

An AeroCom intercomparison exercise on organic aerosol modeling

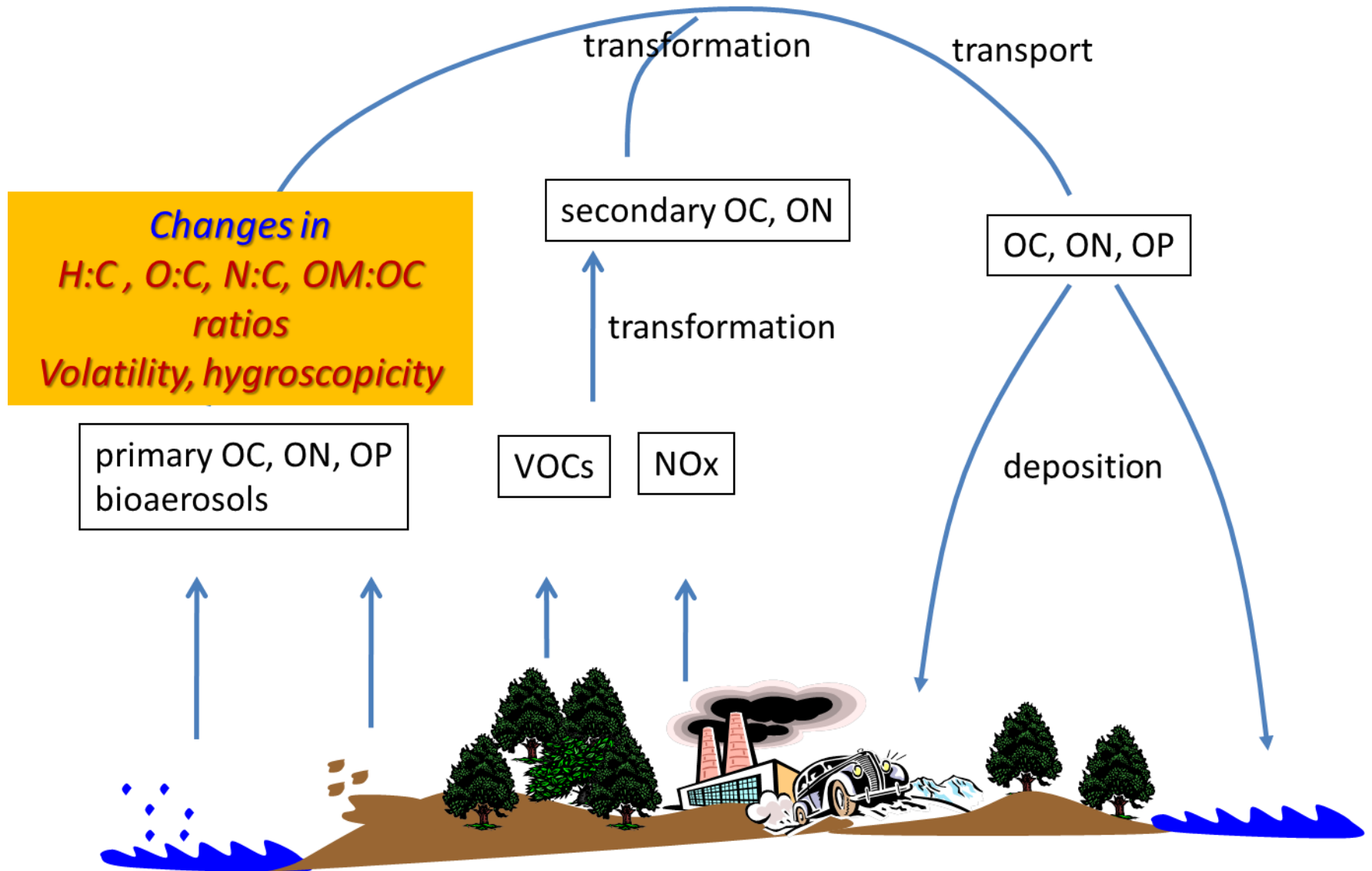
Kostas Tsigaridis,
Nikos Daskalakis, Maria Kanakidou,
AeroCom modelers and data providers

An AeroCom intercomparison exercise on organic aerosol modeling, in preparation for ACP

