## shp-atl-shift-1950: 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 1.5e-12 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ emiso2 (kg m $^{-2}$ s $^{-1}$ nmrbc (kg kg-1) 9.8e-21 1.8e-16 so2 (kg kg – 1) mmrso4 (kg kg 5.5e-21 1.2e-16 0.0e+00 1.2e-21 -5.0e-13 4.8e-17 0.0e+00 -2 0e-1 2000 2001 2002 2003 2004 2002 2003 2004 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 longway flux at TOA - arctic incident shortwave flux at TOA – arctic 5.0e-02 4e-02 2e-01 $rsut(W m^{-2})$ rlut (Wm-2)2e-02 rsut (Wm-2)rsdt (Wm-2)rlutcs (W m -1e-01 0.0e + 0.00e+00 0e+00 0e+00 00+00 -2 5e-02 -2e-02 -1e-01 -1e-01 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 implied cloud response dry deposition rate wet deposition rate clear-sky net radiative flux at TOA - arctic flux at TOA - arctic at TOA - arctic of BC - arctic of BC - arctic rsutcs (W m<sup>-2</sup>) 3.6e-17 2e-0 2e-02 5.0e-02 lutcs + rsutcs (W $m^{-2}$ ) rsutcs (W m-2) 9.0e-19 3.1e-16 drybc (kg $m^{-2} s^{-1}$ wetbc (kg m<sup>-2</sup> s<sup>-</sup> 1e-02 1e-01 2.5e-02 rlutcs -0.0e+00 0e+00 0e+00 rsut – -6.8e-17 -1e-02 1e-01 -5.0e-02 \_1 0e\_16 -3.0e-1 Ė 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 5.2e-16 5.2e-15 2.8e-18 4.2e-15 $\mathrm{drybc} + \mathrm{wetbc} \, (\mathrm{kg} \, \mathrm{m}^{-2} \, \mathrm{s}^{-1})$ wetso2 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ wetso4 $(kg m^{-2} s^{-1}$ dryso2 (kg m $^{-2}$ s $^{-1}$ dryso4 (kg m<sup>-2</sup> s<sup>-1</sup> 3.0e-16 8.4e-17 4.3e-15 1.2e-18 1.4e-15 0e+002000 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 dryso2 + wetso2)/2 + (dryso4 + wetso4)/3Dimethyl sulphide (DMS) mole fraction total deposition rate cloud cover Ice water path - arctic ambient aerosol optical thickness at 550nm 1e-01 % clivi (kg $m^{-2}$ ) \_lom lom) smb $(kg m^{-2} s^{-1})$ expression cltc 1.5e-04 0e+00 1.0e-04 -5e-05 -6e-13 -1e-0420002001200220032004 2002 2003 2004 2002 2003 2004 2002 2003 2004 2000 2001 2000 2001 2002 2003 2004 2000 2001 2000 2001 Year Year Year Year Year load load of so2 - arctic of bc - arctic 5e-12 loadso4 (kg m<sup>-2</sup>) 1e-08 0e+00 loadbc (kg m<sup>-2</sup>) -5e-12 -1e-11 0e+00 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year