bc-no-season: percent difference surface flux surface flux surface concentration surface concentration surface concentration of BC - land of SO2 - land of BC - land of SO4 - land of SO2 - land 1.5e-01 8e+00 0.0e + 006e+00 -2.5e+01 1e-01 1.0e-01 -5.0e+01 _1e+00 5.0e-02 20+00 -2e+00 -1e-01 0.0e+00 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 2001 2002 2003 2004 Year Year upwelling longwave flux at TOA – land upwelling shortwave flux at TOA – land upwelling clear-sky longwave flux at TOA - land net radiative flux incident shortwave flux at TOA – land at TOA - land 5.0e-08 5e-01 1e-01 8e-02 0.0e+000e+00 Δ rsut 5e-02 0.0e+00 rlut + -5.0e-08 -2 5e-0° 0e+00 -5e-01 -1.0e-070e+00 -5.0e-01 -1.5e-07 2002 2003 2004 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 dry deposition rate of BC – land upwelling clear-sky shortway clear-sky net radiative implied cloud response wet deposition rate flux at TOA - land flux at TOA - land at TOA - land of BC - land rsutcs 6e-01 5e-01 1e+00 rsutcs 8e+00 0e+00 rlutcs -0e+00 4e-01 ∆ rsutcs ∆ rlutcs + _5e_01 -5e-01 rsut – 4e+00 2e-01 -1e+00 0e+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 Year Year dry deposition rate of SO4 – land wet deposition rate of SO4 – land wet deposition rate total deposition rate dry deposition rate of BC - land of SO2 - land of SO2 - land 1e+01 4e-01 4e+006e+00 ∆ drybc + wetbc 3e+00 ∆ dryso2 ∆ wetso2 ∆ wetso4 5e+00 4e+00 2e+00 1e+00 0e+00 -1e+000e+00 0e+00 0e+00 -1e+00 -2e-01 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 $\frac{1}{3} dryso2 + wetso2)/2 + \frac{1}{3} dryso4 + wetso4)/3$ total deposition rate ambient aerosol optical total cloud cover - land convective cloud cover - lan surface cloud cover - land of S - land thickness at 550nm - land 4e-01 2e-01 0e+00 1.2e + 0.10e+00 -2e+00 ∆ od550ae -2e+01∆ clt ا کا کا 4.0e+00 -8e-01 -6e+01 -6e+00 0.0e+00 2000 2001 2002 2003 2004 20002001200220032004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year ice water path - land column mass burden column mass burden column mass burden surface concentration of DMS - land of SO2 - land of SO4 - land 2.0e+00 1.2e+01 4e-01 1e+00 1.5e + 005e-01 8.0e+00 1.0e+00 -5e-01 4.0e+00 0.0e + 000.0e+00 -8e-01 -9e+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 Year Year Year Year CAM5 E3SM **GISS** OsloCTM3 CESM1 **GEOS** MIROC **UKESM**

CESM2

GFDL

NorESM2