## so2-no-season: percent difference surface flux surface flux surface concentration surface concentration surface concentration of BC - arctic of SO2 - arctic of BC - arctic of SO4 - arctic of SO2 - arctic 5e-01 00+00 5e+00 1e+00 4e+00 ∆ emibc 0e+00 0e+00 -4e-02-5e+00 -5e-01 -1e+01 -1e+00 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 2e-02 5.0e-02 4e-01 0e+00 2e-01 2e -2 5e-02 -4e-02 \_1e\_07 -5.0e-02 2002 2003 2004 2001 2002 2003 2004 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 2001 Year Year Year Year upwelling clear-sky shortwave flux at TOA – arctic clear-sky net radiative flux at TOA - arctic implied cloud response dry deposition rate wet deposition rate at TOA - arctic of BC - arctic of BC - arctic rsutcs) 3e+00 4e-01 rlutcs rsutce 2e-01 2e-01 $\Delta$ rsutcs 2e+00∆ drybc ∆ rlutcs + 26-01 0e+00 rsut – -4e-01 0e+00 r L L -8e-01 0e+00 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 dry deposition rate of SO2 – arctic wet deposition rate of SO4 – arctic total deposition rate wet deposition rate dry deposition rate of BC - arctic of SO2 - arctic of SO4 - arctic ∆ drybc + wetbc -2.5e+00 6e+00 2e+00 ∆ wetso4 0.0e+00 0e+00 1e+00 -2 5e+00 -5e+00 2e+00 -7.5e+000e+00 -1e+01 0e+00 -1.0e+0.12000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 Year Year Year Year $\frac{1}{3} dryso2 + wetso2)/2 + \frac{1}{3} dryso4 + wetso4)/3$ Year total deposition rate ambient aerosol optical total cloud cover - arctic convective cloud cover - arc surface cloud cover - arctic of S - arctic thickness at 550nm - arctic 1e+00 0e+00 0e+00 0e+00∆ od550ae. 2.5e-01 ا کا کا -1e-01 0.0e+00 0e+00 -2e-01 -1e+01 -5e-01 -5.0e-01 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 20002001200220032004 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 BC - arctic of SO2 - arctic of DMS - arctic of SO4 - arctic 1e+01 4e-01 5e+00 5e-01 ∆ loadbc 1e+00 0e+00 -5e+00 0e+00 -5e-01 -1e+01 -8e-01 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year CAM5 E3SM **GISS** OsloCTM3 CESM1 **GEOS** MIROC **UKESM**

CESM2

GFDL

NorESM2