## shp-atl-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 -3.0e-12 nmrbc (kg kg-1) -3.5e-12 emiso2 (kg m<sup>-2</sup> s<sup>-</sup> mmrso4 (kg kg – (kg kg--5.0e-12 -3.0e-13 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 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 $rsut (W m^{-2})$ rlutcs (Wm-2)rsut (W m-2) sdt (Wm-2)-1e-01 0e+00 -2e-01 -1.5e-01 -2e-02 -4e-07 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2000 2001 Year Year Year Year upwelling clear–sky shortwa flux at TOA – NH–pacific implied cloud response at TOA – NH–pacific clear-sky net radiative flux at TOA - NH-pacific dry deposition rate of BC - NH-pacific wet deposition rate of BC – NH-pacific 1.8e-16 9.3e-16 rsutcs (W vetbc (kg $m^{-2}$ s<sup>-1</sup>) drybc (kg m<sup>-2</sup> s<sup>-</sup> 1e-02 rlutcs + rsutcs (W 0e+00 -1e-02 rict + 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 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 wetso2 $(kg m^{-2} s^{-1})$ $\rm wetso4~(kg~m^{-2}~s^{-1}$ -1.0e-13 dryso2 (kg m<sup>-2</sup> s<sup>-†</sup> dryso4 (kg m $^{-2}$ s $^{-1}$ 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 total deposition rate cloud cover Ice water path - NH-pacifiDimethyl sulphide (DMS) mole fraction ambient aerosol optical thickness at 550nm – NH-pag percentage – NH-pacific of S – NH–pacific 1e-02 dms (mol mol<sup>-</sup> clivi (kg m<sup>-2</sup>) ession cltc od550aer 0e+00 0e+00 -1e-02 -6e-04 20002001200220032004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year load of so2 load of so4 - NH-pacific of bc - NH-pacific - NH-pacific oadso2 (kg m<sup>-2</sup>) oadbc (kg m<sup>-2</sup>) 0.0e + 0.0-9 0e-09

2000 2001 2002 2003 2004

Year

GISS modelE

NorESM2

F3SM

**GEOS** 

4.8e-21

3.2e-22

-4.2e-2 -8.7e-21

5e-02

-5e-02

rlut (Wm-2)

rsutcs (W m-2)

 $drybc + wetbc (kg m^{-2} s^{-1})$ 

dyso2 + wetso2)/2 + (dryso4 + wetso4)/3

loadso4 (kg m<sup>-2</sup>)

 $(kg m^{-2} s^{-1})$ 

-1.0e-08

-1.5e-08

-2.5e-08

-3.0e-08

\_1.5e\_02

-2 0e-02

9.5e-16

5.2e-16 1.0e-16 -3.2e-16 Year

Year

Year

Year

Year

-5.0e-10

2000 2001 2002 2003 2004

Year

CAM-ATRAS

CESM1

load

2000 2001 2002 2003 2004

Year

 $\mathrm{emibc}\,(\mathrm{kg}\,\mathrm{m}^{-2}\,\mathrm{s}^{-1})$