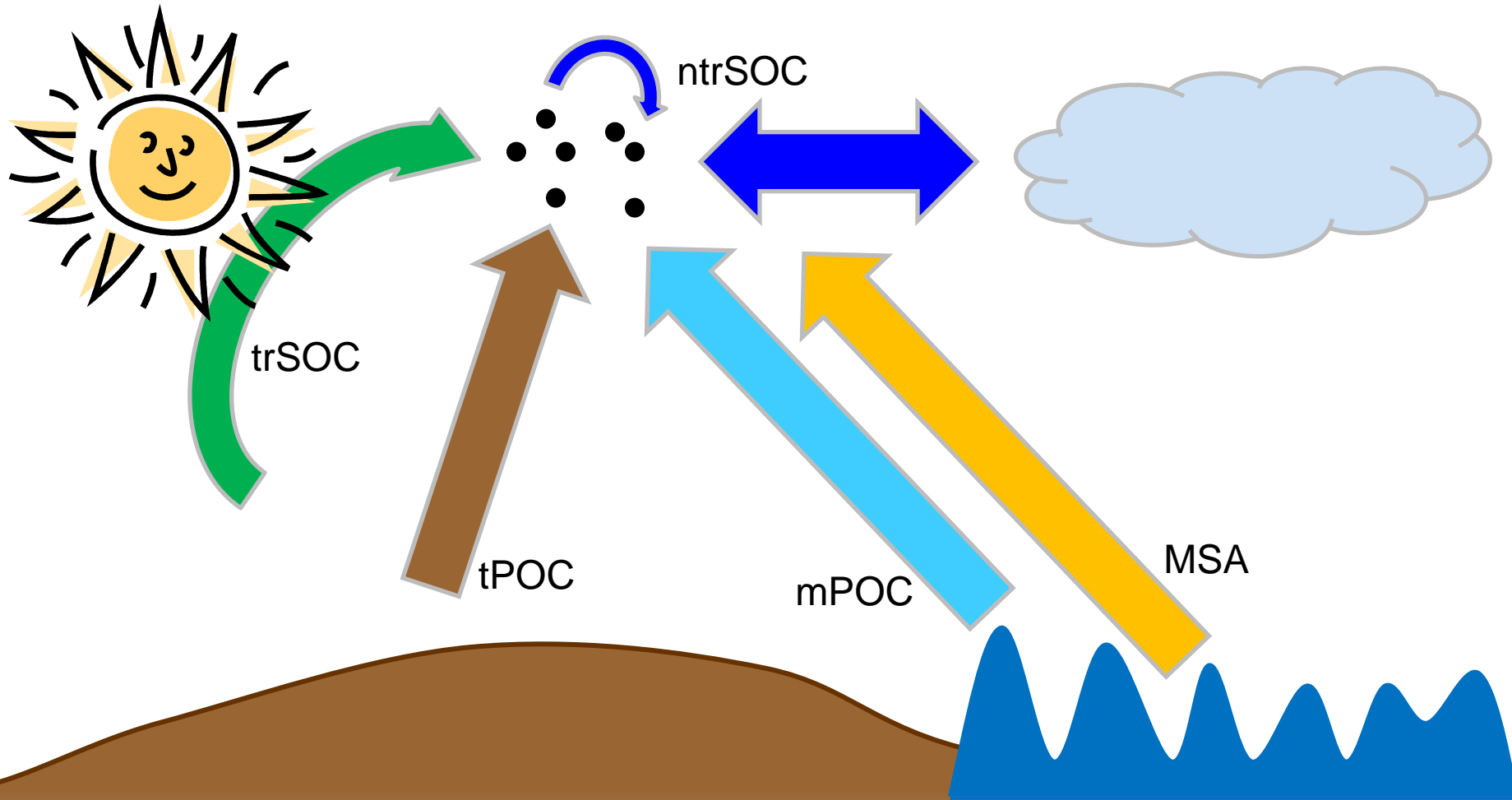
K. Tsigaridis^{1,2,*}, N. Daskalakis^{3,4}, M. Kanakidou³, P. J. Adams^{5,6}, P. Artaxo⁷, R. Bahadur⁸, Y. Balkanski⁹, S. E. Bauer^{1,2}, N. Bellouin¹⁰, A. Benedetti¹¹, T. Bergman¹², T. K. Berntsen^{13,14}, H. Bian¹⁵, K. Carslaw¹⁶, M. Chin¹⁷, G. Curci¹⁸, T. Diehl^{17,19}, R. Easter²⁰, S. Ghan²⁰, S. L. Gong²¹, C. R. Hoyle²², T. Iversen²³, S. Jathar⁵, J.-L. Jimenez²⁴, J. W. Kaiser¹¹, A. Kirkevåg²³, D. Koch^{1,2,25}, H. Kokkola¹², Y. H. Lee^{5,26}, G. Lin²⁷, X. Liu²⁰, G. Luo²⁸, X. Ma^{29,30}, G. Mann³¹, N. Mihalopoulos³, J.-J. Morcrette¹¹, J.-F. Müller³², G. Myhre¹⁴, S. Myriokefalitakis^{3,4}, S. Ng³³, D. O'Donnell^{34,35}, J. E. Penner²⁷, L. Pozzoli³⁶, K. J. Pringle^{37,38}, L. M. Russell⁸, M. Schulz²³, J. Sciare⁹, Ø. Seland²³, D. Shindell^{2,1}, S. Sillman²⁷, R. B. Skeie¹⁴, D. Spracklen¹⁶, J. Stavrakou³², S. Steenrod¹⁹, A. Strunk³⁹, T. Takemura⁴⁰, H. Tost⁴¹, T. van Noije³⁹, K. von Salzen²⁹, F. Yu²⁸, Z. Wang⁴², Z. Wang⁴³, R. Zaveri²⁰, H. Zhang⁴², K. Zhang^{34,44}, Q. Zhang⁴⁵, X. Zhang⁴³

