Reference – absolute sea averages surface flux of SO2 - sea surface flux of BC - sea surface concentration surface concentration surface concentration of BC - sea of SO4 - sea of SO2 - sea $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ 9.0e-14 əmiso2 (kg m $^{-2}$ s $^{-1}$ mmrbc (kg kg⁻¹) mmrso4 (kg kg so2 (kg kg 4.0e-2002 2003 2004 2002 2003 2004 2002 2003 2004 2002 2003 2004 Year Year Year Year incident shortwave flux clear-sky longwave flux at TOA - sea longwave flux at TOA - sea shortwave flux at TOA - sea net radiative flux at TOA - se at TOA – sea -335 -240 300 _96 rlut + rsut (W m^{-2}) 340 $rlut (W m^{-2})$ $rsut (W m^{-2})$ rlutcs $(W m^{-2})$ 200 $rsdt (W m^{-2})$ -244100 -345-100 -270 -246 0 -350 -273 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 Year Year Year clear-sky net radiative flux at TOA - sea clear-sky shortwave flux at TOA - sea implied cloud response at TOA – sea dry deposition rate of BC – sea wet deposition rate of BC – sea rsutcs (W m⁻²) -40 lutcs + rsutcs $(W m^{-2})$ -305 wetbc $(kg m^{-2} s^{-1})$ drybc (kg $m^{-2} s^{-1}$) rsutcs (W m⁻²) rsut - rlutcs --310 -44 -315 rlut + 0.0e+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 Year Year dry deposition rate of SO2 – sea dry deposition rate of SO4 – sea total deposition rate of BC – sea wet deposition rate wet deposition rate of SO2 - sea of SO4 - sea $drybc + wetbc (kg m^{-2} s^{-1})$ 0.020 $dryso2 (kg m^{-2} s^{-1})$ wetso2 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ wetso4 (kg m⁻² s⁻¹ dryso4 (kg $\mathrm{m}^{-2} \mathrm{s}^{-1}$ 0.015 8.0e-13 0.010 2000 2001 2002 2003 2004 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 Year Year Year Year total deposition rate (dryso2 + wetso2)/2 + (dryso4 + wetso4)/3of S - sea 0.012 0.009 $(kg m^{-2} s^{-1})$ 0.006 0.003 0.000 2000 2001 2002 2003 2004 Year CAM-ATRAS CESM1-1950 **GEOS** GISS-1950

GEOS-1950

GISS

E3SM-1950

NorESM2

NorESM2-1950

CAM-ATRAS-1950

CESM1