shp-ind-shift-1950: absolute difference surface flux of BC – arctic surface flux surface concentration surface concentration of SO4 – arctic surface concentration of SO2 – arctic 9.5e-20 5.0e-13 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ mmrbc (kg kg - 1) emiso2 (kg m⁻² s^{-′} 0.0e + 0.006.3e-20 -6 4e-16 so2 (kg kg – 1) 0e+00 (kg kg-0e+00 3.1e-20 -1.4e-15 -9.0e-23 -2.2e-15 2000 2001 2002 2003 2004 2000 2001 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 – arctic upwelling shortwave flux at TOA – arctic net radiative flux at TOA – arctic incident shortwave flux at TOA – arctic upwelling clear-sky longwa flux at TOA - arctic 2.5e-02 ·lut + rsut (W m rlut (Wm-2)rsut (Wm-2)rsdt (Wm-2)1e-02 lutcs (W m-0e+00 0.0e+00 0e+00 0e+00 4e-02 -1e-02 -1e-01 -5.0e-02 -8e-02 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year upwelling clear–sky shortwa flux at TOA – arctic clear-sky net radiative flux at TOA – arctic implied cloud response dry deposition rate of BC – arctic wet deposition rate of BC – arctic rlutcs – rsutcs (W m^{-2}) at TOA – arctic 3 8e-16 lutcs + rsutcs (W m^{-2} 1e-01 vetbc (kg $m^{-2} s^{-1}$) rsutcs (W m-2) 4e-02 drybc (kg m⁻² s⁻¹ 2.0e-16 5.0e-02 5e-02 0.0e+00 0e+00 -5e-02 -4e-02 rsut – _1 0e_01 -1e-01 -1.5e-0 rlut + 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 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 4 0e-16 2 8e-15 1 2e-15 4 5e-15 $drybc + wetbc (kg \ m^{-2} \ s^{-1})$ $dryso2 (kg m^{-2} s^{-1})$ wetso2 (kg m⁻² s^{-′}· dryso4 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ 2.0e-16 vetso4 (kg m⁻² 2.5e-18 -2.0e-16 -3.2e-15 -3.5e-15 -4e-05 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 dryso2 + wetso2)/2 + (dryso4 + wetso4)/3total deposition rate of S – arctic cloud cover Ice water path - arctic Dimethyl sulphide (DMS) mole fraction ambient aerosol optical percentage - arctic thickness at 550nm - arct 1e-04 0.0e+00 5e-05 dms (mol mol⁻¹ clivi (kg m^{-2}) 4e - 01 $(kg m^{-2} s^{-1})$ ctc 0e+00 0e+00 2e-01 -1.5e-05 -4e-13 _1 5e_04 0e+00 -2.0e-05 200@001200220032004 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 load load load of so2 of so4 - arctic of bc - arctic arctic 0.0e+00 loadso4 (kg m⁻²) oadso $2 (kg m^{-2})$ loadbc (kg m⁻²) -2.5e-092.5e-10 -1.0e-080.0e + 0.0-1.5e-08 -7.5e-09 -1.0e-08 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year CAM-ATRAS

F3SM

GEOS

CESM1

GISS modelE

NorESM2