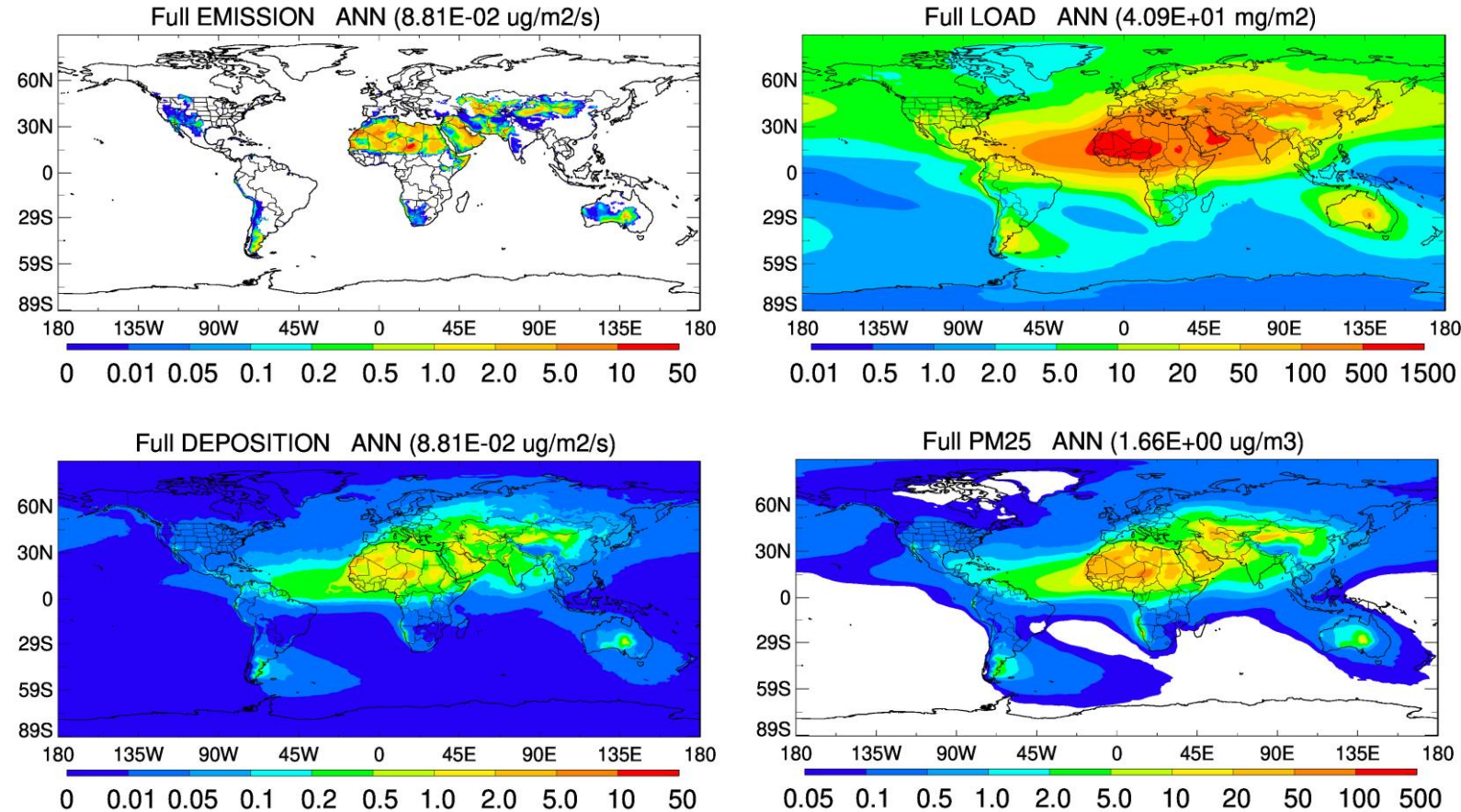


AEROCOM3/DUSA

October 12, 2020

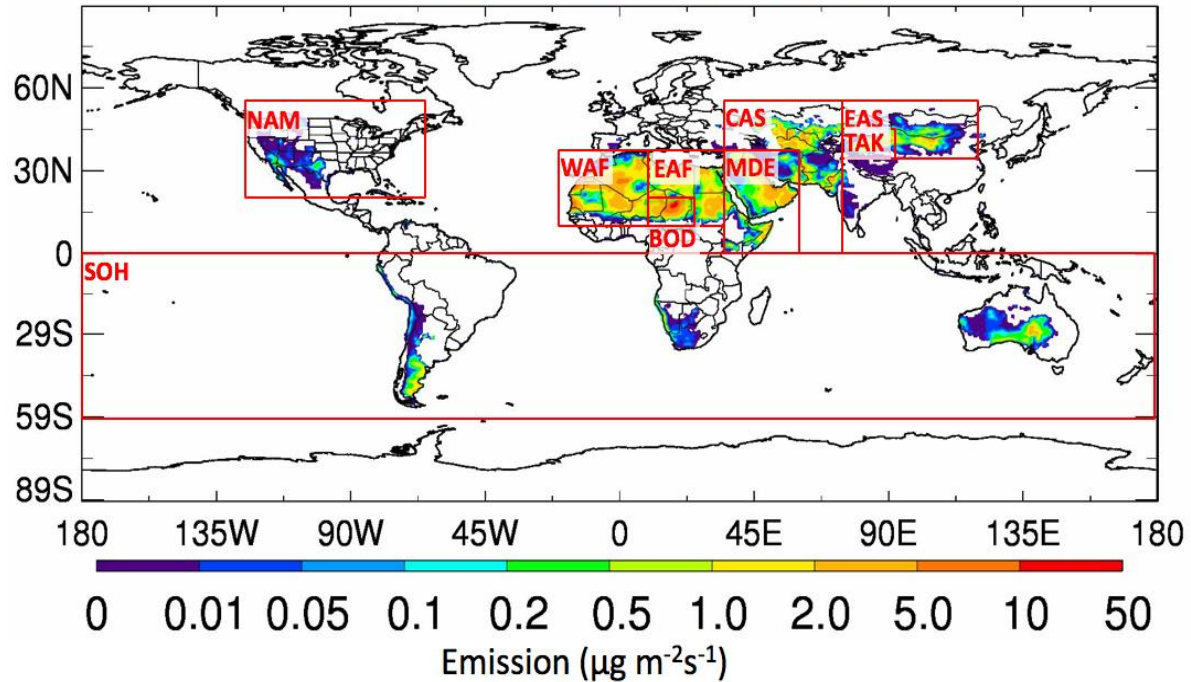
Dongchul Kim, Mian Chin, Greg Schuster, Toshihiko Takemura, Paolo Tuccella, and
others

An example of typical global simulation results from GEOS:

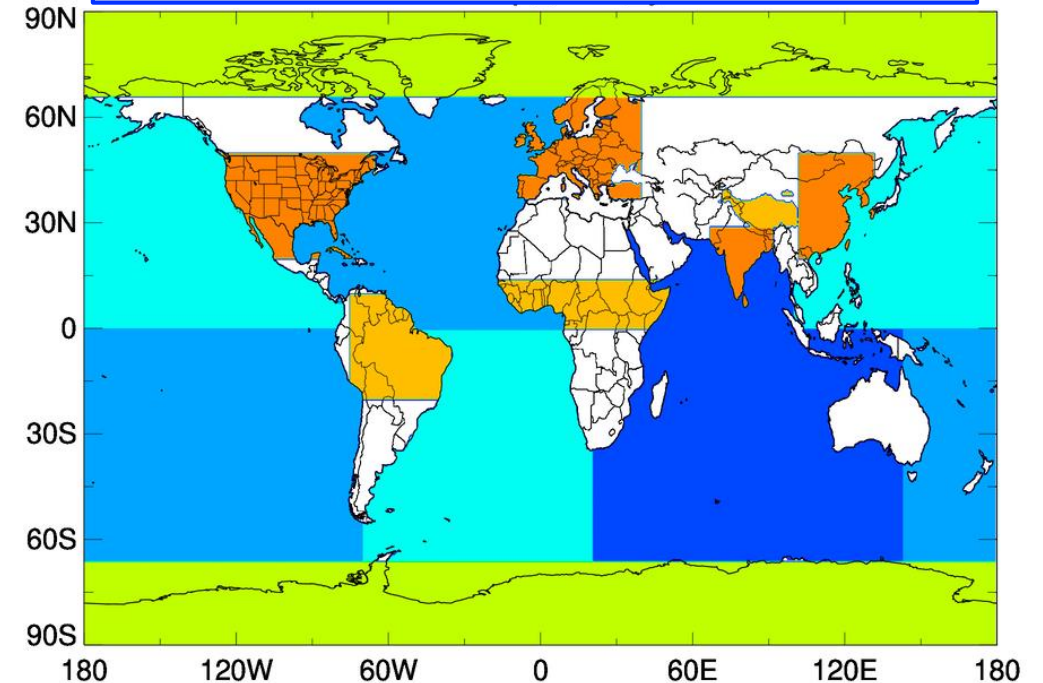


In addition to this typical global model analysis, our focus in DUSA experiment is to quantitatively estimate the contributions of various sources.