67 authors, 45 affiliations and ~31 models

OA life cycle

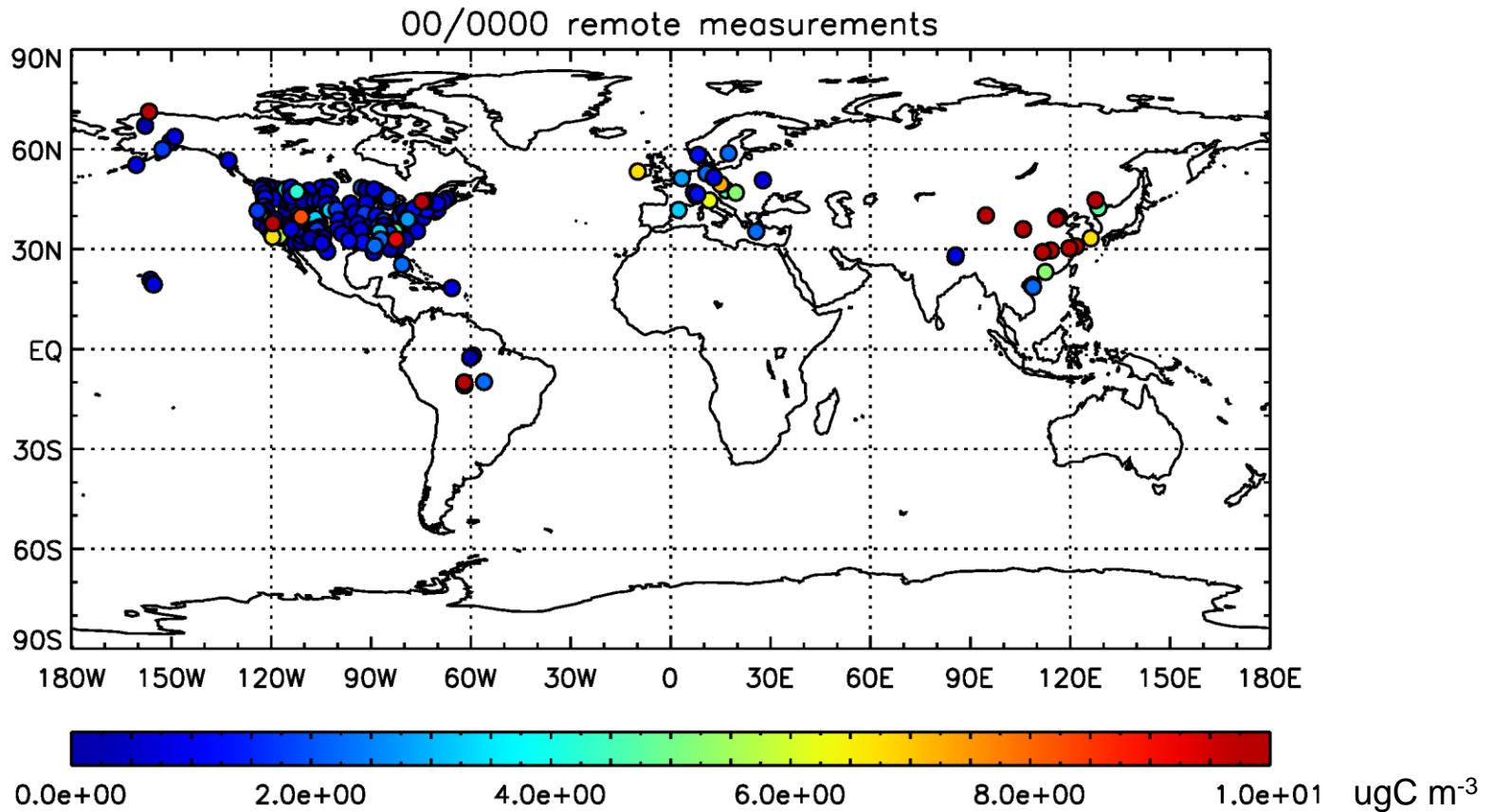


Source apportionment

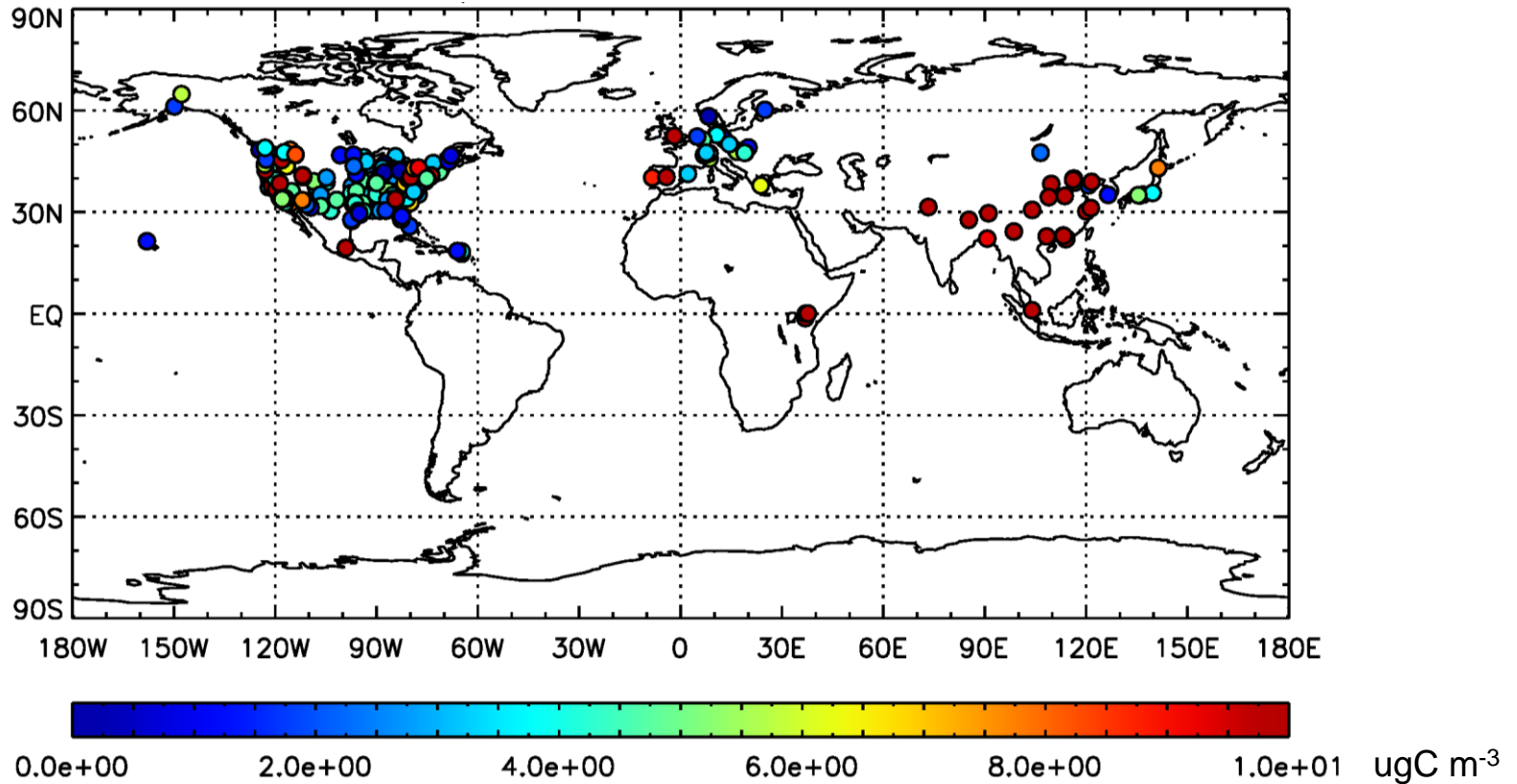


What do **observations** tell us about
the surface OA distribution?

