## shp-atl-shift: absolute difference surface concentration of BC – arctic surface flux surface flux surface concentration surface concentration of BC - arctic of SO2 - arctic of SO4 - arctic of SO2 - arctic $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ mmrbc (kg kg-1) emiso2 (kg m $^{-2}$ s $^{-1}$ 2.9e-20 (kg kg - 1)mmrso4 (kg kg 2e-12 0e+00 -1.5e-20 3.6e-16 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 2001 Year Year Year Year Year upwelling longwave flux at TOA – arctic upwelling shortwave flux at TOA – arctic net radiative flux at TOA – arctic upwelling clear-sky longwav flux at TOA - arctic incident shortwave flux at TOA – arctic 5.0e-02 1e-01 1e-01 4e-02 -lut + rsut $(W m^{-2})$ rlutes (W m-2) rlut (Wm-2)rsut (Wm-2)(Wm-2)2e-02 0.0e + 0.00e+00 1e-02 rsdt 0e+00 0e+00 -5e-02 -2 5e-02 0e+00 -2e-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 at TOA - arctic of BC - arctic of BC - arctic rlutcs - rsutcs (W m<sup>-2</sup>) 9.6e-17 1e-01 5e-02 rlutes + rsutes (W m<sup>-2</sup>) rsutcs (W m-2) 1e-01 drybc (kg $m^{-2}$ s<sup>-1</sup> 3.5e-16 wetbc (kg m<sup>-2</sup> s<sup>-</sup> 5e-02 5e-02 0e+00 -5e-02 rsut – 6.1e-17 -5e-02 rt H \_2 2e\_16 -8.3e-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 total deposition rate of BC – arctic dry deposition rate of SO2 – arctic wet deposition rate of SO2 – arctic dry deposition rate of SO4 – arctic wet deposition rate of SO4 – arctic 5.4e-16 9.5e-15 4.5e-18 7.0e-15 $drybc + wetbc (kg \, m^{-2} \, s^{-1})$ 5.5e-14 wetso2 (kg $m^{-2}$ s<sup>-1</sup> dryso4 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ dryso2 (kg m $^{-2}$ s $^{-1}$ 3.8e-16 wetso4 (kg m<sup>-2</sup> 2.2e-16 7.5e-15 3.5e-18 3.2e-15 3.5e 6.5e 2.9e 2.5e -6.7e-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 dryso2 + wetso2)/2 + (dryso4 + wetso4)/3Dimethyl sulphide (DMS) mole fractic total deposition rate cloud cover Ice water path - arctic ambient aerosol optical thickness at 550nm - arctic 1.2e-14 1e-01 2e-04 % clivi (kg m<sup>-2</sup>) \_lom lom) smb $(kg m^{-2} s^{-1})$ expression cltc 2e-13 0e+00 0e+000e+00 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 20002001200220032004 2000 2001 2000 2001 2000 2001 Year Year Year Year Year load load of so2 - arctic of bc - arctic 5.0e-11 2.0e-08 $loadso4 (kg m^{-2})$ 1.5e-08 2.5e-11 oadbc (kg ${\sf m}^{-2}$ ) 0.0e+00 5.0e-09 -2.5e-11 0.0e+00 -5.0e-11 -5.0e-09 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year