Source regions (9)

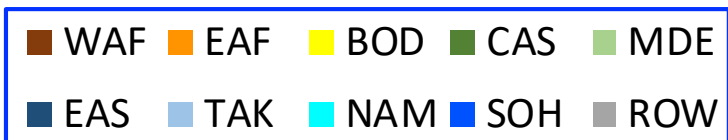
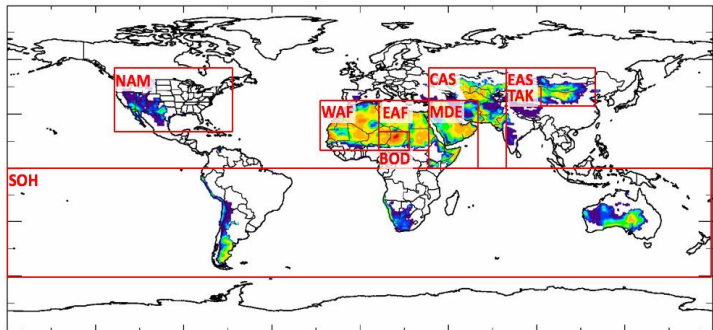


Receptor regions (14)



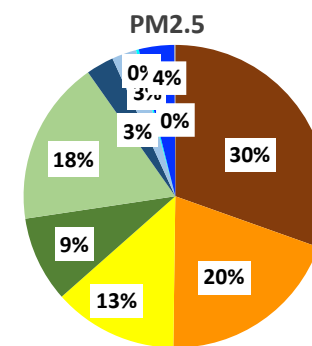
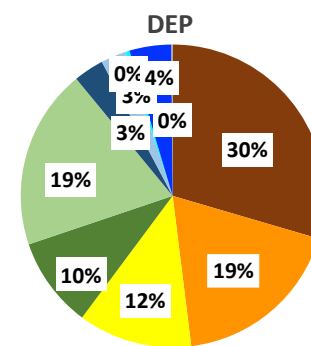
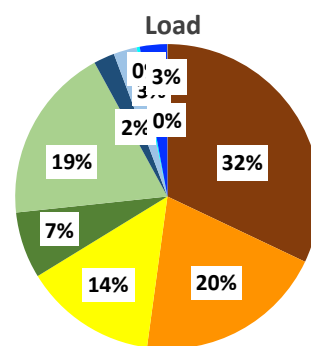
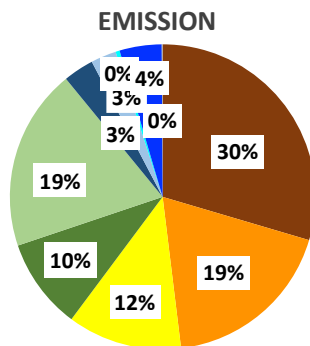
- Source regions (9)
- Receptor regions (14)
- Participating models (5): **GEOS**, **SPRINTARS**, **GEOS-chem**, GISS, CESM2
- DOD 10um is included (special experiment)
- Period: 4 years (2009-2012)

Source contribution in global scale (annual)

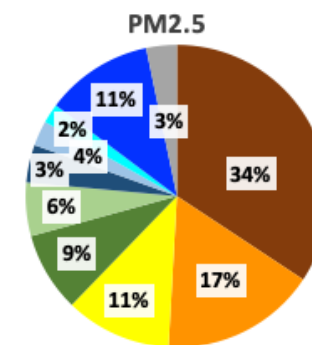
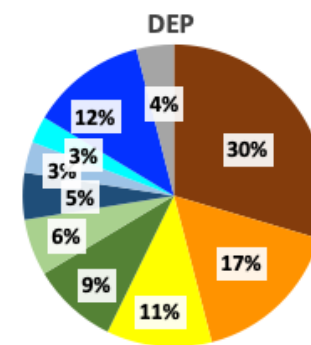
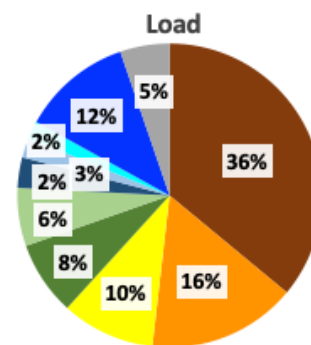
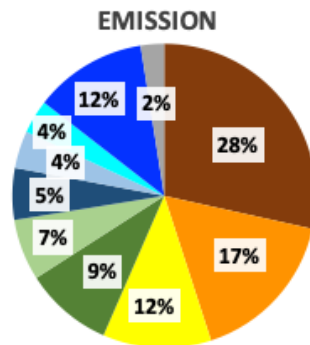


	Unit	GEOS	SPRINTARS	GEOS-chem
EMI	Tg yr ⁻¹	1417	2278	1130
LOAD	Tg yr ⁻¹	20.8	22.7	21.9
DEP	Tg yr ⁻¹	1418	2084	1132
PM2.5	μg m ⁻³	1.6	1.0	2.1

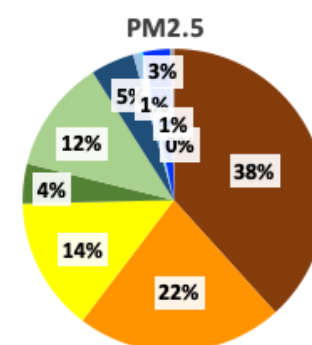
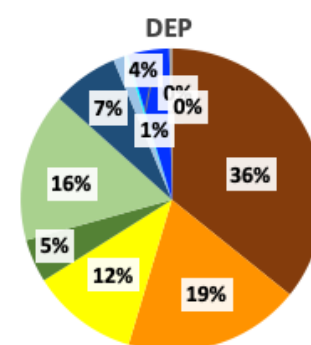
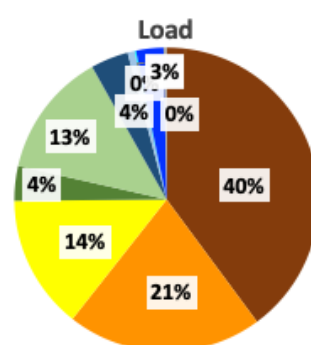
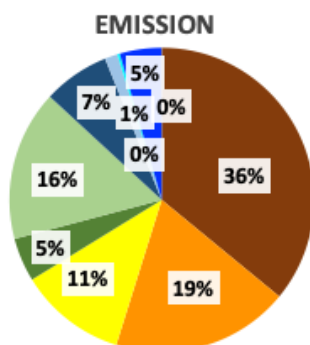
GEOS



SPRINTARS



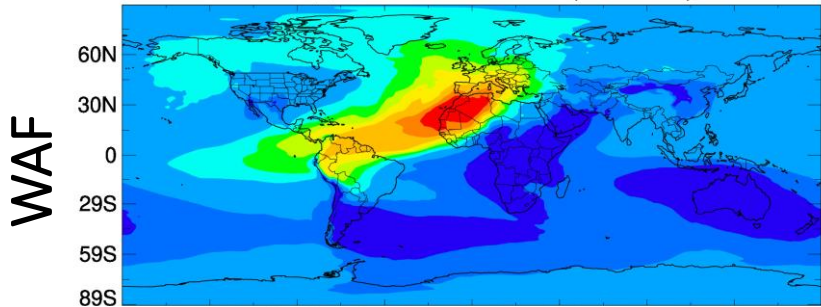
GEOS-chem



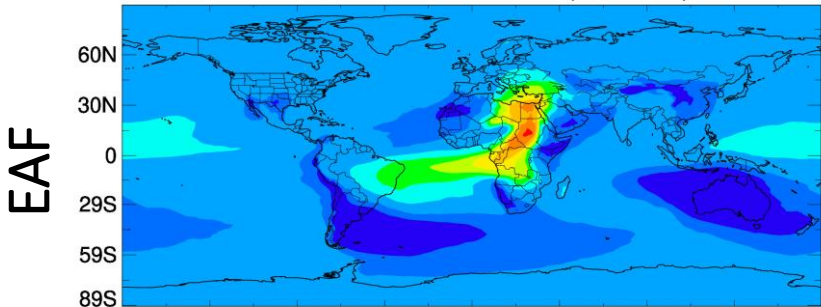
RSRC of African Dust (DJF)

