## shp-30p-red: absolute difference surface flux of SO2 – arctic surface flux of BC – arctic surface concentration surface concentration of SO4 – arctic surface concentration of SO2 – arctic 1.0e-13 kg-1nmrbc (kg kg-1) əmiso2 (kg m $^{-2}$ s $^{-1}$ so2 (kg kg – 1) -5 0e-13 ķď 0.0e+00 -1.0e-12 -5.0e-14 -9.0e-1 \_1 5e\_12 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year Year upwelling longwave flux at TOA – arctic upwelling shortwave flux at TOA – arctic net radiative flux at TOA – arctic incident shortwave flux at TOA – arctic upwelling clear-sky longway flux at TOA - arctic $rsut (W m^{-2})$ 1e-0 rlutcs (Wm-2)rsdt (Wm-2)rsut (Wm-2)0e+00 0e+00 rlut + 1 -02 -2e-01 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year Year upwelling clear-sky shortway clear-sky net radiative flux at TOA - arctic implied cloud response dry deposition rate wet deposition rate of BC – arctic flux at TOA – arctic rlutcs - rsutcs (W m<sup>-2</sup>) at TOA – arctic of BC - arctic 2 0e-16 6 1e-16 rlutcs + rsutcs (W m<sup>-2</sup>) 1e-01 5e-02 vetbc (kg $m^{-2} s^{-1}$ ) 3.3e-16 lrybc (kg m<sup>-2</sup> s<sup>-</sup> 0e+00 0e+00 -5e-02 rsut – -1e-01 rlut + 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year Year total deposition rate of BC – arctic dry deposition rate of SO2 – arctic wet deposition rate of SO2 – arctic dry deposition rate of SO4 – arctic wet deposition rate of SO4 – arctic 0.0e+00 wetso4 (kg m<sup>-2</sup> s<sup>-1</sup> wetso2 (kg $m^{-2}$ s<sup>-1</sup> $dryso4 (kg m^{-2} s^{-1}$ dryso2 (kg $\mathrm{m}^{-2} \mathrm{s}^{-1}$ 7.5e-03 0e+00 5.0e-03 2.5e-03 0.0e+002000 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 cloud cover total deposition rate of S – arctic Ice water path - arctic Dimethyl sulphide (DMS) mole fract ambient aerosol optical percentage - arctic thickness at 550nm - arctic 0e+00 1.0e-01 clivi (kg ${\sf m}^{-2}$ ) \_lom lom) smb 양 <u>6</u> 0e+00 -5.0e 0.0e+00 -1.0e-01 -2.5e-13 -5e-04 20002001200220032004 2000 2001 2002 2003 2004 2000 2001 2002 2003 2004 2002 2003 2004 2000 2001 2002 2003 2004 2000 2001 Year Year Year Year Year SO4 lifetime SO<sub>2</sub> lifetime load load load of so2 of so4 - arctic of bc - arctic arctic arctic - arctic wetso4) (days 0e+005.0e-10 oadso2/emiso2 (days) oadso2 (kg m<sup>-2</sup>) oadbc (kg m<sup>-2</sup>) 0.0e+00 -4e-08 drvso4 -1.0e-09 -6e-08 \_1 5e\_09 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

NorESM2

5.0e-19

3 16-19

1.3e-19

-5.4e-20

40\_02

0e+00

-4e-02

5e-02

0e+00

-5e-02

-1e-01

7 0e-16

3.2e-16

-5.5e-1

-4.3e-16

rlut (Wm-2)

rsutcs (W m-2)

drybc + wetbc (kg m<sup>-2</sup> s<sup>-1</sup>)

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

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

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

2e-03

0e+00

1e-08

0e+00

-1e-08

-2e-08

-3e-08

CAM-ATRAS

CESM1

F3SM

**GEOS** 

GFDI -FSM4

GISS modelE

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