2003 2002 2003 2001 2002 2003 2002 2003 2003 Year Year Year total deposition rate of S – high–so4 ambient aerosol optical total cloud cover convective cloud cover thickness at 550nm - high-s percentage - high-so4 percentage - high-so4 4e-01 0e+00 2e+00 2e-01 1e+00 2e-01 ∆ od550aeı 1e-01 -1e+00 -1e-01-2e+00 2002 2003 2004 2002 2003 2002 2003 Year Year Year Year

GISS

CESM2

MIROC

NorESM2

GFDI

OsloCTM3

CESM1

E3SM

UKESM

GEOS

∆ emibc

∆ rsutcs

drybc + wetbc

(dryso2 + wetso2)/2 + (dryso4 + wetso4)/3

0e+00