GEOS

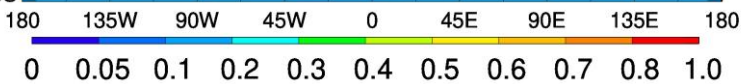
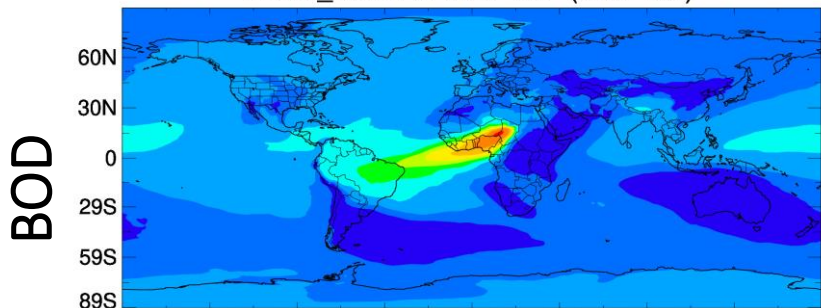
RSRC_LOAD of WAF DJF (1.68E-01)



RSRC_LOAD of EAF DJF (1.49E-01)

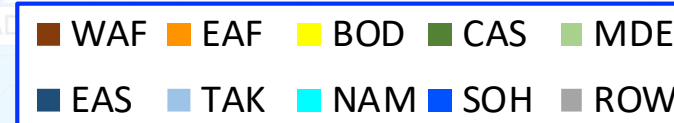
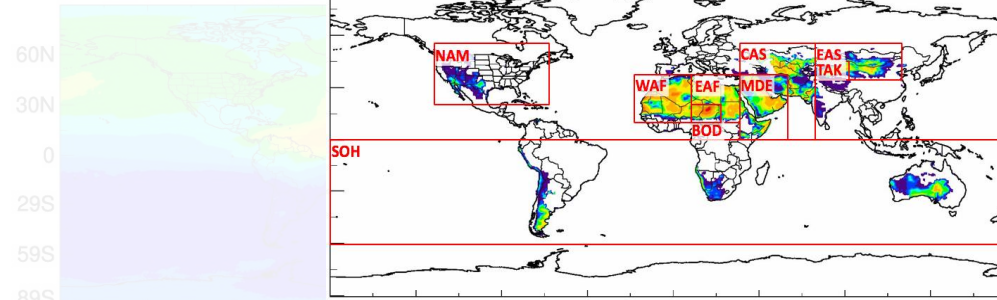


RSRC_LOAD of BOD DJF (1.16E-01)



SPRINTARS

RSRC_LOAD of WAF DJF (1.68E-01)



Relative Source contribution:

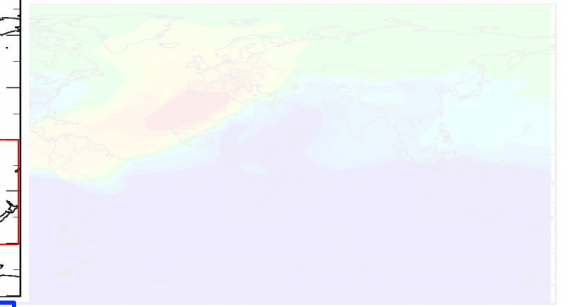
$$RSRC = Tag/Base \quad (0 < RSRC < 1)$$

High RSRC: Source dominant

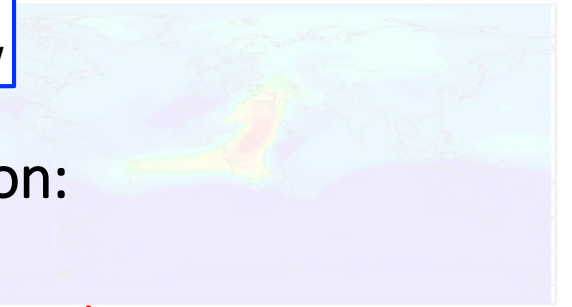
Low RSRC: Source negligible

GEOS-chem

RSRC_LOAD of WAF DJF (1.83E-01)



RSRC_LOAD of EAF DJF (1.10E-01)



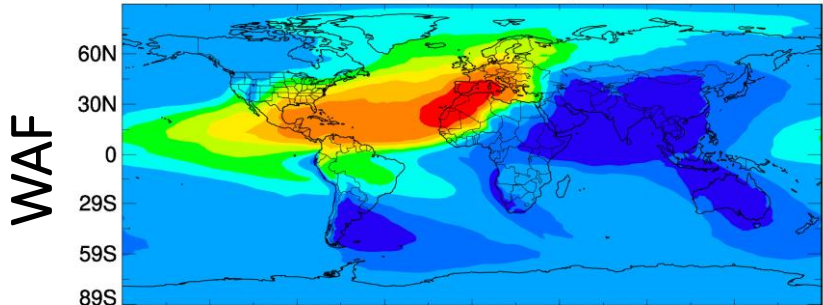
RSRC_LOAD of BOD DJF (7.74E-02)



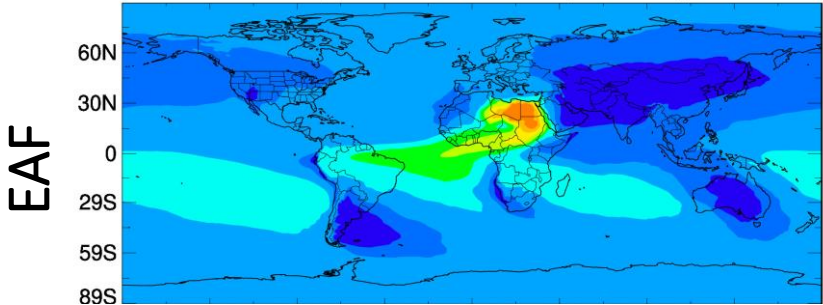
RSRC of African Dust (JJA)

GEOS

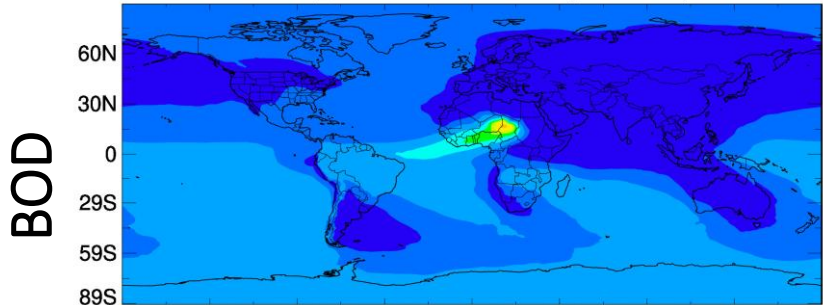
RSRC_LOAD of WAF JJA ($2.16E-01$)



RSRC_LOAD of EAF JJA ($1.50E-01$)

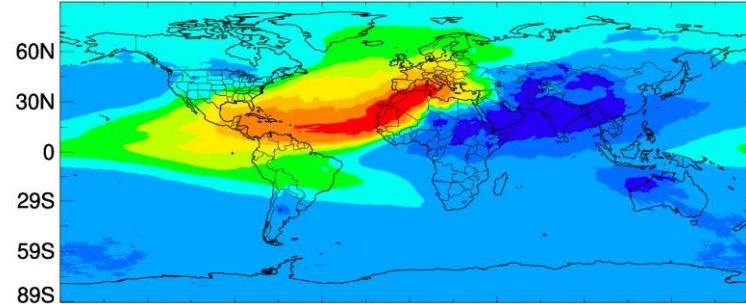


RSRC_LOAD of BOD JJA ($7.70E-02$)

