global: absolute difference surface flux surface flux surface concentration surface concentration surface concentration of BC - no-so4 of SO2 - no-so4 of BC - no-so4 of SO4 - no-so4 of SO2 - no-so4 5.0e-01 40-05 2.8e+00 2e+00 2e-05 ∆ emiso2 ∆ mmrbc 2.4e+00 0.0e + 000e+00 1e+00 _2 5e_01 2.0e+00 -2e-05 -5.0e-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 shortwave flux at TOA – no–so4 upwelling longwave flux at TOA – no-so4 net radiative flux incident shortwave flux upwelling clear-sky longwav flux at TOA – no-so4 at TOA - no-so4 at TOA - no-so4 4e-01 4e-01 4e-02 3e-02 2e-01 ∆ rlut + rsut 2e-01 ∆ rsut ∆ rlut 2e-02 0e+00 1e-02 0e+00 0e+00 -3e-08 -2e-01 -1e-02 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2000 2001 Year Year Year Year Year upwelling clear–sky shortwave flux at TOA – no–so4 clear-sky net radiative flux at TOA - no-so4 dry deposition rate of BC – no-so4 wet deposition rate of BC – no-so4 implied cloud response at TOA - no-so4 rsutcs) 4e-01 3e-01 2e-01 3e-01 0e+00 ∆ (rlut + rsut - rlutcs -2e-2e-01 rlutcs + -5e-02 1e-01 1e-01 -5e-01 -2e-01 -1e-01 0e+00 0e+00 -1e+00 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 2001 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year Year total deposition rate of BC – no–so4 wet deposition rate of SO2 – no-so4 dry deposition rate of SO4 – no–so4 wet deposition rate of SO4 – no–so4 dry deposition rate of SO2 - no-so4 2.5e+00 -5.0e-01 4e-01 -2.5e+00 2 20+00 2.0e+00 drybc + wetbc ∆ dryso2 ∆ wetso2 0e+00 2.0e+00 -1.5e+00 -4e-01 1.0e+00 1.8e+00 -2.0e+005 0e-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 total deposition rate ambient aerosol optical total cloud cover convective cloud cover (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3of S - no-so4 thickness at 550nm - no-so percentage - no-so4 percentage - no-so4 1e+00 0e+00 0e+00 -1e-01-1e+00 -2e-01 -1e-01 -6e+01 20002001200220032004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year Year CAM-ATRAS E3SM GISS modelE OsloCTM3 CESM **GEOS** MIROC-SPRINTARS UKESM1 CESM2 GFDL-ESM4 NorESM2