Aerosol Forcing : Trying to estimate the contribution from China

N. Huneeus, Y. Balkanski, R. Wang, O. Boucher, S. Tao

The direct radiative forcing (DRF) of anthropogenic aerosols is estimated using on one hand traditional bottom-up inventories and on the other hand the emission estimates resulting from the assimilation of satellite aerosol optical depth into an aerosol model of intermediate complexity. The DRF is computed for all anthropogenic aerosols (namely black carbon, particulate organic matter and sulphate) and for each one of the species separately. In order to estimate the contribution on the DRF from China three experiments are conducted where all sources are considered, only emissions over China are included and one where emissions over China are omitted. The main results from these experiments using the two inventories will be presented.

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Two set of experiments estimating aerosol RF

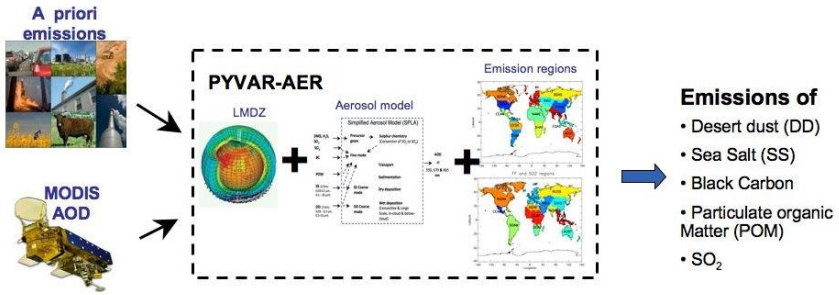
- Using emissions based on bottom-up inventories (R. Wang, Y. Balkanski & S. Tao)

  BC: PKU Inventory (2007)

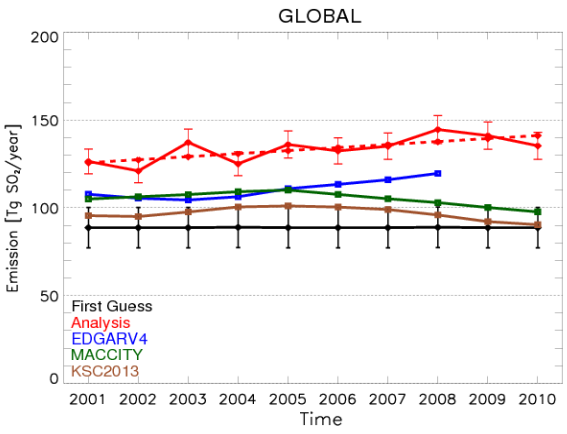
  OC & SO_2: AeroCom (2000)

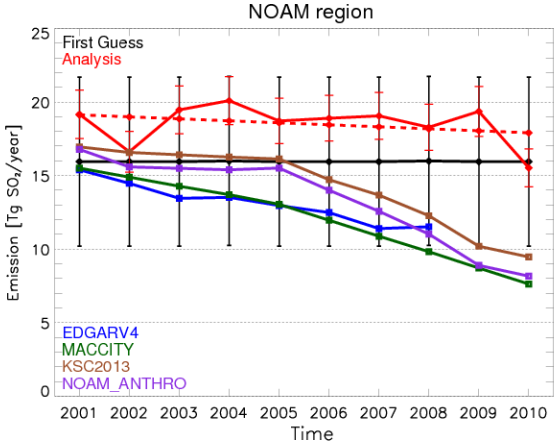
- Using emissions based on top-down method (N. Huneeus & O. Boucher)

