so2-at-height: percent difference surface flux of BC – arctic surface flux of SO2 – arctic surface concentration of BC – arctic surface concentration of SO4 – arctic surface concentration of SO2 – arctic -40% 0% 1e-04% 20% -50% 5e-05% 0% Percent Percent 0% Percent _70% -40% -80% -0.00015% -60% 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 Year Year Year Year Year upwelling longwave flux at TOA – arctic upwelling shortwave flux at TOA – arctic upwelling clear–sky longwave flux at TOA – arctic net radiative flux incident shortwave flux at TOA - arctic at TOA - arctic 0.15% 2e-08% 0.4% 0.1% 0.19 Percent Percent Percent 0% 0% 0% 0.05% 0.05% -2e-08% -0.5% -0.4% -0.05% -4e-08% 2002 2003 2001 2002 2003 2004 2001 2002 2003 2001 2002 2003 2004 2001 2002 2003 Year Year Year Year Year upwelling clear-sky shortwave clear-sky net radiative dry deposition rate wet deposition rate total deposition rate flux at TOA - arctic flux at TOA - arctic of BC - arctic of BC - arctic of BC - arctic 0.5% 0.5% 1.5% 2% 0% 0% Percent Percent Percent 1% -0.5% 0.5% -1.5% 2003 2003 2003 2003 2003 2001 2001 2001 2001 2001 2002 Year Year Year Year Year dry deposition rate wet deposition rate dry deposition rate wet deposition rate total deposition rate of SO2 - arctic of SO2 - arctic of SO4 – arctic of SO4 – arctic of S - arctic 80% 25% -20% 25% 40% -30% 0% Percent Percent Percent Percent _40% 0% -50% -50% -80% -50% -60% 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2004 2001 2002 2003 2004 Year Year Year ambient aerosol optical convective cloud cover total cloud cover thickness at 550nm - arctic percentage - arctic percentage - arctic 0.4% 200% 150% Percent Percent Percent -0.25% 100% 0% -0.5% 50% -0.2% 2002 2003 2002 2003 2002 2003 2001 2004 2001 2004 2004 2001 Year Year Year CESM1 NorESM2 GISS

E3SM

MIROC

OsloCTM3