## arctic: absolute difference surface flux surface flux surface concentration surface concentration surface concentration of SO2 - shp-20p-red-19 of BC - shp-20p-red-19 of SO4 - shp-20p-red-195 of BC - shp-20p-red-195 of SO2 - shp-20p-red-195 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ nmrbc (kg kg – 1) emiso2 (kg m<sup>-2</sup> s<sup>-</sup> so2 (kg kg – 1) 0e+00mmrso4 (kg kg -1e-12 0e+00 -2e-12 -4.5e-21 -7.3e-2° 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year Year upwelling longwave flux at TOA – shp-20p-red-195 upwelling shortwave flux at TOA – shp–20p–red–195 upwelling clear-sky longwa flux at TOA - shp-20p-redincident shortwave flux at TOA – shp–20p–red–19 net radiative flux at TOA - shp-20p-red-19 5.0e-02 8e-02 0.0e + $m^{-2}$ 2.5e-02 5 rlut (Wm-2)sut (Wm-2)(Wm-2)4e-02 rlutcs (W m rsut (W 0.0e + 0.0-1 0e-01 -2.5e-02 rsdt 0e+00 -1.5e-01 -2 5e-02 -5.0e-02 -2.0e-01 -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 implied cloud response dry deposition rate wet deposition rate upwelling clear-sky shortway clear-sky net radiative flux at TOA - shp-20p-red-1 flux at TOA - shp-20p-red-1 at TOA - shp-20p-red-195 of BC - shp-20p-red-19 of BC - shp-20p-red-19 rsutcs (W $m^{-2}$ ) 1.2e-16 3.6elutcs + rsutcs (W m<sup>-2</sup>) 2e-02 0e+00 2e-02 rsutcs (Wm-2) 8.0e-17 2.2e-16 drybc (kg $m^{-2} s^{-1}$ vetbc (kg m<sup>-2</sup> s<sup>-</sup> 0e+00 0e+00 -1e-01 3.7erlutcs. -2e-02 -2e-024e-02 -2e-01 -5.7e-18 rsut \_4 9e\_1 \_2 1e\_1 ₽ 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 dry deposition rate of SO4 – shp–20p–red–19 wet deposition rate of SO4 – shp-20p-red-19 total deposition rate of BC – shp-20p-red-19! dry deposition rate of SO2 – shp–20p–red–19 wet deposition rate of SO2 – shp–20p–red–19 1.2e-15 $\mathrm{drybc} + \mathrm{wetbc} \, (\mathrm{kg} \, \mathrm{m}^{-2} \, \mathrm{s}^{-1})$ dryso2 (kg m $^{-2}$ s $^{-1}$ wetso2 (kg m<sup>-2</sup> s<sup>-</sup> wetso4 (kg m<sup>-2</sup> s<sup>-</sup> 2.8e-16 dryso4 (kg m<sup>-2</sup> s<sup>-</sup> 1.0e-16 -2.9e-18 -2.4e-15 -6.1e-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 dryso2 + wetso2)/2 + (dryso4 + wetso4)/3Ice water path - shp-20p-Dantethyl sulphide (DMS) mole fraction - sh total deposition rate cloud cover ambient aerosol optical of S - shp-20p-red-1! percentage - shp-20p-red-19 thickness at 550nm - shp-20p-re 1e-01 0e+00 % -9.3e-15 clivi (kg $m^{-2}$ ) \_lom lom) smb $(kg m^{-2} s^{-1})$ expression cltc 1e-04 od550aer 0e+00 -2e-13 0e+00 -1e-04 -1.0e-14 -1e-04 20002001200220032004 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 2001 Year Year Year Year Year load load of so4 - shp-20p-red-19 of bc - shp-20p-red-1950 2.0e-11 5.0e-09 $loadso4 (kg m^{-2})$ oadbc (kg m<sup>-2</sup>) 0.0e+00 1.0e-11 -5.0e-09 5.0e-12 -1.0e-08 0.0e+00 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004

Year