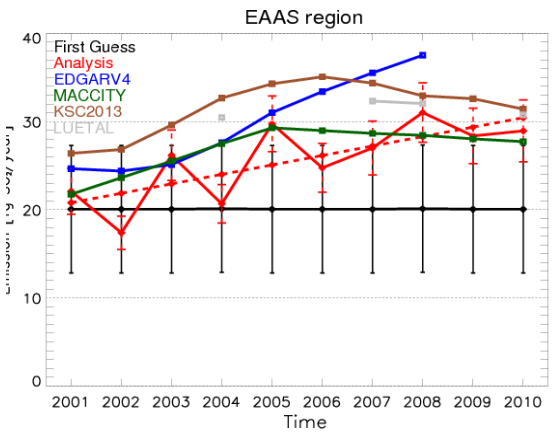
  Emissions are estimated assimilating total and fine mode satellite aerosol optical depth (AOD) into a global aerosol model of intermediate complexity (Huneeus et al., 2012, 2013)

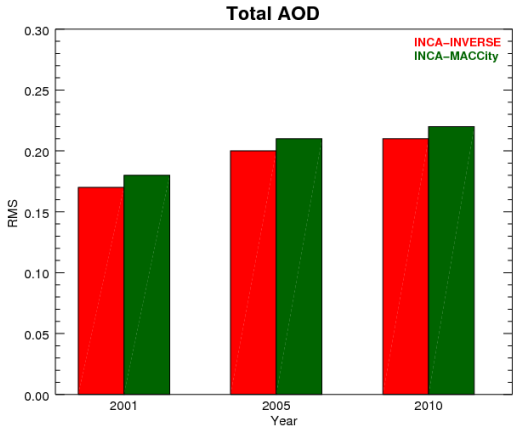


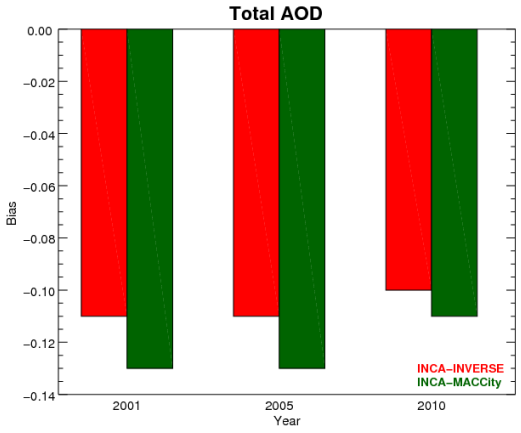
Two set of experiments estimating aerosol RF

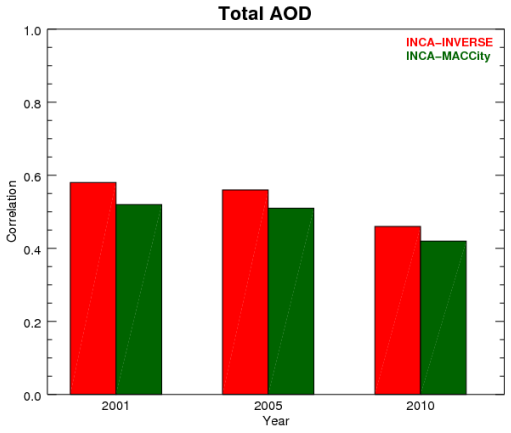












(Huneeus et al., submitted to JGR)

Present day emissions of aerosols and their precursors (bottom-up & top down)

