arctic: absolute difference surface flux of SO2 – shp–atl–shift surface flux of BC – shp–atl–shift surface concentration surface concentration surface concentration of SO4 - shp-atl-shift of BC - shp-atl-shift of SO2 - shp-atl-shift $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ emiso2 (kg m $^{-2}$ s $^{-1}$ nmrbc (kg kg-1) 2.9e-20 so2 (kg kg – 1) mmrso4 (kg kg 2e-12 0e+00 -1.5e-20 3.6e-16 -3 7e-20 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2000 2001 Year Year Year Year Year upwelling longwave flux at TOA – shp-atl-shift upwelling shortwave flux at TOA – shp-atl-shift net radiative flux at TOA – shp-atl-shift upwelling clear-sky longway flux at TOA - shp-atl-shif incident shortwave flux at TOA – shp-atl-shift 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 + 0.000+00 1e-02 rsdt 0e+00 0e+00 -5e-02 -2 5e-02 0e+00 -2e-02 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 clear-sky net radiative implied cloud response dry deposition rate wet deposition rate flux at TOA - shp-atl-shif flux at TOA - shp-atl-shift at TOA - shp-atl-shift of BC - shp-atl-shift of BC - shp-atl-shift rlutcs - rsutcs (W m^{-2}) 5e-02 ·lutcs + rsutcs (W m⁻²) rsutcs (W m-2) 1e-01 drybc (kg m^{-2} s⁻¹ 3.5e-16 vetbc (kg m⁻² s⁻ 5e-02 5e-02 0e+00 -5e-02 rsut – 6.1e-17 0e+00 -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 dry deposition rate of SO4 – shp–atl–shift total deposition rate of BC - shp-atl-shift dry deposition rate of SO2 – shp-atl-shift wet deposition rate of SO2 – shp-atl-shift wet deposition rate of SO4 – shp-atl-shift 5.4e-16 9.5e-15 4.5e-18 7.0e-15 $\mathrm{drybc} + \mathrm{wetbc} \, (\mathrm{kg} \, \mathrm{m}^{-2} \, \mathrm{s}^{-1})$ 5.5e-14 wetso2 $(kg m^{-2} s^{-1})$ dryso2 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ dryso4 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ 3.8e-16 4.5e-14 wetso4 (kg m⁻² 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)/3Ice water path - shp-atl-spimethyl sulphide (DMS) mole fraction total deposition rate cloud cover ambient aerosol optical of S - shp-atl-shift percentage - shp-atl-shift thickness at 550nm - shp-atl-1e-01 2e-04 % clivi (kg m⁻²) _lom lom) smp $(kg m^{-2} s^{-1})$ expression cltc 1e-04 2e-13 0e+00 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 so4 shp-atl-shift of bc - shp-atl-shift 5.0e-11 2.0e-08 loadso4 (kg m⁻²)1.5e-08 2.5e-11 oadbc (kg ${\sf m}^{-2}$) 1.0e-08 0.0e+00 5.0e-09 -2.5e-11 0.0e+00 -5.0e-11 -5.0e-09

2000 2001 2002 2003 2004

Year

2000 2001 2002 2003 2004

Year