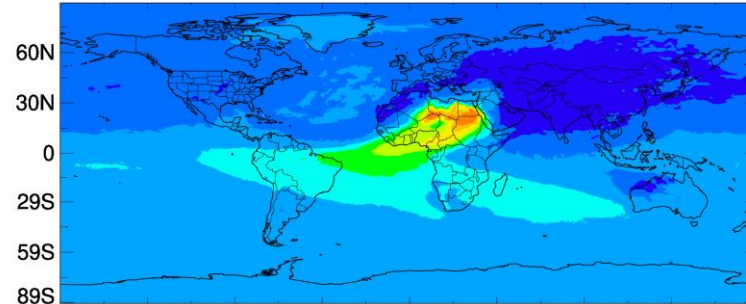


SPRINTARS

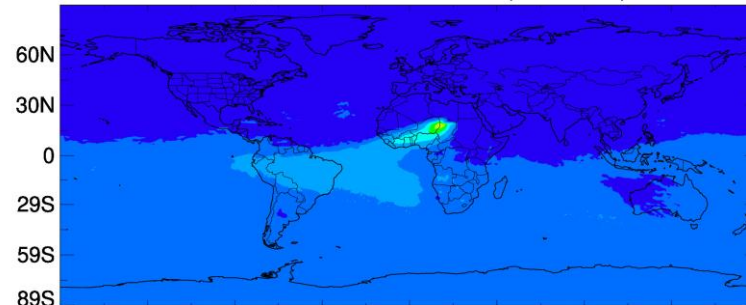
RSRC_LOAD of WAF JJA ($2.30E-01$)



RSRC_LOAD of EAF JJA ($1.42E-01$)

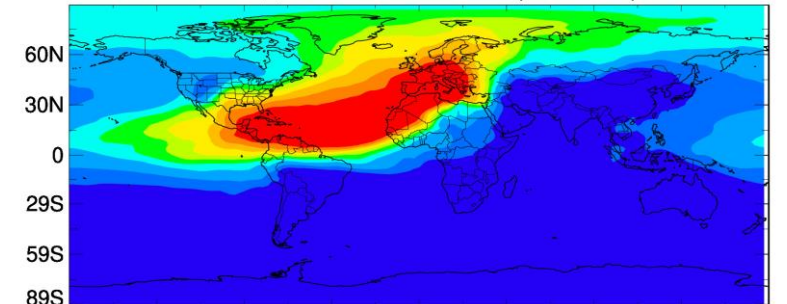


RSRC_LOAD of BOD JJA ($5.97E-02$)

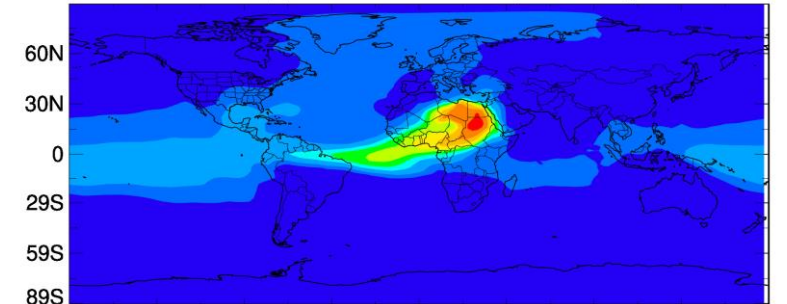


GEOS-chem

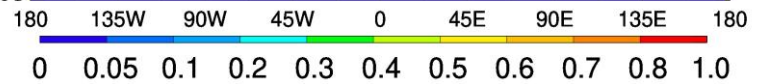
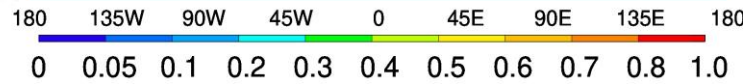
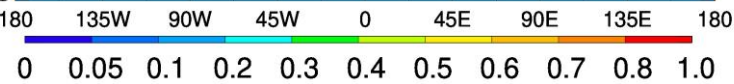
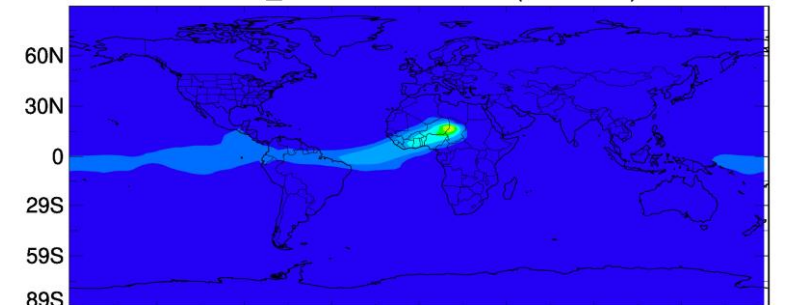
RSRC_LOAD of WAF JJA ($1.77E-01$)



RSRC_LOAD of EAF JJA ($6.37E-02$)



RSRC_LOAD of BOD JJA ($1.59E-02$)



Summary and Plan

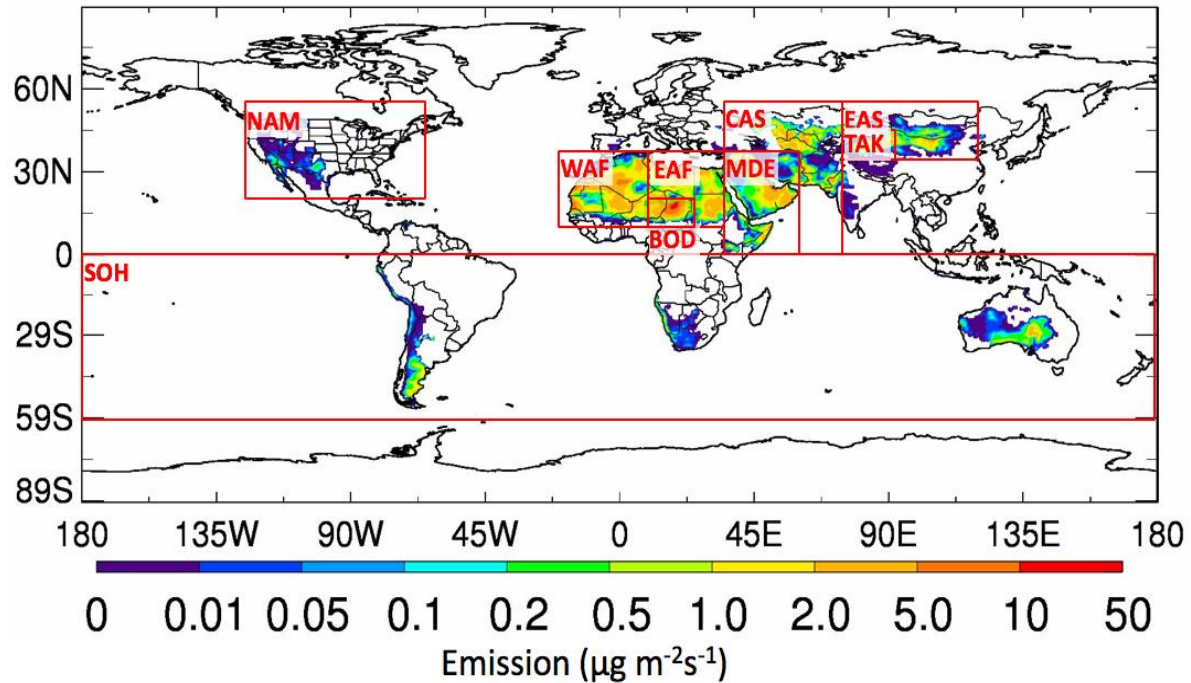
- DUSA experiment provides estimations of source contribution in various fields including **LOAD**, PM2.5, and DEP.
- Significant differences in RSRC is found between models
- Another major goals is global map of source attribution, using AeroCom model ensemble.
- **We need more model participation.**
- Thanks!

