bc-no-season: absolute difference surface flux of SO2 – arctic surface flux of BC – 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) mmrso4 (kg kg-1) mmrbc (kg kg-1) so2 (kg kg-1) 0e+00 0e+00 0.0e+00 -5.0e-12 2001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2002 2003 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 0.2 1.5e-07 0.04 rlut + rsut (W m-2) 0.1 0.05 0.1 rlutcs (W m-2) rsut (W m-2) rlut (W m-2) rsdt (W m-2) 1.0e-07 0.0 0.0 0.00 0.00 -0.1 -0.1 -0.04 -0.05 -0.2 -0.2 0.0e+00 2001 2003 2001 2003 2001 2003 2001 2002 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 1.7e-15 0.0e + 00(kg m-2 s-1)0.0e+00 rlutcs + rsutcs (W m-2) 0.0 drybc (kg m-2 s-1) 6.2e-16 rsutcs (W m-2) -5 0e-15 -5.0e-15 (kg m-2 -0.1-0.1 drybc + wetbc -1.0e-14 wetbc (-0.2 -0.2-0.3 2001 2002 2003 2001 2003 2001 2002 2003 2001 2003 2001 2002 2003 Year Year Year Year Year (dryso2 + wetso2)/2 + (dryso4 + 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 1.1e-14 8.3e-15 5.2e-15 4.5e-15 dryso2 (kg m-2 s-1) wetso2 (kg m-2 s-1) dryso4 (kg m-2 s-1) wetso4 (kg m-2 s-1) 7.5e-15 2.8e-15 3.0e-15 3.9e-15 3.1e-16 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 Year ambient aerosol optical convective cloud cover total cloud cover percentage - arctic percentage - arctic 0.3 0.0075 0.2 0.06 0.0050 0.1 clt (%) 0.04 0.0025 0.0 0.02 -0.1 0.0000 -0.2 2003 2002 2003 2002 2003 2001 2002 2004 2001 2004 2001

Year

MIROC

NorESM2

OsloCTM3

od550aer

Year

Year

CFSM1

E3SM

GFDI

GISS