## 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 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 1.0e-09 3e-10 2.5e 5.0e-10 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 incident shortwave flux at TOA – arctic upwelling clear-sky longwave flux at TOA – arctic net radiative flux at TOA - arctic 305 191 216 rlut + rsut (W m-2) rlutes (W m-2) rlut (W m-2) rsut (W m-2) .sdt (W m-2) 190 200 189 210 295 188 208 90 2001 2003 2001 2002 2003 2001 2003 2001 2003 2001 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 1.75e-13 drybc + wetbc (kg m-2 s-1) 80 drybc (kg m-2 s-1) rsutcs (W m-2) rlutcs + rsutcs (W 75 290 (kg 285 70 280 5.00e-14 8 0e-14 2003 2003 2003 2001 2002 2003 2001 2001 2001 2002 2001 2002 2003 Year Year Year Year Year + wetso4)/3 (kg m-2 s-1) wet deposition rate of SO4 – arctic dry deposition rate wet deposition rate dry deposition rate total deposition rate of SO2 - arctic of SO2 - arctic of SO4 - arctic of S - arctic 1.50e-12 3.5e-12 dryso2 (kg m-2 s-1) 1.25e-12 wetso2 (kg m-2 s-1) dryso4 (kg m-2 s-1) wetso4 (kg m-2 s-1) 3.0e-12 1 00e-12 (dryso2 + wetso2)/2 + (dryso4 7 50e-13 2.0e-12 5.00e 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 Year Year ambient aerosol optical convective cloud cover total cloud cover thickness at 550nm - arctic percentage - arctic percentage - arctic 0.10 90 0.08 80 cltc (%) clt (%) 10 0.06 70 0.04 2003 2002 2003 2004 2002 2003 2004 2002 2004 2001 2001 2001 Year Year Year

CFSM1

CESM2

F3SM

**GEOS** 

**GFDI** 

**GISS** 

MIROC

NorESM2

OsloCTM3

**UKESM**