AEROCOM3/DUSA (Dust Source Attribution)

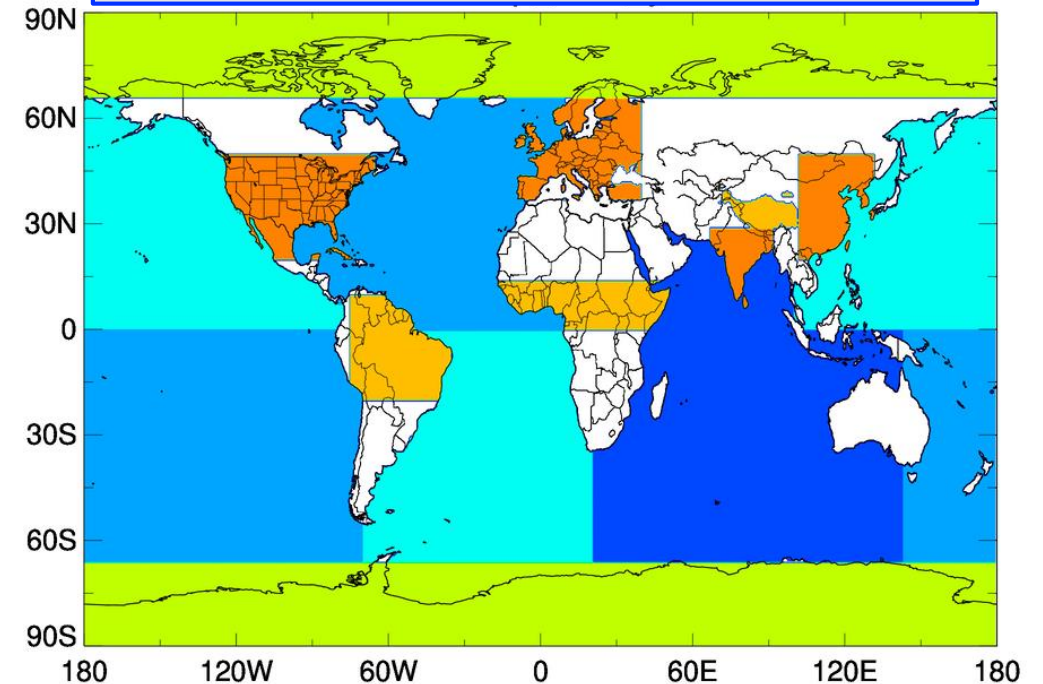
Aerocom meeting, October 13, 2020

Dongchul Kim, Mian Chin, Greg Schuster, Toshihiko Takemura, Paolo Tuccella, and
others

Source regions (9)

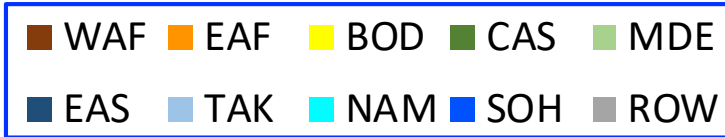
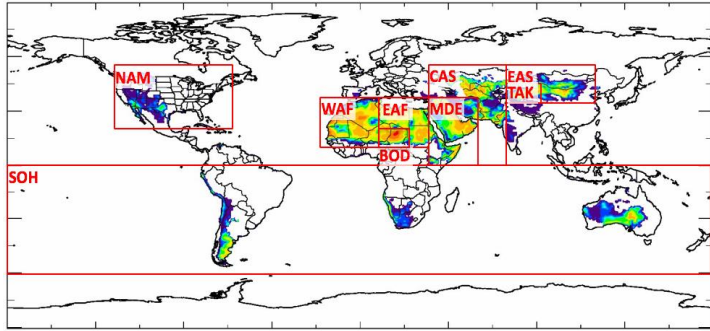


Receptor regions (14)

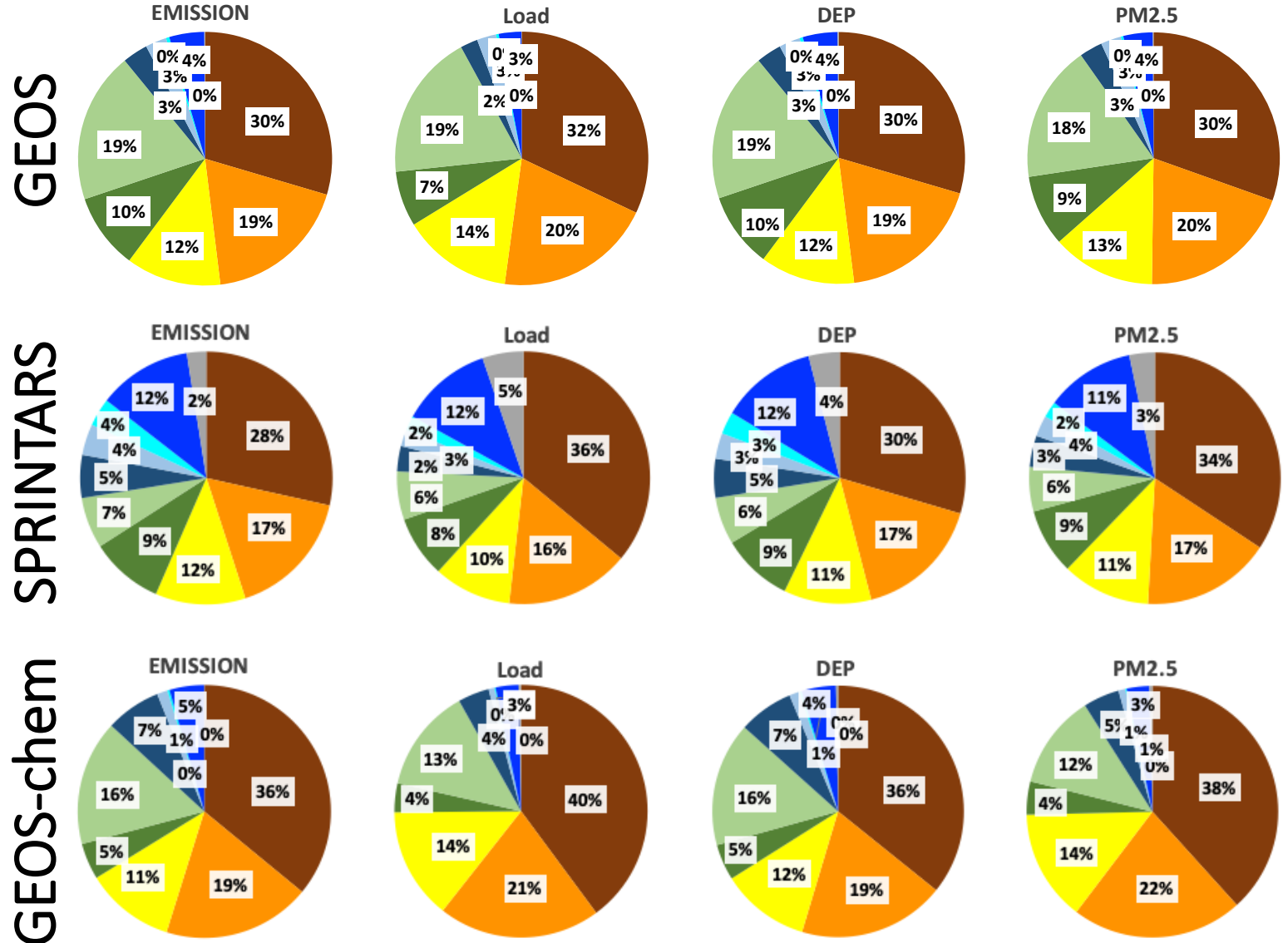


- Source regions (9)
- Receptor regions (14)
- Participating models (5): **GEOS**, **SPRINTARS**, **GEOS-chem**, GISS, CESM2
- DOD 10um is included (special experiment)
- Period: 4 years (2009-2012)

Source contribution in global scale (annual)



	Unit	GEOS	SPRINTARS	GEOS-chem
EMI	Tg yr ⁻¹	1417	2278	1130
LOAD	Tg yr ⁻¹	20.8	22.7	21.9
DEP	Tg yr ⁻¹	1418	2084	1132
PM2.5	μg m ⁻³	1.6	1.0	2.1



RSRC of Dust from WAF, EAF, and BOD (Annual)

