so2-no-season: absolute difference surface flux of SO2 – arctic surface concentration of SO4 – arctic surface concentration of SO2 – arctic surface flux of BC – arctic surface concentration 0e+00 mmrbc (kg kg-1) mmrso4 (kg kg-1) so2 (kg kg-1) emiso2 (kg m-2 -2.0e-10 -3.3e 2001 2002 2003 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 Year Year Year Year Year upwelling longwave flux at TOA – arctic upwelling shortwave flux at TOA – arctic net radiative flux at TOA – arctic incident shortwave flux at TOA – arctic upwelling clear-sky longwave flux at TOA – arctic 0.000 0.3 rlut + rsut (W m-2) -0.025 0.3 rlutes (W m-2) -0.025 sdt (W m-2) 0.2 0e+00 rsut (W m--0.050 0.2 -0.050 0.1 -0.075 0.1 -0.075 -5e-08 -0.100 0.0 -0.100 0.0 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 4.0e-16 9.6e-16 1.2e-15 drybc + wetbc (kg m-2 s-1) rlutcs + rsutcs (W m-2) drybc (kg m-2 s-1) wetbc (kg m-2 s-1) 7.8e-16 0.05 8.6e-1 3.2e-16 0.00 -3 0e-16 2001 2003 2001 2002 2003 2001 2002 2003 2001 2003 2001 2003 Year Year Year Year Year (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3 (kg m-2 s-1) wet deposition rate of SO2 – arctic total deposition rate of S – arctic dry deposition rate dry deposition rate wet deposition rate of SO2 - arctic of SO4 - arctic of SO4 - arctic 2.0e-13 0.0e + 00wetso2 (kg m-2 s-1) dryso4 (kg m-2 s-1) wetso4 (kg m-2 s-1 0e+00 -5.0e-14 -5e-14 0.0e+00 -1.5e-13 -9e-14 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 Year Year Year ambient aerosol optical total cloud cover convective cloud cover percentage - arctic percentage - arctic 0.00 0.01 -0.01 0.0 cltc (%) clt (%) -0.02 -0.1 -0.03-0.2 -0.01

emibc (kg m-2 s-1)

rlut (W m-2)

0.20

0.15

0.10

0.05

0.00

rsutcs (W m-2)

dryso2 (kg m-2 s-1)

od550aer

-0.04

2001

2002

2003

Year

2004

