bc-no-season: absolute difference surface flux of SO2 – arctic surface flux of BC surface concentration surface concentration of SO4 – arctic surface concentration of SO2 – arctic arctic 0e+00 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ emiso2 (kg $m^{-2} s^{-1}$) mmrso4 (kg kg⁻¹) mmrbc (kg kg⁻¹) 2e-12 so2 (kg kg⁻¹ 4e-12 0e+00 0e+00 -2e-12 -5.2e-16 2003 2001 2002 2003 2001 2002 2003 2001 2002 2001 2002 2003 2001 2002 2003 Year Year Year Year Year net radiative flux at TOA – arctic incident shortwave flux at TOA – arctic clear-sky longwave flux at TOA - arctic longwave flux at TOA shortwave flux at TOA arctic arctic 0.05 1.5e-07 0.00 rlut + rsut $(W m^{-2})$ rlutcs (W m⁻²) rlut $(W m^{-2})$ $rsut(Wm^{-2})$ $rsdt (W m^{-2})$ 1.0e-07 -0.05 0.5 -0.1 -0.10 -0.15 0.0 0.0 -0.2 0.0e+00 2001 2003 2001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2003 Year Year Year Year Year clear-sky shortwave clear-sky net radiative implied cloud response dry deposition rate wet deposition rate flux at TOA - arctic flux at TOA - arctic at TOA - arctic of BC - arctic of BC - arctic 8.1e-15 rlut + rsut – rlutcs – rsutcs (W m $^{-2}$) 0.1 0.0e + 0.0rlutcs + rsutcs (W m⁻²) 5.4e-15 $drybc (kg m^{-2} s^{-1})$ wetbc (kg m⁻² s⁻¹) $\rm rsutcs \, (W \, m^{-2})$ 0.0 2.6e-15 0.5 0.0 0.0 -2 9e-1 2003 2001 2002 2003 2001 2002 2003 2001 2003 2001 2002 2001 2003 Year Year Year Year Year dry deposition rate of SO4 – arctic wet deposition rate of SO4 – arctic total deposition rate dry deposition rate wet deposition rate of BC - arctic of SO2 - arctic of SO2 - arctic 1.5e-13 $drybc + wetbc (kg m^{-2} s^{-1})$ 1.0e $dryso2 (kg m^{-2} s^{-1})$ 3.7e-15 wetso2 $(kg m^{-2} s^{-1})$ $dryso4 (kg m^{-2} s^{-1})$ wetso4 (kg m⁻² s⁻¹) 0e+00 -5.0e-5.0e-14 -1.0e-14 0e+00 -2.0e-1 -8.6e 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2001 2002 2003 2001 2002 2003 ambient aerosol optical total deposition rate convective cloud cover total cloud cover (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3percentage - arctic percentage - arctic 0.025 0.00 5.0e-14 0.000 -0.01 $(kg m^{-2} s^{-1})$ 2.5e-14 8 clt (%) 0.0 -0.02 -0.0500.0e+00 -0.03-0.2 -0.04 2001 2002 2003 2004 2003 2003 2004 2002 2001 2002 2004 2001 2002 2001 2003 2004 Year Year Year Year

CFSM1

CESM2

F3SM

GEOS

GFDI

GISS

MIROC

NorESM2

OsloCTM3

UKESM