GEOS

SPRINTARS

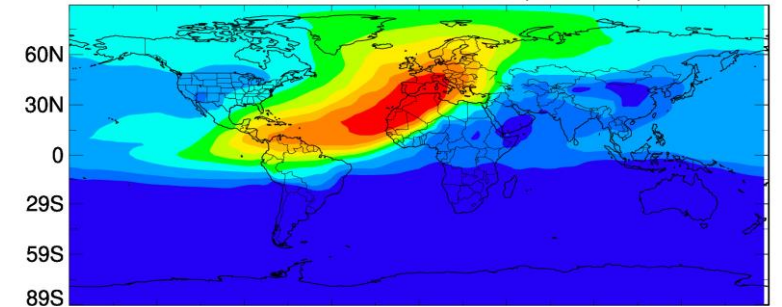
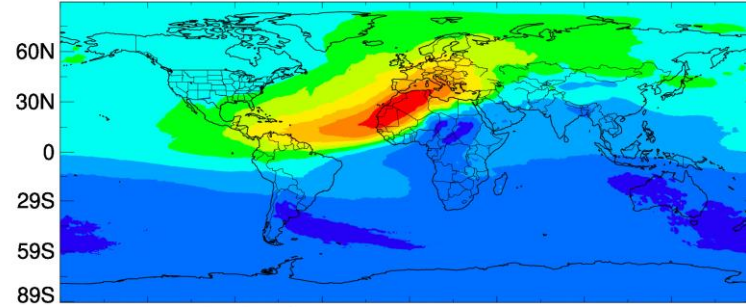
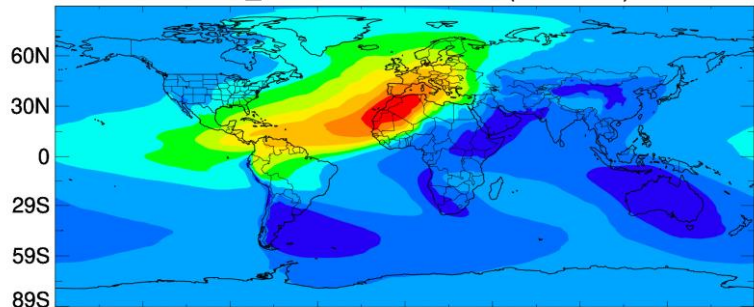
GEOS-chem

RSRC_LOAD of WAF ANN (1.85E-01)

RSRC_LOAD of WAF ANN (2.03E-01)

RSRC_LOAD of WAF ANN (1.62E-01)

WAF

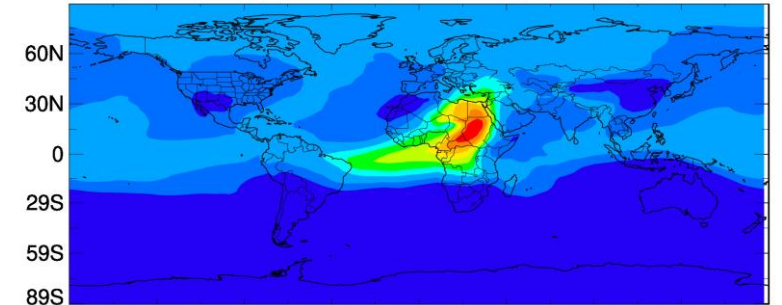
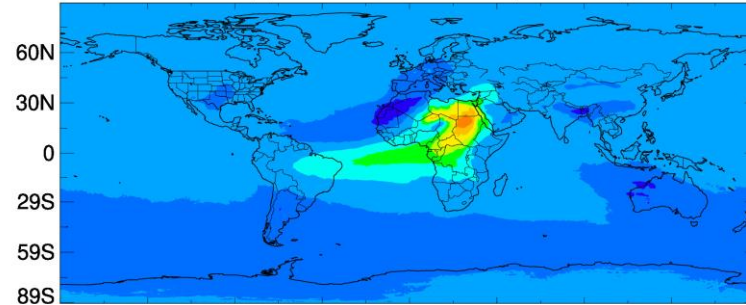
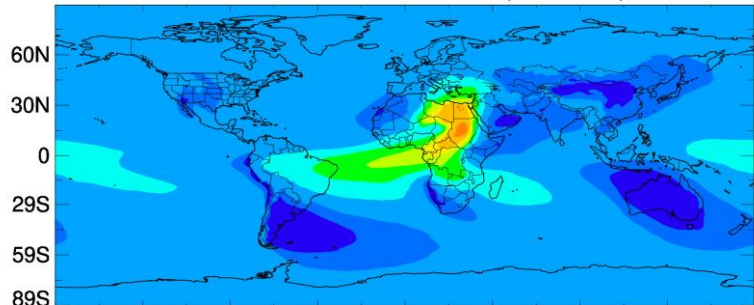


RSRC_LOAD of EAF ANN (1.50E-01)

RSRC_LOAD of EAF ANN (1.28E-01)

RSRC_LOAD of EAF ANN (8.64E-02)

EAF

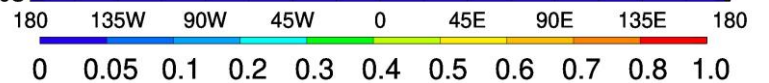
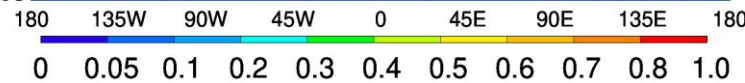
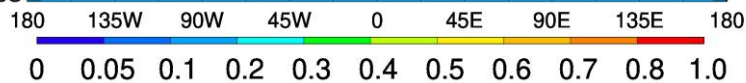
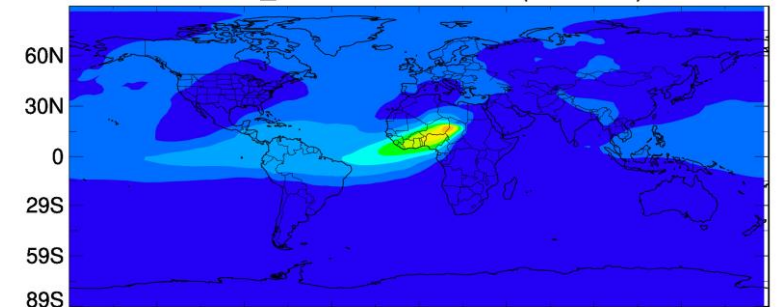
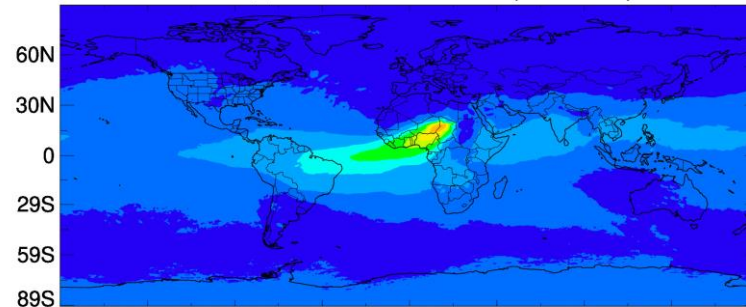
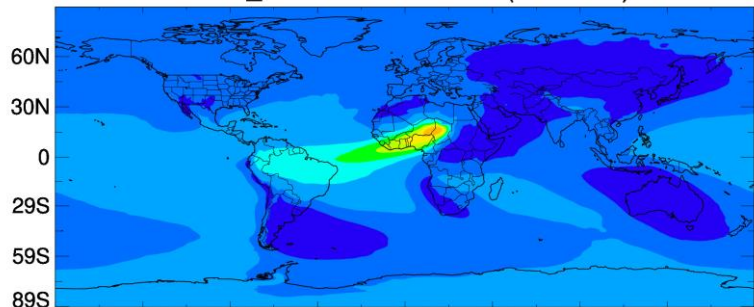


RSRC_LOAD of BOD ANN (9.50E-02)

RSRC_LOAD of BOD ANN (7.34E-02)

RSRC_LOAD of BOD ANN (4.49E-02)

BOD



RSRC of Dust from EAS, TAK, and MDE (Annual)

GEOS

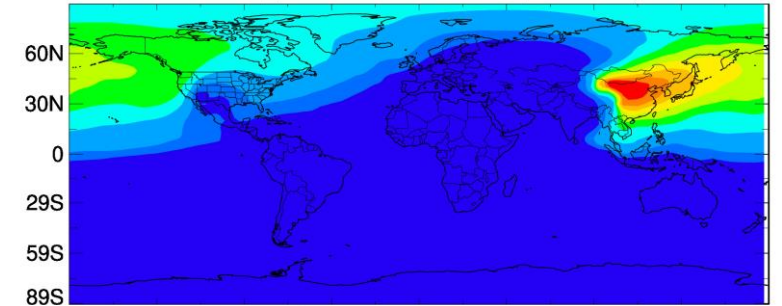
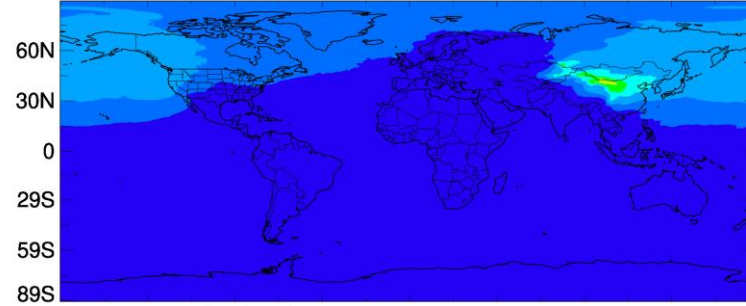
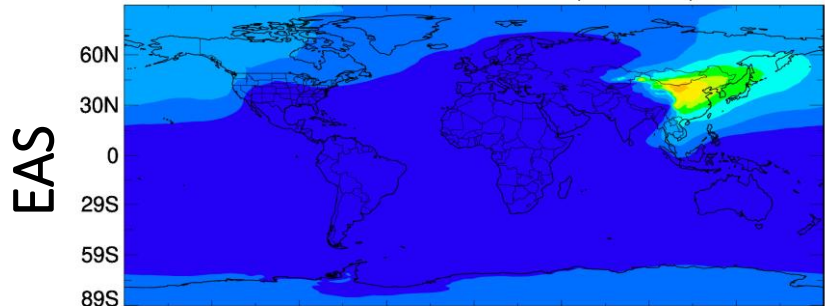
SPRINTARS