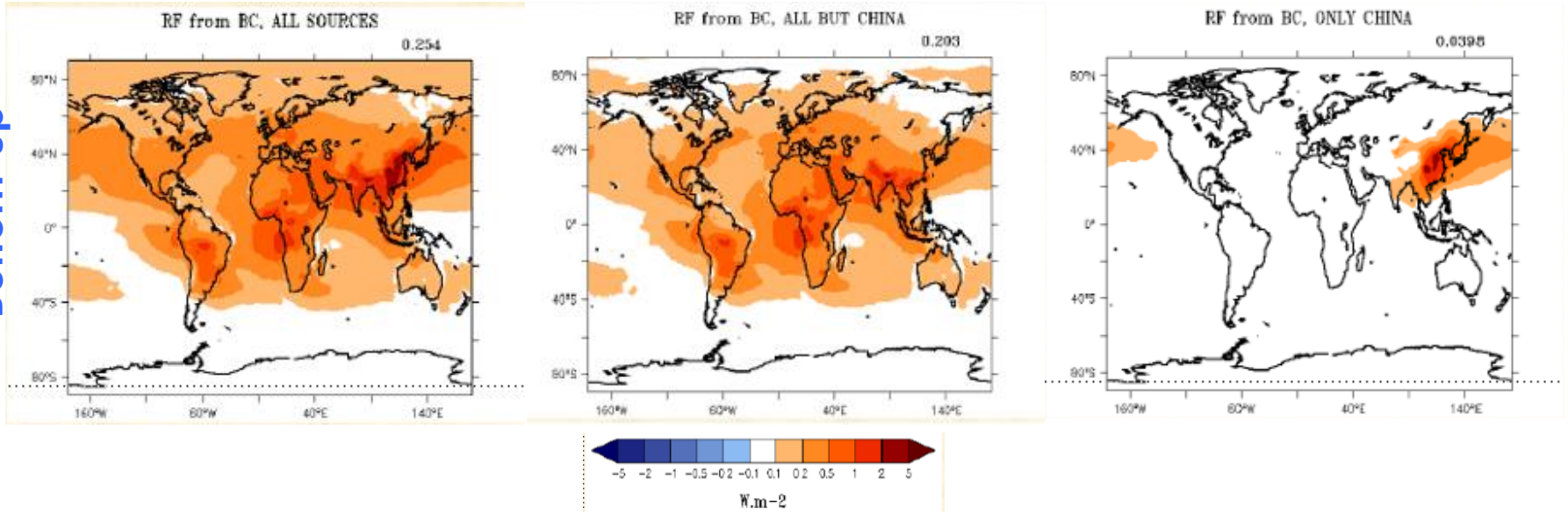
	BC [Tg/yr]	POM [Tg/yr]	SO2 [Tg/y]
China	**1.93**/2.14	**4.46**/7.53	**15.1**/26.9
North America	0.58/0.37	5.58/0.78	24.3/15.7
South America	1.11/0.48	12.28/1.88	9.5/13.8
Europe	0.8/0.87	3.67/2.53	22.4/10.9
Africa	2.11/3.19	19.9/20.4	13.9/9.36
Total	**8.92**/10.8	**69.0**/50.8	**130**/137

Comparison of the Direct Aerosol Effect for **BC+POM+SO_4** only (bottom-up & top down)[Wm^{-2}]

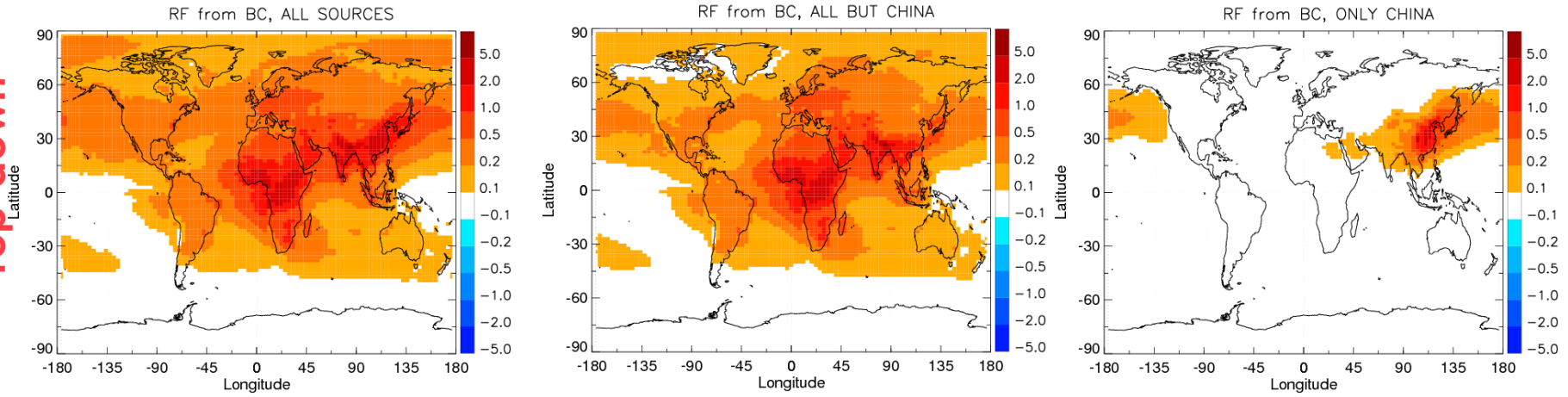
	All sources	Sources over China only	Sources all but China
Global	-0.24/-0.19	-0.002/-0.02	-0.21/-0.16
China	-0.50/-0.87	-0.37/-0.71	-0.05/-0.18
All but China	-0.23/-0.18	0.005/-0.01	-0.22/-0.16