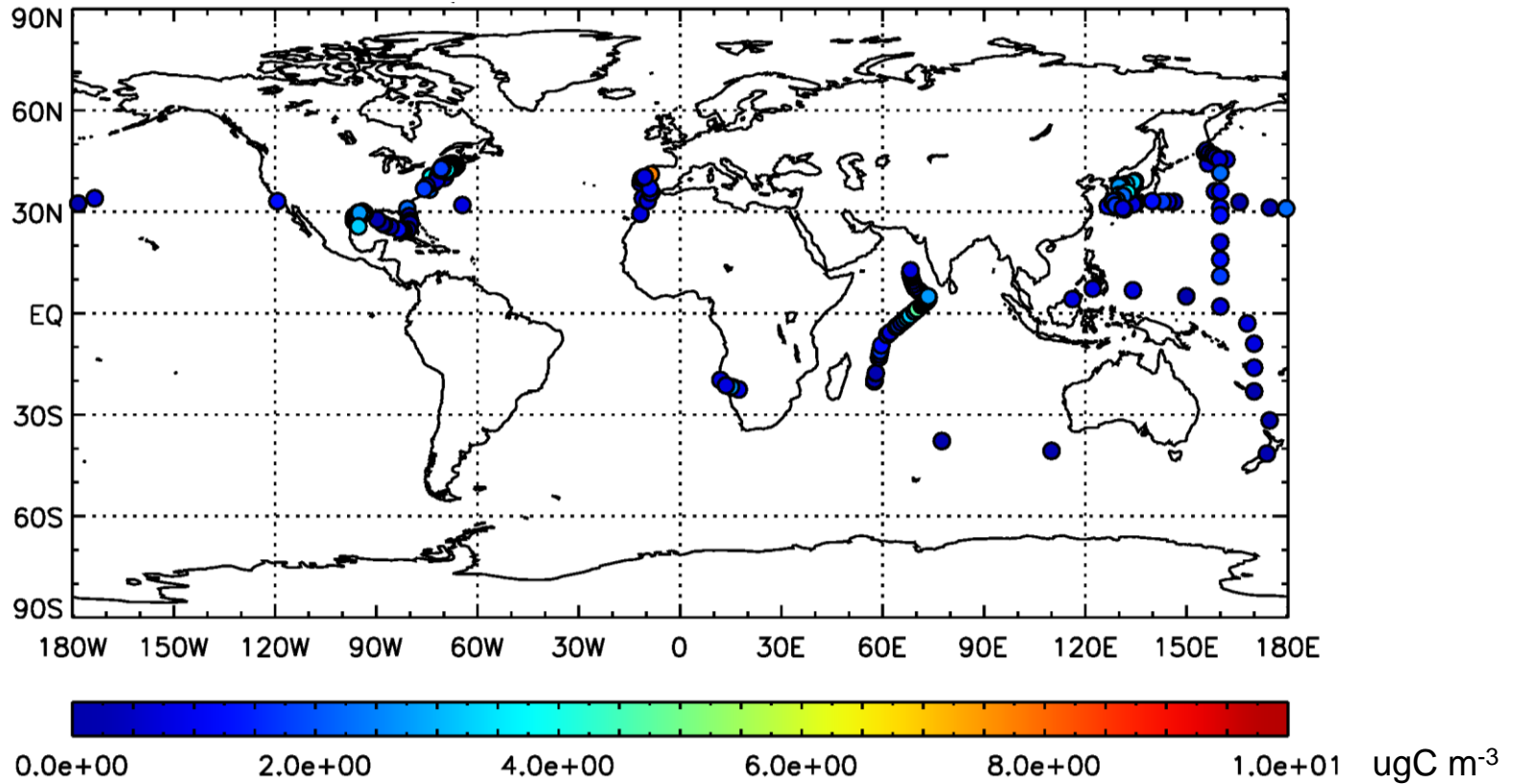
OC measurements – remote



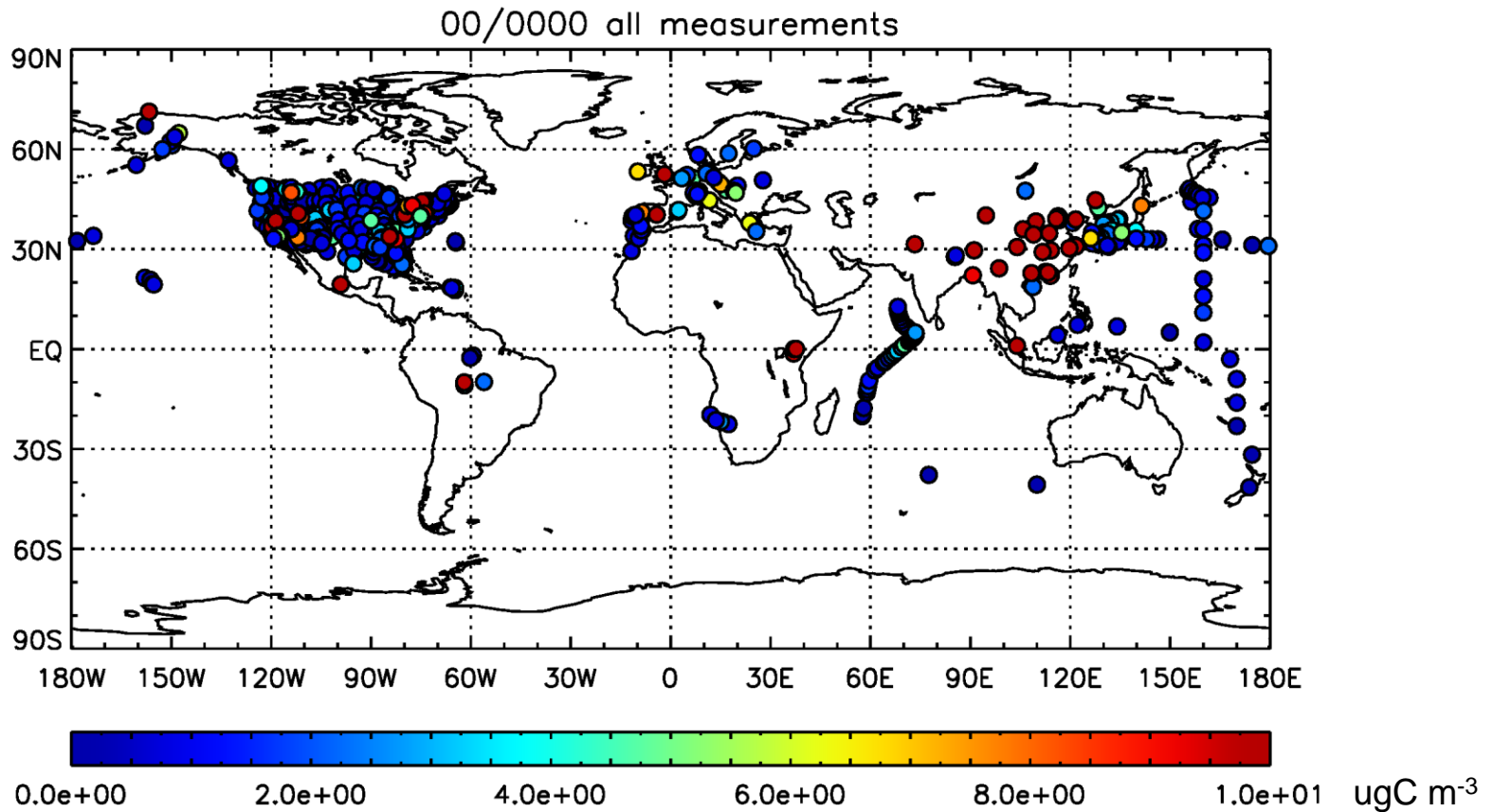
OC measurements – urban



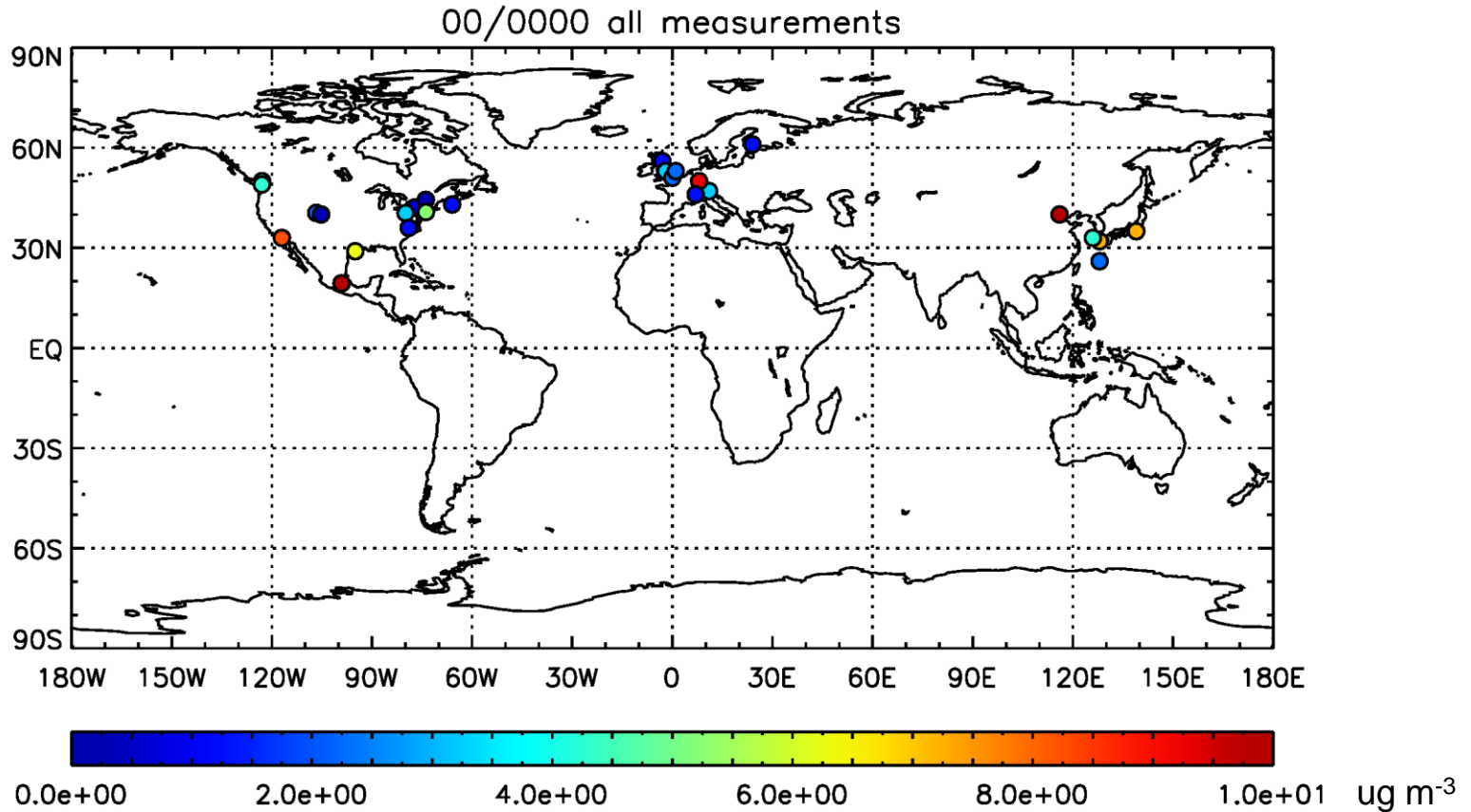
OC measurements – marine



