## Reference – absolute arctic averages surface flux of BC - arctic surface flux of SO2 - arctic surface concentration surface concentration of SO4 – arctic surface concentration of SO2 – arctic 2.0e-09 emibc (kg m-2 s-1) emiso2 (kg m-2 s-1 3.5e-12 kg-1mmrbc (kg kg-1) so2 (kg kg-1) mmrso4 (kg 3.0e-12 3e-10 2.5e-12 2002 2003 2001 2003 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2001 Year Year Year Year Year upwelling longwave flux at TOA – arctic upwelling shortwave flux at TOA – arctic upwelling clear-sky longwave flux at TOA – arctic net radiative flux at TOA - arct incident shortwave flux at TOA - arctic 105 300.0 191 rlut + rsut (W m-2) 100 297 5 rlutcs (W m-2) 212 rlut (W m-2) rsut (W m-2) .sdt (W m-2) 190 295.0 200 95 210 189 208 292.5 188 90 2001 2003 2001 2002 2003 2001 2003 2001 2003 2001 2002 2003 Year Year Year Year Year upwelling clear-sky shortwave clear-sky net radiative dry deposition rate wet deposition rate total deposition rate flux at TOA - arctic flux at TOA - arctic of BC - arctic of BC - arctic of BC - arctic 80 drybc + wetbc (kg m-2 s-1) rlutcs + rsutcs (W m-2) drybc (kg m-2 s-1) wetbc (kg m-2 s-1) 285 rsutcs (W m-2) 4e-14 282 70 279 65 2003 2003 2001 2002 2003 2001 2003 2001 2001 2002 2001 2002 2003 Year Year Year Year Year wetso4)/3 (kg m-2 s-1) dry deposition rate wet deposition rate dry deposition rate wet deposition rate total deposition rate of SO2 - arctic of SO2 - arctic of SO4 - arctic of SO4 - arctic of S - arctic 5.0e-12 dryso2 (kg m-2 s-1) wetso2 (kg m-2 s-1) dryso4 (kg m-2 s-1) (kg m-2)(dryso2 + wetso2)/2 + (dryso4 + 1 9 0e-13 wetso4 3.5e-12 2.5e-12 6.0e-3 0e-12 3 0e-13 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2004 Year Year Year Year Year ambient aerosol optical total cloud cover convective cloud cover thickness at 550nm - arctic percentage - arctic percentage - arctic 2.0 80 1.5 0.06 od550aer cltc (%) clt (%) 1.0 0.04 0.5 0.02 0.0 2001 2003 2002 2003 2004 2002 2003 2004 2002 2004 2001 2001 Year Year Year

OsloCTM3

CESM1

E3SM

**GFDI** 

**GISS** 

MIROC

NorESM2