Comparison of the Direct Aerosol Effect for **BC** only

Bottom-up



Top-down

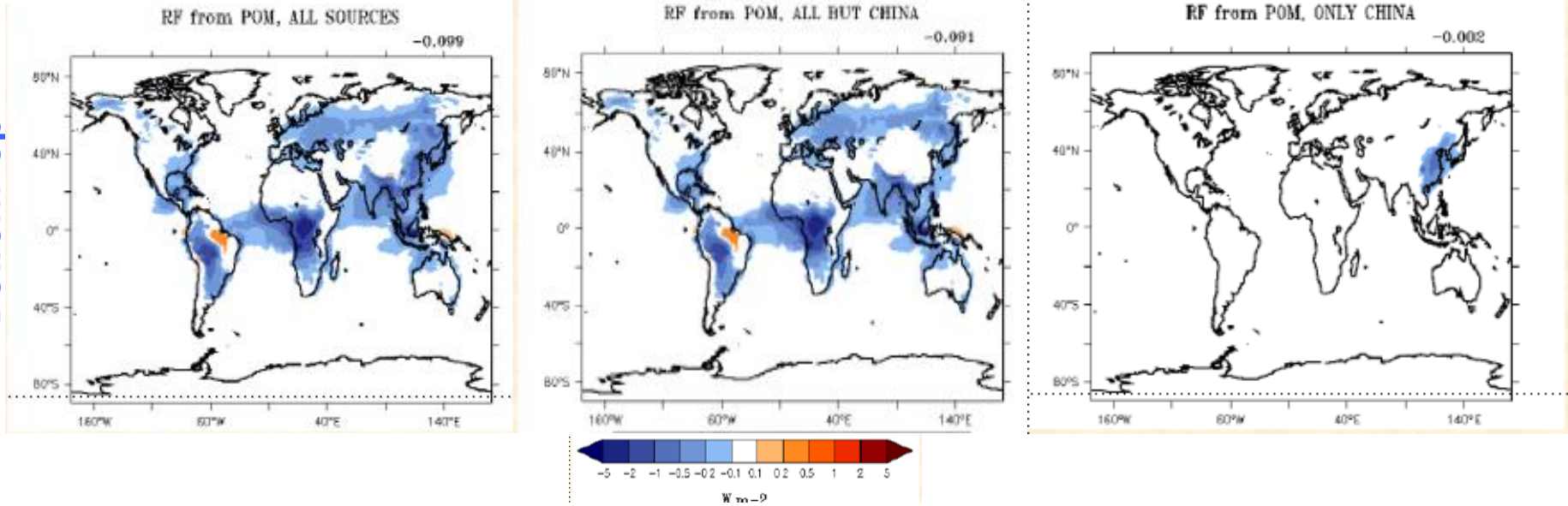


Comparison of the Direct Aerosol Effect for **BC** only (bottom-up & top down)[Wm^{-2}]

