## shp-ind-shift: absolute difference surface flux surface flux surface concentration surface concentration surface concentration of BC - arctic of SO2 - arctic of BC - arctic of SO4 - arctic of SO2 - arctic 3.2e-20 9.0e-16 2e-12 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ əmiso2 (kg m $^{-2}$ s $^{-1}$ mmrbc (kg kg – 1) 2.1e-20 6.5e-16 so2 (kg kg-1) 0e+00 \$ <u>ka</u> 1.0e-20 4.0e-16 -2e-12 -5.5e 1.4e-16 -4e-12 \_2 5e\_12 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year upwelling longwave flux at TOA – arctic upwelling shortwave flux at TOA – arctic upwelling clear-sky longwa flux at TOA - arctic net radiative flux incident shortwave flux at TOA – arctic at TOA – arctic 2e-01 5.0e-02 1e-01 $rsut (W m^{-2})$ rlut (Wm-2)sut (Wm-2)rsdt (Wm-2)rlutcs (W m -2.5e-02 0e+00 2.5e-02 0.0e+00 0.0e+00 -1e-01 -1e-01 0.0e+00 -2.5e-02 -2.5e-02-2.5e-02 -5.0e-02 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year upwelling clear-sky shortway clear-sky net radiative implied cloud response dry deposition rate wet deposition rate flux at TOA - arctic flux at TOA - arctic rlutcs - rsutcs (W m<sup>-2</sup>) at TOA - arctic of BC - arctic of BC - arctic 7.5e-02 2.7e-16 2.4e-16 5e-02 rlutcs + rsutcs (W m<sup>-2</sup>) 1e-01 rsutcs (W m-2) 5 0e-02 vetbc (kg m<sup>-2</sup> s<sup>-</sup> drybc (kg m<sup>-2</sup> s<sup>-</sup> 0e+00 0e+00 2.5e-02 5.6e-17 0.0e + 00-5e-02 -2.5e-02 rlut + rsut -1e-01 -1.6e-1 -5.0e-16 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year dry deposition rate of SO2 – arctic wet deposition rate of SO2 – arctic total deposition rate of BC – arctic dry deposition rate of SO4 – arctic wet deposition rate of SO4 – arctic $drybc + wetbc (kg \ m^{-2} \ s^{-1})$ wetso4 $(kg m^{-2} s^{-1})$ wetso2 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ 7.3edryso2 (kg m<sup>-2</sup> s<sup>-</sup> dryso4 (kg $m^{-2}$ s<sup>-</sup> -1.7e-16 -3.1e-18 -4.0e-16 -6.6e-15 -3.8e-18 -2.1e-15 -6 4e-16 -2 9e-15 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year dryso2 + wetso2)/2 + (dryso4 + wetso4)/3total deposition rate Dimethyl sulphide (DMS) mole fractic cloud cover Ice water path - arctic ambient aerosol optical thickness at 550nm 1e-01 1e-04 expression cltc (%) dms (mol mol<sup>-1</sup> clivi (kg $m^{-2}$ ) 2e-13 $(kg m^{-2} s^{-1})$ 0e+00 -1e-04 -2e-04 -3e-04 0e+00 0e+00 2000 2001 2002 2003 2004 20002001200220032004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year load load of so2 - arctic of bc - arctic 5.0e-11 3e-08 $\log \log (\log \, m^{-2})$ 2e-08 oadbc (kg m<sup>-2</sup>) 1e-08 0.0e + 000e+00 -1e-08 -5.0e-11 -2e-08 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year