OC measurements – all



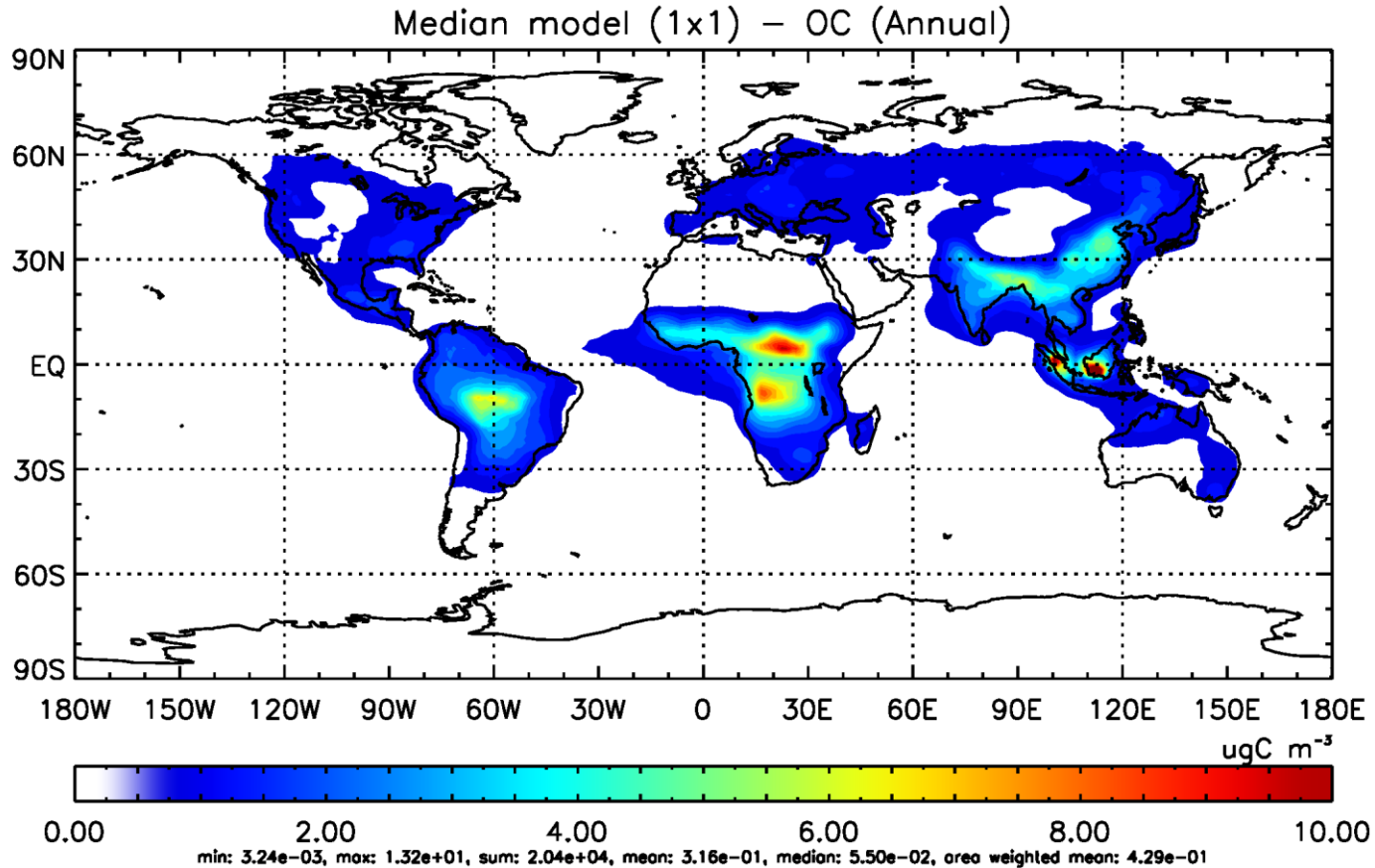
OM measurements – all



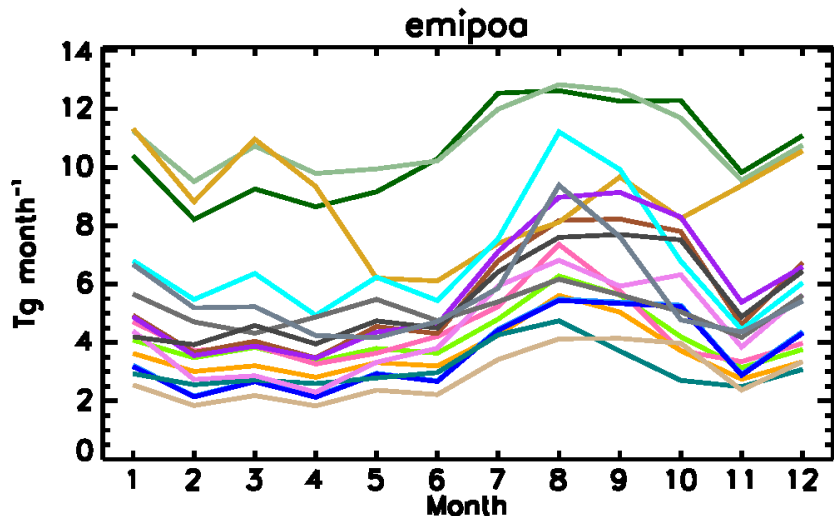
Some stations are missing, we do not have access yet to all available data