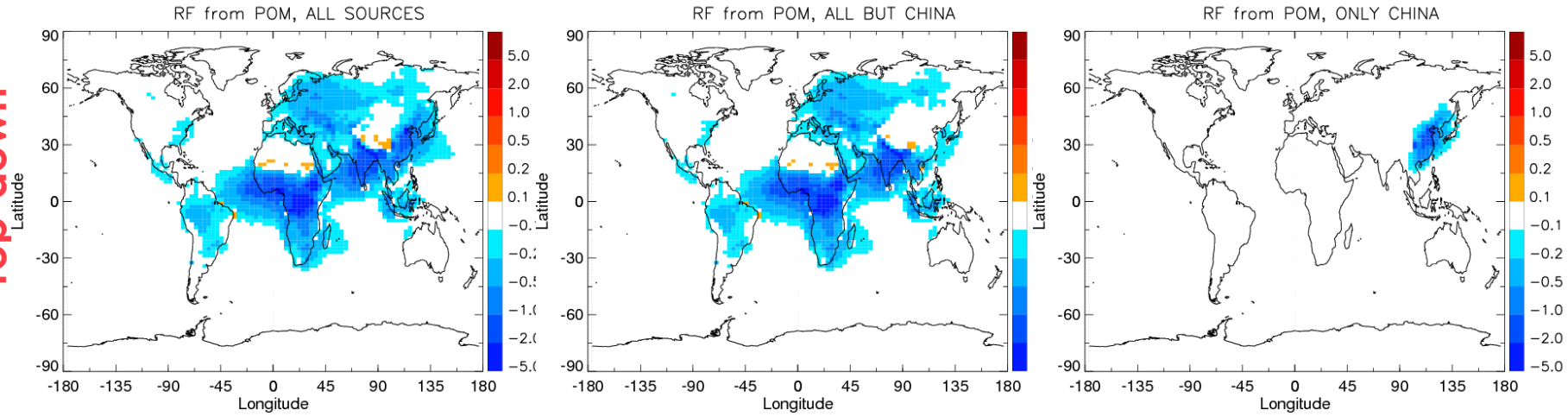
	All sources	Sources over China only	Sources all but China
Global	0.26/0.29	0.04/0.05	0.21/0.24
China	1.03/1.22	0.66/0.70	0.36/0.53
All but China	0.24/0.27	0.03/0.04	0.20/0.24

