NH-atlantic: absolute difference surface flux of SO2 – high–so4 surface concentration of SO4 – high–so4 surface flux of BC – high–so4 surface concentration surface concentration of SO2 – high–so4 1.6e-20 0e+00 -6.0e-12 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ mmrso4 (kg kg – 1) emiso2 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ mmrbc (kg kg – 1) so2 (kg kg – 1) 1.6e-2 -5.6e-21 -1.5e-1 2002 2003 2002 2003 2002 2003 2002 2003 2002 2003 2001 2001 2001 2001 2001 Year Year Year Year Year upwelling longwave flux at TOA – high–so4 upwelling shortwave flux at TOA – high–so4 net radiative flux at TOA – high–so4 incident shortwave flux at TOA – high–so4 upwelling clear-sky longway flux at TOA - high-so4 1e-01 4e-02 $rsut (W m^{-2})$ rlutcs (W m-2) rlut (W m – 2) sut (W m-2) rsdt(Wm-2)2e-02 -2e-01 0e+00 0e+00rlut + 1 -3e-0 -2e-02 -1e-07 -4e-01 -1e-01 -4e-01 2002 2003 2003 2003 2002 2003 2003 2001 2001 2002 2001 2002 2001 2001 2002 Year Year Year Year clear-sky net radiative flux at TOA - high-so4 dry deposition rate of BC – high–so4 wet deposition rate of BC – high–so4 upwelling clear-sky shortwav implied cloud response flux at TOA - high-so4 at TOA - high-so4 1e-01 0.0e+00 0e+00 rlutcs - rsutcs (W ·lutcs + rsutcs (W m⁻²) 1.5e-15 1.8e-15 $drybc (kg m^{-2} s^{-1})$ wetbc $(kg m^{-2} s^{-1})$ rsutcs (W m-2) -1e-01 8.3e-16 rsut -3e-01 2003 2001 2002 2003 2001 2002 2003 2001 2002 2002 2003 2001 2002 2003 Year Year Year Year Year total deposition rate of BC – high–so4 dry deposition rate of SO2 – high–so4 wet deposition rate of SO2 – high–so4 dry deposition rate of SO4 – high–so4 wet deposition rate of SO4 – high–so4 3.7e-15 2.0e-13 $drybc + wetbc (kg m^{-2} s^{-1})$ 2.5e-15 wetso4 $(kg m^{-2} s^{-1})$ wetso2 $(kg m^{-2} s^{-1})$ $dryso2 (kg m^{-2} s^{-1})$ dryso4 $({\rm kg}~{\rm m}^{-2}~{\rm s}^{-1})$ 1.3e-15 2002 2003 2002 2003 2002 2003 2002 2003 2002 2003 Year Year Year total deposition rate of S – high–so4 ambient aerosol optical total cloud cover convective cloud cover (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3percentage - high-so4 5.0e-14 0e+00 1e-01 2.5e-14 expression(clt~(%) $(kg m^{-2} s^{-1})$ od550aeı 0e+00 -1e-01 0e+00 -2e-01 -5.0e-14 2001 2002 2003 2004 2002 2003 2002 2002 2003 Year Year Year Year **UKESM** CESM1 GISS MIROC **GFDI**

NorESM2

OsloCTM3

GEOS

E3SM