What do **models** tell us about
the surface OA distribution?

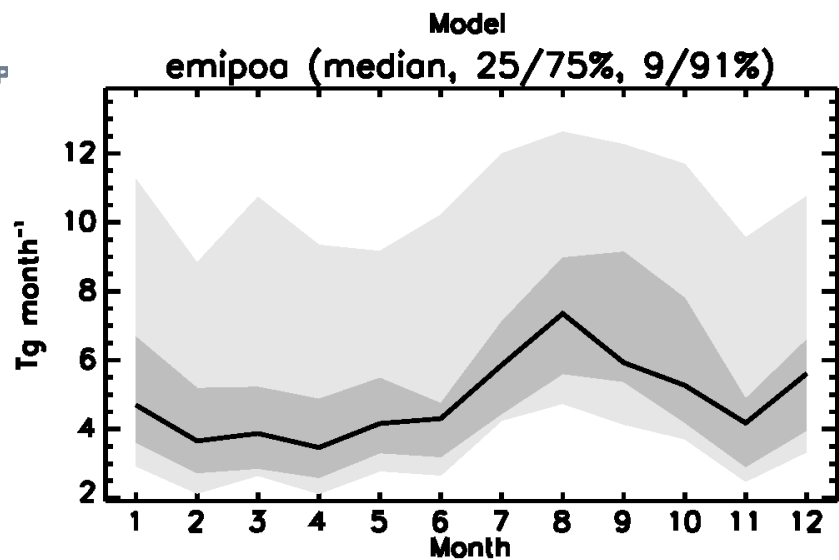
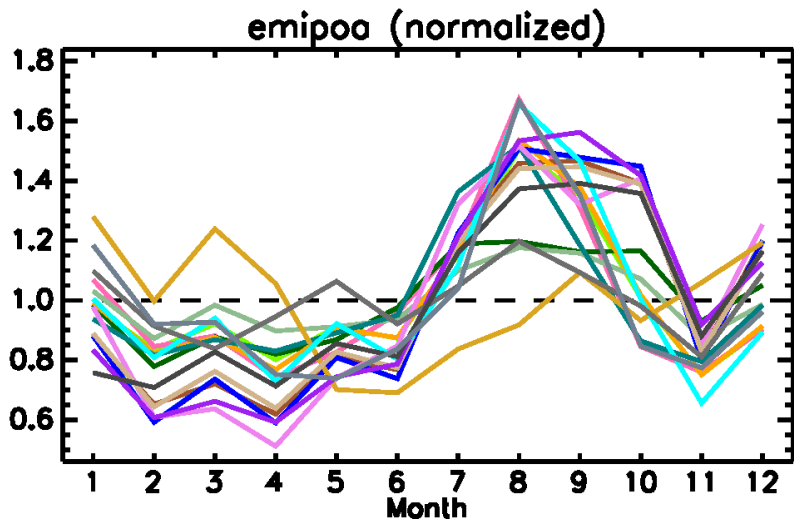
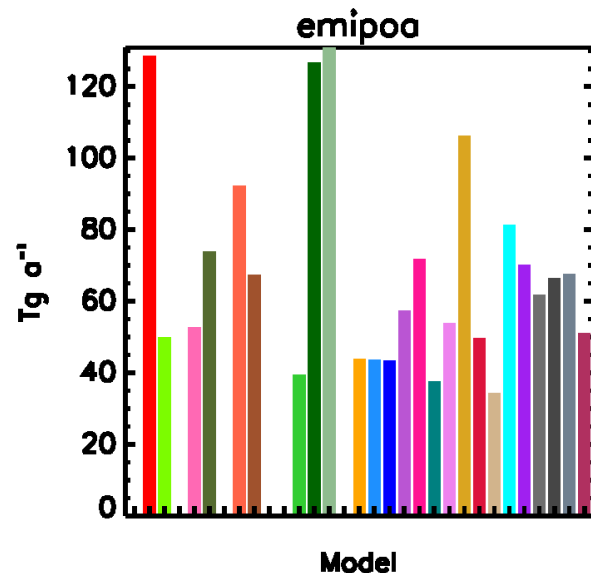
Surface median OC (31 models)



