## shp-ind-shift-1950: absolute difference surface flux of SO2 – NH–pacific surface flux of BC – NH–pacific surface concentration surface concentration of SO4 – NH–pacific surface concentration of SO2 – NH–pacific 1.2e-20 -3 0e-12 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$ nmrbc (kg kg-1) emiso2 (kg m<sup>-2</sup> s<sup>-</sup> 8.2e-21 so2 (kg kg – 1) (kg kg-4.3e-21 3.6e-22 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year Year upwelling longwave flux at TOA – NH–pacific upwelling shortwave flux at TOA – NH–pacific net radiative flux at TOA – NH-pacific incident shortwave flux at TOA – NH–pacific upwelling clear-sky longway flux at TOA - NH-pacific 5.0e-02 $rsut (W m^{-2})$ 5e-02 rsut (W m-2) sdt (Wm-2)0.0e+00 rlutcs (W m-0e+00 0e+00 0e+00 -5e-02 -1e-01 -2e-02 -1e-0 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 shortway flux at TOA - NH-pacific clear-sky net radiative flux at TOA - NH-pacific implied cloud response at TOA – NH-pacific dry deposition rate of BC - NH-pacific wet deposition rate of BC – NH-pacific rsutcs (W $\mathrm{m}^{-2}$ ) 1 2e-16 9 4e-16 2e-02 wetbc (kg $m^{-2}$ s<sup>-1</sup>) 1e-02 4.8e-16 drybc (kg m<sup>-2</sup> s<sup>-</sup> rsutcs (W 0e+00 -5e-03 0e+00 rlutcs --5e-02 rlutcs + rsut – -1e-01 rict + 2002 2003 2004 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 2001 2000 2001 Year Year Year Year Year total deposition rate of BC - NH-pacific dry deposition rate of SO2 – NH–pacific wet deposition rate of SO2 – NH–pacific dry deposition rate of SO4 – NH–pacific wet deposition rate of SO4 – NH-pacific 8 8e-16 -5 6e-15 $drybc + wetbc (kg m^{-2} s^{-1})$ dryso2 (kg $\mathrm{m}^{-2}\,\mathrm{s}^{-1}$ vetso2 (kg m<sup>-2</sup> s<sup>-1</sup> $dryso4 (kg m^{-2} s^{-1}$ wetso4 $(kg m^{-2} s^{-1}$ 4.1e-16 -6.2e-1 -5.3e-16 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 Yea Year total deposition rate cloud cover Ice water path - NH-paciDimethyl sulphide (DMS) mole fraction ambient aerosol optical percentage – NH-pacific of S – NH–pacific thickness at 550nm – NH–pag 0.0e+00 0e+00 2e-02 cltc (%) clivi (kg m<sup>-2</sup>) \_lom lom) smp 0e+00 -5.0e-05 expression -2e-04 -5.0e-04 20002001200220032004 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 load load load of so2 of so4 - NH-pacific of bc - NH-pacific NH-pacific 2e-10 loadso4 (kg m<sup>-2</sup>) oadso2 (kg m<sup>-2</sup>) 4e-09 oadbc (kg m<sup>-2</sup>) -1.0e-08 -8e-09 -1.5e-08 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 Year Year Year

CAM-ATRAS

CESM1

F3SM

**GEOS** 

GISS modelE

NorESM2

rlut (Wm-2)

rsutcs (W m-2)

 $\frac{1}{3}$  dryso2 + wetso2)/2 +  $\frac{(dryso4 + wetso4)}{3}$