Comparison of the Direct Aerosol Effect for **POM** only

Bottom-up



Top-down

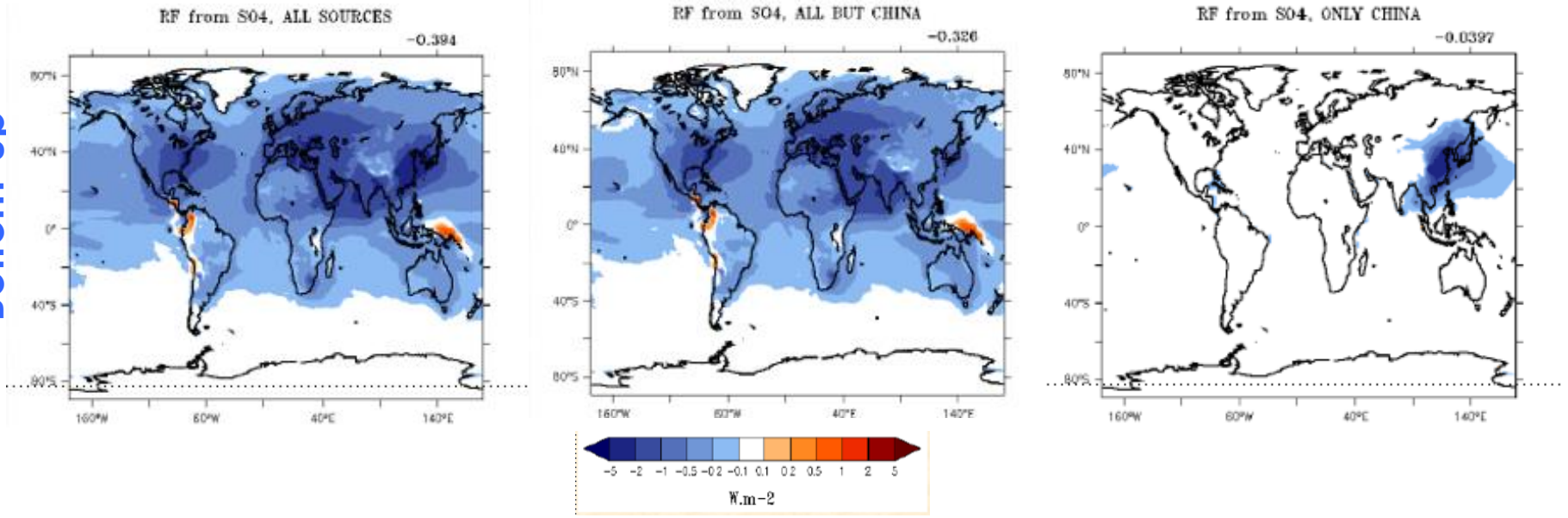


Comparison of the Direct Aerosol Effect for **POM** only (bottom-up & top down)[Wm^{-2}]

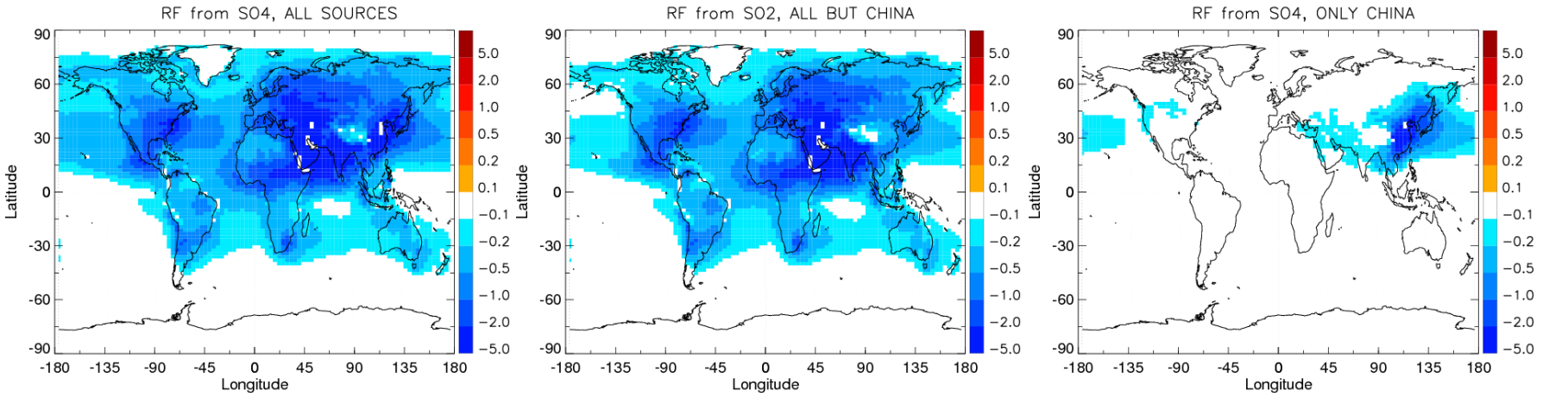
	All sources	Sources over China only	Sources all but China
Global	-0.10/-0.09	-0.002/-0.008	-0.09/-0.08
China	-0.23/-0.37	-0.16/-0.30	-0.05/-0.07
All but China	-0.10/-0.09	0.001/-0.003	-0.09/-0.08

Comparison of the Direct Aerosol Effect for **SO4** only

Bottom-up



Top-down



Comparison of the Direct Aerosol Effect for SO_4 only (bottom-up & top down)[Wm^{-2}]

	All sources	Sources over China only	Sources all but China
Global	-0.40/-0.40	-0.04/-0.06	-0.33/-0.34
China	-1.30/-1.71	-0.87/-1.13	-0.36/-0.52
All but China	-0.38/-0.38	-0.02/-0.04	-0.33/-0.33

Thank you