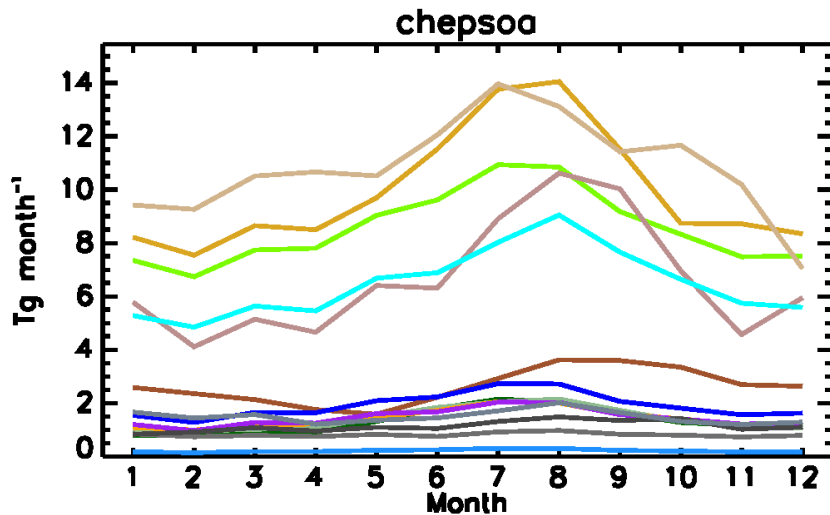
POA emissions



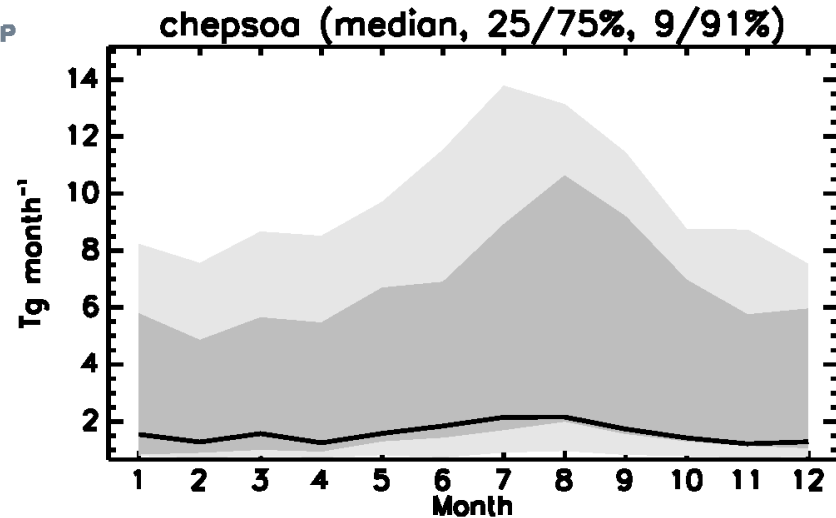
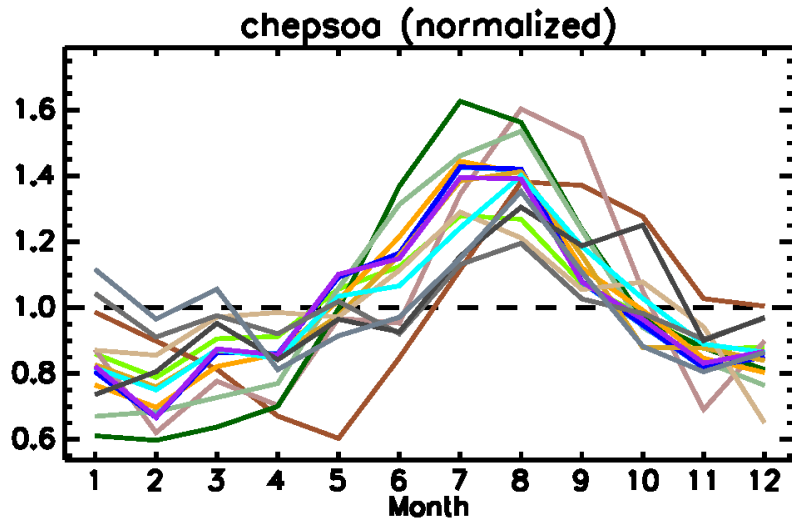
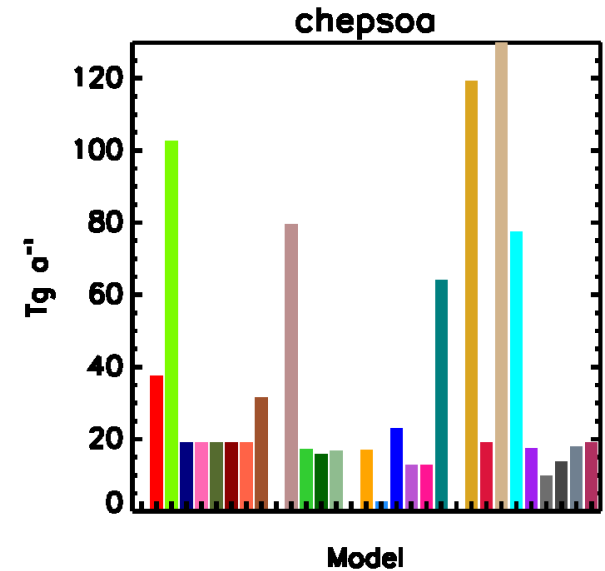
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- CAM4-Oslo
- CAM5-MAM3
- ConAM-PAM
- ECHAM5-HAMMOZ
- ECHAM5-SALSA
- ECMWF-GEMS
- EMAC
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- TM4-ECPL-C
- TM4-ECPL-F
- TM4-ECPL-FNP
- TM5