GEOS-chem

RSRC_LOAD of EAS ANN (4.56E-02)

RSRC_LOAD of EAS ANN (3.88E-02)

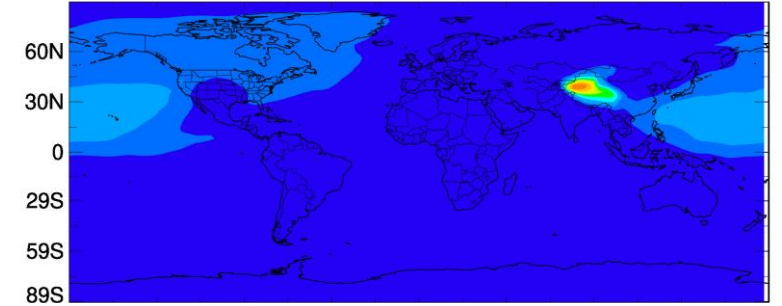
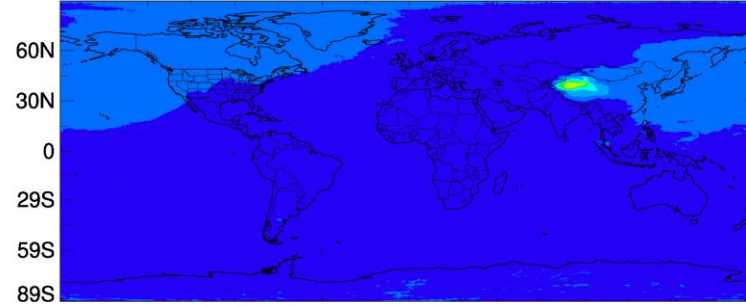
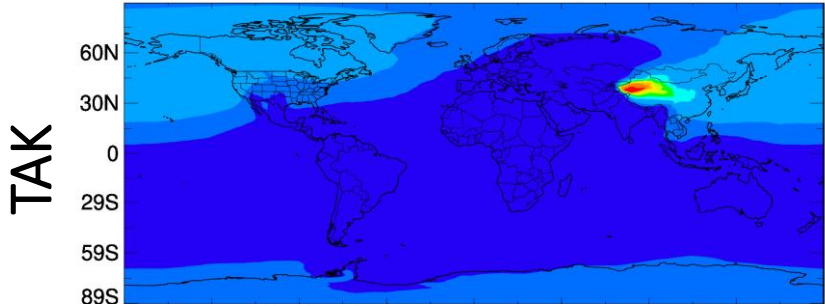
RSRC_LOAD of EAS ANN (8.18E-02)



RSRC_LOAD of TAK ANN (4.74E-02)

RSRC_LOAD of TAK ANN (3.59E-02)

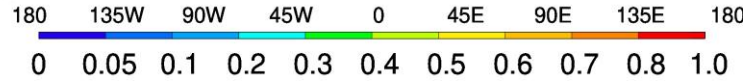
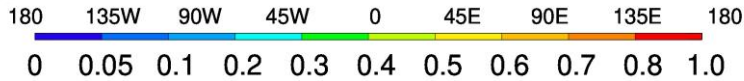
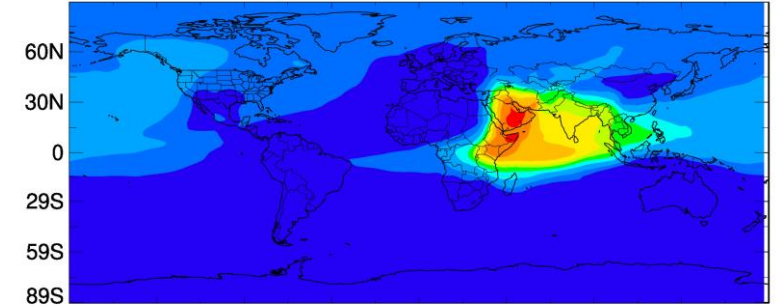
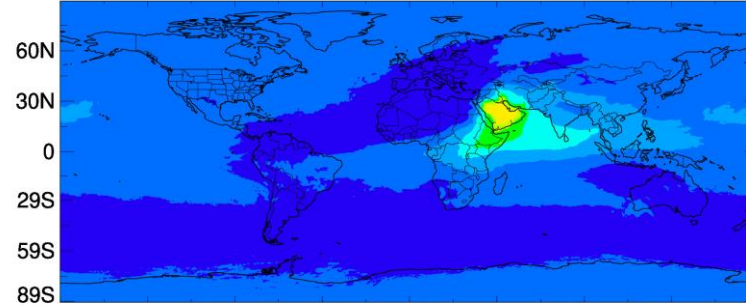
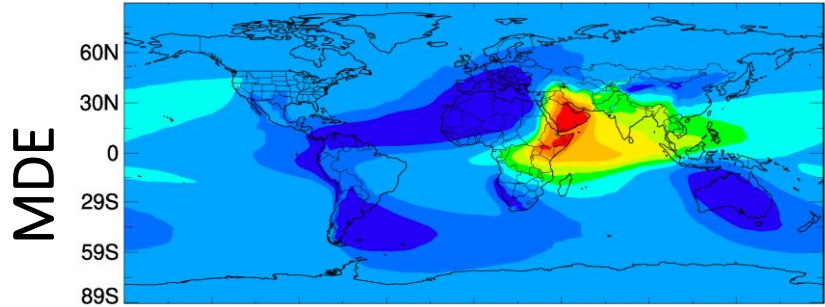
RSRC_LOAD of TAK ANN (2.66E-02)



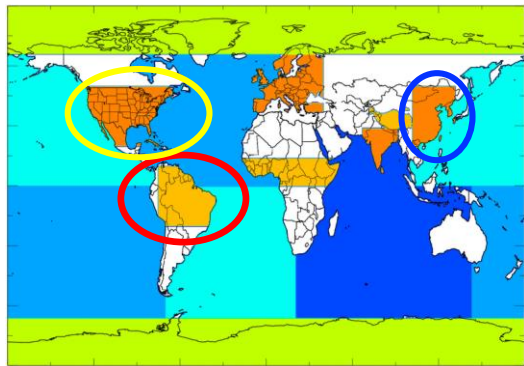
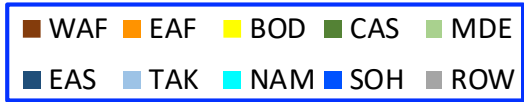
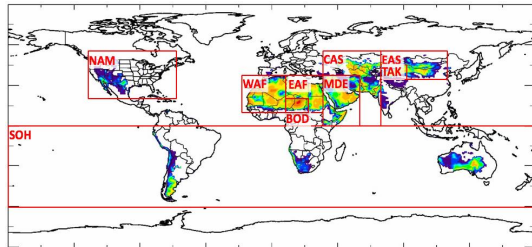
RSRC_LOAD of MDE ANN (1.65E-01)

RSRC_LOAD of MDE ANN (7.09E-02)

RSRC_LOAD of MDE ANN (8.72E-02)

