NH-sea: percent difference surface flux surface flux surface concentration surface concentration surface concentration of BC - no-so4 of SO2 - no-so4 of BC - no-so4 of SO4 - no-so4 of SO2 - no-so4 1e-05 3e+00 mmrso4 ∆ mmrbc 5e-06 2.0e+00 0e+00 -5e-01 -5e-06 -4e+00 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year upwelling longwave flux at TOA – no–so4 upwelling shortwave flux at TOA – no-so4 upwelling clear–sky longwave flux at TOA – no–so4 net radiative flux incident shortwave flux at TOA - no-so4 at TOA - no-so4 1e-01 5.0e-08 5.0e-01 5.0e-01 rsut 2.5e-08 2e-02 ∆ rlut ∆ rlut + ı 0.0e + 000e+00 0.0e+00 0.0e+00 _2 5e_08 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 shortwave flux at TOA – no–so4 clear-sky net radiative flux at TOA - no-so4 dry deposition rate of BC – no–so4 implied cloud response wet deposition rate at TOA - no-so4 of BC - no-so4 rsutcs) 1e-01 6e-01 6e-01 rlutcs -1e+00 s de-01 √ 2e-01 4e-01 0e+00 rsut – -1e-01 2e-01 -3e-01 0e+00 0e+00 _6e_01 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 Year dry deposition rate of SO4 – no–so4 wet deposition rate of SO4 – no-so4 total deposition rate of BC – no–so4 dry deposition rate wet deposition rate of SO2 - no-so4 of SO2 - no-so4 ∆ drybc + wetbc -1e+00 -5.0e-01 1e+00 ∆ wetso4 1.8e + 000e+001.0e+00 -1.5e+00-1e+00 5.0e-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 $\frac{1}{3} dryso2 + wetso2)/2 + \frac{1}{3} dryso4 + wetso4)/3$ total deposition rate ambient aerosol optical total cloud cover - no-so4 convective cloud cover - no-s of S - no-so4 thickness at 550nm - no-so 2e-01 1e-01 2e+00 1e-01 -2e+01 0e+00 0e+00 -4e-01-4e+01 -1e+00 _2e_01 -6e+01 _8e_01 -2e+00 -1e-01 -3e-01 -3e+00 _8e+01 20002001200220032004 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 ice water path - no-so4 surface concentration column mass burden column mass burden column mass burden of DMS - no-so4 of BC - no-so4 of SO2 - no-so4 of SO4 - no-so4 5e-01 1.0e+01 0.0e + 005.0e-01 0e+00 oadso2 5.0e+00 4e+00 -5.0e-0 2.5e+00 -5e-01 -1.0e+00

2000 2001 2002 2003 2004

Year

