shp-60p-red-1950: absolute difference surface flux of BC – land surface concentration of SO4 – land surface flux surface concentration surface concentration of SO2 – land of SO2 – land 7.0e-19 emibc $(kg m^{-2} s^{-1})$ (kg kg – 1) emiso2 (kg $\mathrm{m}^{-2} \mathrm{s}^{-1}$ nmrbc (kg kg-1) 3 96-19 so2 (kg kg – 1) -9.0e-12 8.1e-20 mmrso4 -2.3e-19 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 longwave flux at TOA – land upwelling shortwave flux at TOA – land net radiative flux at TOA – land incident shortwave flux at TOA – land upwelling clear-sky longway flux at TOA - land 0e+00 1e-07 0e+00 $rsut (W m^{-2})$ rlutcs (Wm-2)rsdt (Wm-2)rsut (W m-_2e_01 2e+00 -2e-01 2e+00 rlut + 1 1e+00 1e+00 4e-01 -1e-07 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 Year Year Year Year Year upwelling clear-sky shortwav flux at TOA - land clear-sky net radiative implied cloud response dry deposition rate of BC – land wet deposition rate of BC – land rsutcs $(W m^{-2})$ flux at TOA – land at TOA – land 6 2e-15 2 0e-15 8e-01 rsutcs (W m^{-2}) 3e+00 6e-01 drybc (kg $\mathrm{m}^{-2}~\mathrm{s}^{-1}$ 4.6e-15 wetbc (kg ${\sf m}^{-2}\,{\sf s}^{-1}$ 2e+00 4e-01 2.9e-15 rlutcs -1e-01 1e+00 rlutes + 2e-01 1 2e-15 rsut-0e+00 0e+00 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 Year Year Year Year total deposition rate of BC – land dry deposition rate of SO2 – land wet deposition rate of SO2 – land dry deposition rate of SO4 – land wet deposition rate of SO4 – land -1 0e-14 1.2e-12 $drybc + wetbc (kg m^{-2} s^{-1})$ wetso2 (kg m⁻² s⁻¹. wetso4 (kg m $^{-2}$ s $^{-1}$ dryso2 (kg m^{-2} s⁻¹. dryso4 (kg m⁻² s⁻¹ -1.5e-15 9.0e-13 -1e-043.0e-13 -7.9e-15 -3e-04 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 Dimethyl sulphide (DMS) mole fracti cloud cover total deposition rate of S – land Ice water path - land ambient aerosol optical percentage - land thickness at 550nm - land 0.0e+00 1.5e-02 0e+00 0e+00 clivi (kg ${\sf m}^{-2}$) _lom lom) smb $(kg m^{-2} s^{-1})$ 양 -5.0e-05 -2e-04 1 0e-02 xpression -3e-02 -2e-14 5 0e-03 -1.5e-04 0.0e+0020002001200220032004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 2001 2002 2003 2004 Year Year Year Year Year SO4 lifetime SO₂ lifetime load load load of so2 of so4 - land of bc - land land land land wetso4) (days -1e-08 5e-10 loadso2/emiso2 (days) loadso4 (kg m⁻²) loadso2 (kg m⁻²) oadbc (kg m⁻²) -3e-08 0e+00 (dryso4 + -4e-08 -1.5e-08-5e-08 -5e-10 -2.0e-08 -6e-08 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2001 2002 2003 2004 2000 2001 2002 2003 Year Year Year Year Year

CAM-ATRAS

CESM1

F3SM

GEOS

GISS modelE

NorESM2

rlut (Wm-2)

rsutcs (W m-2)

dyso2 + wetso2)/2 + (dyso4 + wetso4)/3