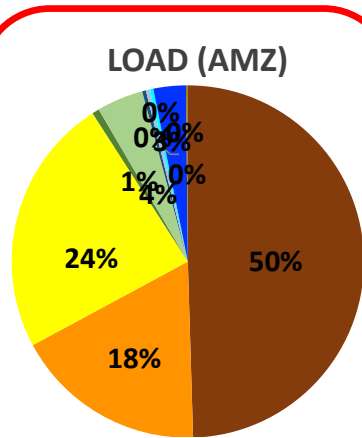


RSRC over various regions

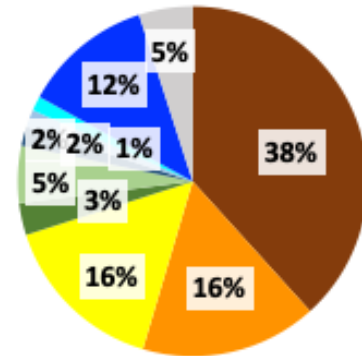


GEO5-chem SPRINTARS GEOS

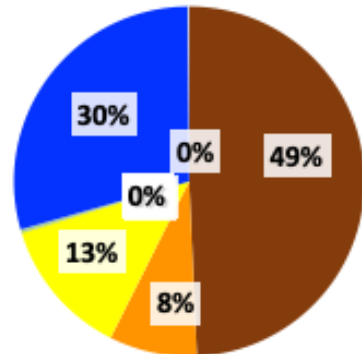
AMZ



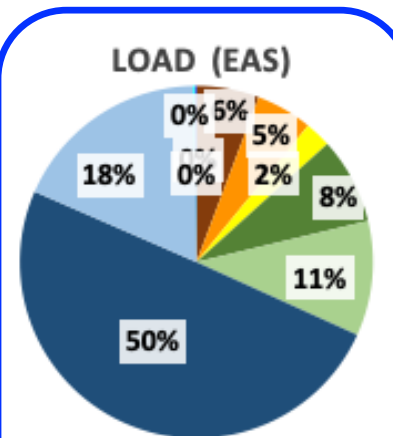
LOAD (AMZ)



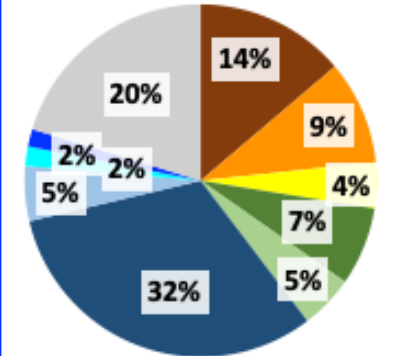
LOAD (AMZ)



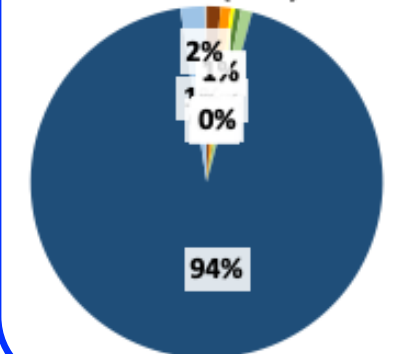
EAS



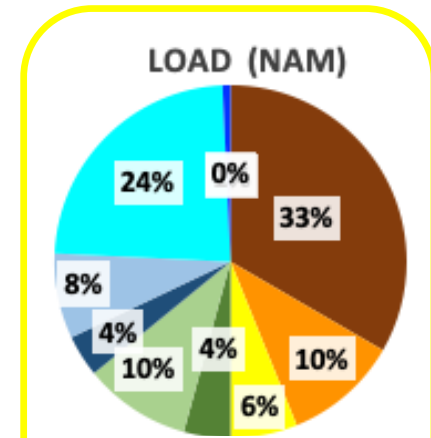
LOAD (EAS)



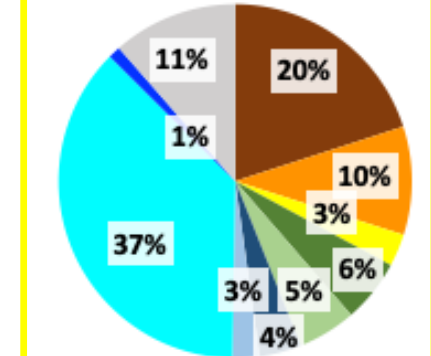
LOAD (EAS)



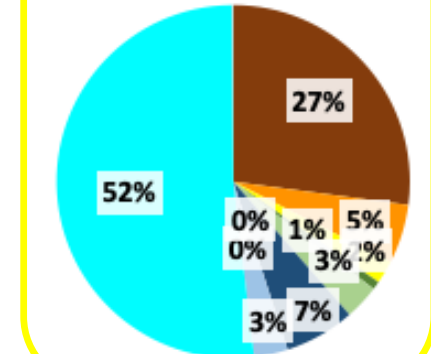
NAM



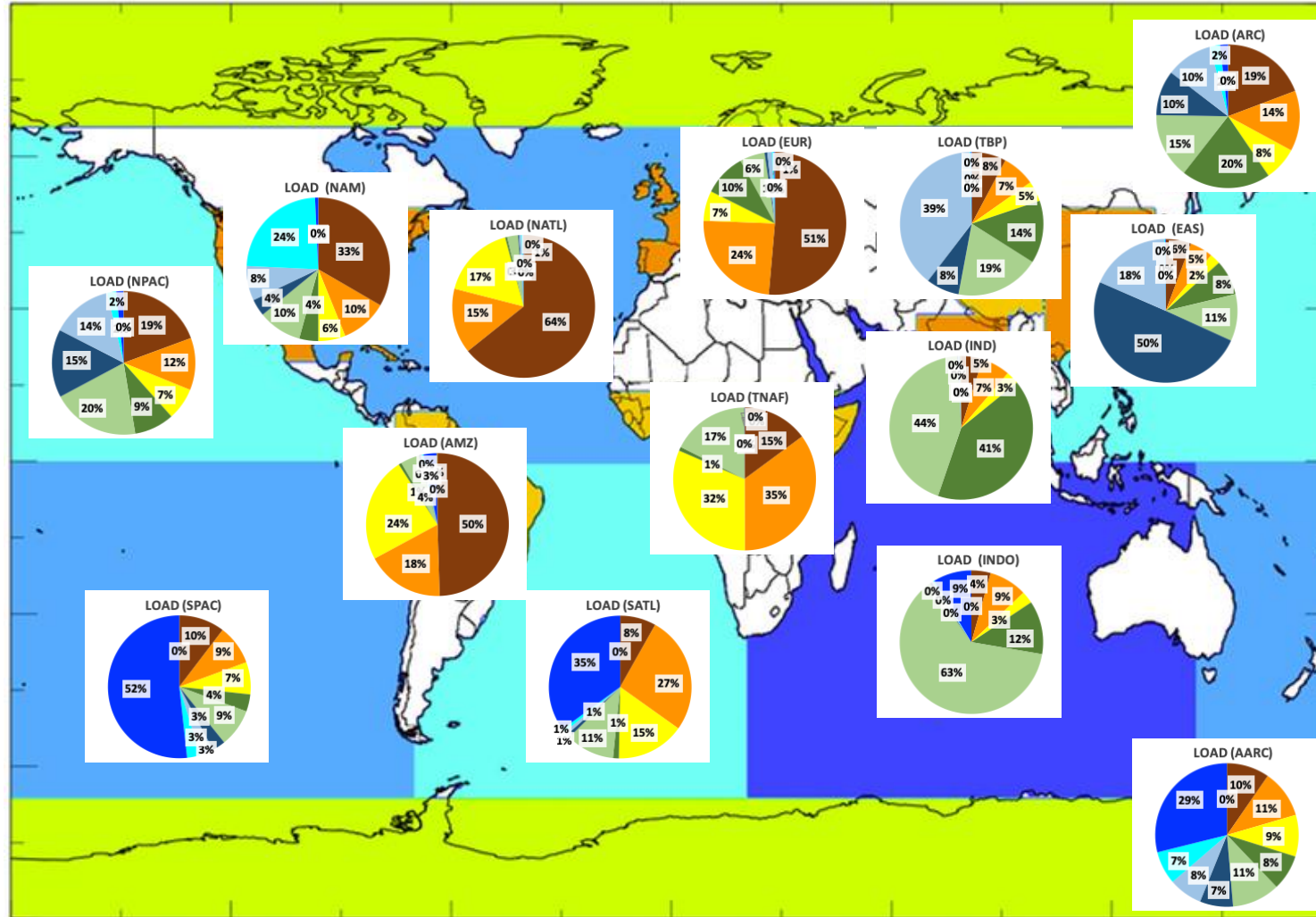
LOAD (NAM)



LOAD (NAM)



LOAD: Contribution of sources from GEOS



Summary and Plan

- DUSA experiment provides estimations of source contribution in various fields including **LOAD**, PM2.5, and DEP.
- Significant differences in RSRC is found between models
- Another major goals is global map of source attribution, using AeroCom model ensemble.
- **We need more model participation.**
- Thanks!