so2-at-height: absolute difference surface flux of BC – arctic surface concentration surface flux surface concentration surface concentration of SO2 - arctic of BC - arctic of SO4 - arctic of SO2 - arctic 4.2e-19 0e+00 Δ emibc (kg m⁻² s⁻¹) ∆ mmrso4 (kg kg − 1) emiso2 (kg m⁻² s⁻¹ ∆ mmrbc (kg kg − 1) (kg kg - 1)0e+00 1.6e-19 -2e-13 ∆ so2 (3.2e-20 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 upwelling longwave flux at TOA – arctic upwelling shortwave flux at TOA – arctic upwelling clear-sky longwa flux at TOA - arctic net radiative flux incident shortwave flux at TOA - arctic at TOA - arctic 0e+00 Δ rlut + rsut (W m⁻²) 1.0e-01 Δ rlutcs (W m – 2) Δ rlut (W m – 2) 5.0e-02 ∆ rsut (W m – E rsdt (W -4e-01 -5.0e-02 -6e-01 -1.0e-01 _8e_01 -8e-0 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 upwelling clear-sky shortway flux at TOA - arctic clear-sky net radiative flux at TOA - arctic $\rm rsutcs \ (W\ m^{-2})$ implied cloud response dry deposition rate wet deposition rate at TOA - arctic of BC - arctic of BC - arctic 6.6e-16 2e-01 1.0e-15 Ē wetbc (kg m^{-2} s⁻¹) Δ rsutcs (W m – 2) drybc (kg $m^{-2} s^{-1}$ rsutcs (W 0e+00 rlutcs --2e-0 -2e-01 -4e-0 4e-0 rsut rlut + 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 dry deposition rate of SO4 – arctic total deposition rate of BC – arctic dry deposition rate wet deposition rate of SO4 – arctic wet deposition rate of SO2 - arctic of SO2 - arctic Δ drybc + wetbc (kg m⁻² s⁻¹ dryso2 (kg m⁻² s⁻¹ Δ wetso4 (kg m⁻² s⁻ Δ wetso2 (kg m $^{-2}$ s $^{-}$ Δ dryso4 (kg m⁻² s⁻ 0e+00 3.1e-16 -8.0e-16 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year dryso2 + wetso2)/2 + (dryso4 + wetso4)/3Year Year total deposition rate ambient aerosol optical total cloud cover - arctic convective cloud cover - arct surface cloud cover - arctic of S - arctic thickness at 550nm - arctic 2e-02 ∆ cltc (percent) ∆ clt (percent) ∆ cl (percent) $(kg m^{-2} s^{-1})$ ∆ od550aer -2e-02 0e+00 -2e-0'0e+00 -4e-02 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 - arctic surface concentration column mass burden column mass burden column mass burden of DMS - arctic of SO2 - arctic of SO4 - arctic of BC - arctic 2.0e-06 Δ clivi (kg m $^{-2}$) Δ loadso2 (kg m $^{-2}$) Δ loadso4 (kg m $^{-2}$) Δ dms (kg kg – 1) Δ loadbc (kg m $^{-2}$) 0e+00 0e+00 -5e-05 1.0e-06 5.0e-07 5.0e-07 -1e-040e+00 -4e-09 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 CAM5 E3SM **GISS** OsloCTM3

CESM1

CESM2

GEOS

GFDL

MIROC

NorESM2

UKESM