so2-no-season: absolute difference surface flux surface concentration of SO4 – SH–land surface flux surface concentration surface concentration of BC - SH-land of SO2 - SH-land of BC - SH-land of SO2 - SH-land 5.5e-17 0e+00 Δ emibc (kg m⁻² s⁻¹) ∆ mmrso4 (kg kg − 1) Δ emiso2 (kg m $^{-2}$ s $^{-1}$ ∆ mmrbc (kg kg − 1) $\Delta \cos (kg kg - 1)$ 4.0e 3e-14 2.5e-17 0e+00 0e+009.8e-18 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 – SH–land upwelling shortwave flux at TOA – SH–land upwelling clear-sky longwa flux at TOA - SH-land net radiative flux incident shortwave flux at TOA - SH-land at TOA - SH-land 4e-07 3e-01 2e-01 Δ rlut + rsut (W m⁻²) 1e-01 Δ rlutcs (W m-2) 2e-01 Δ rlut (W m – 2) 2e-07 1e-01 ∆ rsut (W m – ∆ rsdt (W m – 1e-0 0e+00 0e+00 0e+00 -1e-01 -1e-01 -1e-01 2e-07 -2e-01 -2e-01 -3e-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 upwelling clear–sky shortwav flux at TOA – SH–land dry deposition rate of BC – SH–land wet deposition rate of BC – SH–land clear-sky net radiative $\rm rsutcs \ (W\ m^{-2})$ implied cloud response flux at TOA - SH-land at TOA - SH-land 8.0e-16 2e-01 3.5e-15 E $\Delta \operatorname{rsutcs} (\operatorname{Wm} - 2)$ 1e-01 drybc (kg m^{-2} s⁻¹ wetbc (kg ${\sf m}^{-2}\,{\sf s}^{-1}$ rlutcs + rsutcs (W 1e-0 rlutcs -0e+00 -1e-0 rsut -1e-01 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 Year wet deposition rate of SO4 – SH–land total deposition rate of BC – SH–land dry deposition rate of SO2 – SH-land dry deposition rate of SO4 – SH-land wet deposition rate of SO2 - SH-land Δ drybc + wetbc (kg m⁻² s⁻¹ 3.8e-15 dryso2 (kg m⁻² s⁻ wetso2 (kg m⁻² s⁻ Δ wetso4 (kg m $^{-2}$ s $^{-}$ dryso4 (kg m⁻² s⁻ 4.0e-16 0e+00 0e+00 -3.0e-15 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 Year Year Yea Year dryso2 + wetso2)/2 + (dryso4 + wetso4)/3total deposition rate ambient aerosol optical total cloud cover - SH-land convective cloud cover - SHsurface cloud cover - SH-la of S - SH-land thickness at 550nm - SH-lai ∆ cltc (percent) 2e-01 ∆ clt (percent) ∆ cl (percent $(kg m^{-2} s^{-1})$ 0.0e+00 ∆ od550ae 1.0e-13 0e+00 -4e-02 -1.0e-02 0.0e + 0.0-2e-0'-5e-02 -6e-02 2002 2003 2004 2000 2001 2002 2003 2004 20002001200220032004 2000 2001 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year ice water path - SH-land surface concentration column mass burden column mass burden column mass burden of BC - SH-land of SO2 - SH-land of SO4 - SH-land 1.0e-03 Δ loadso4 (kg m⁻²) Δ loadso2 (kg m $^{-2}$) Δ clivi (kg m $^{-2}$) $loadbc (kg m^{-2})$ ∆ dms (kg kg –1) 2.0e-07 0e+00 5.0e-04 0e+00 0.0e+00 0e+00 -1e-08 1.0e-07 -5e-10 -5.0e-04 5.0e-08 -1e-09 0.0e + 0.02000 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

CESM1

CESM2

E3SM

GEOS

GFDL

GISS

MIROC

NorESM2

OsloCTM3

UKESM