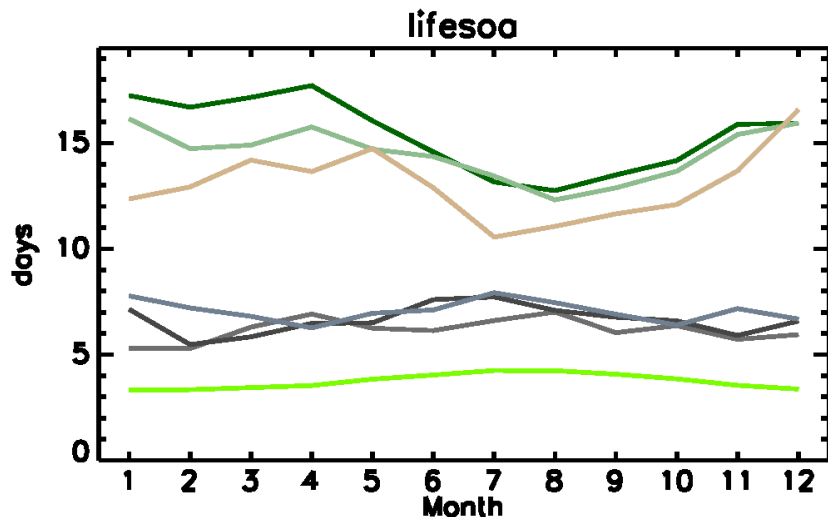
SOA chemical production



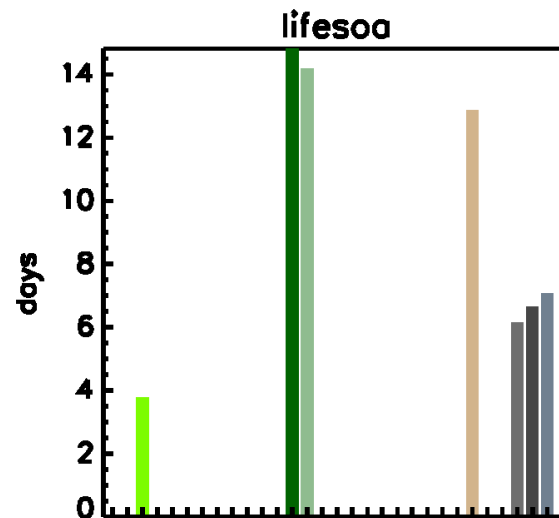
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SOA lifetime

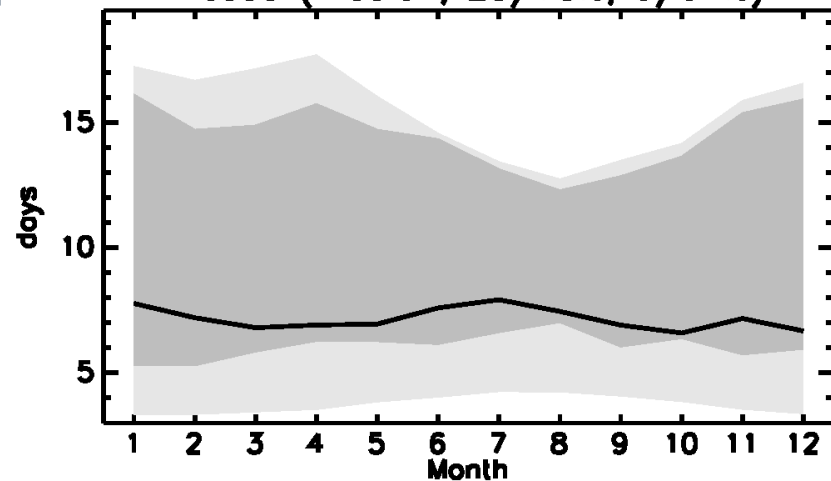


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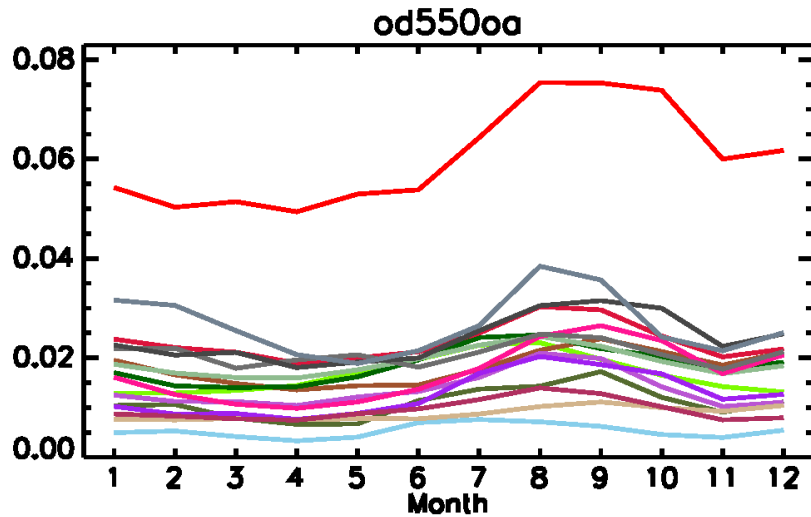


Model

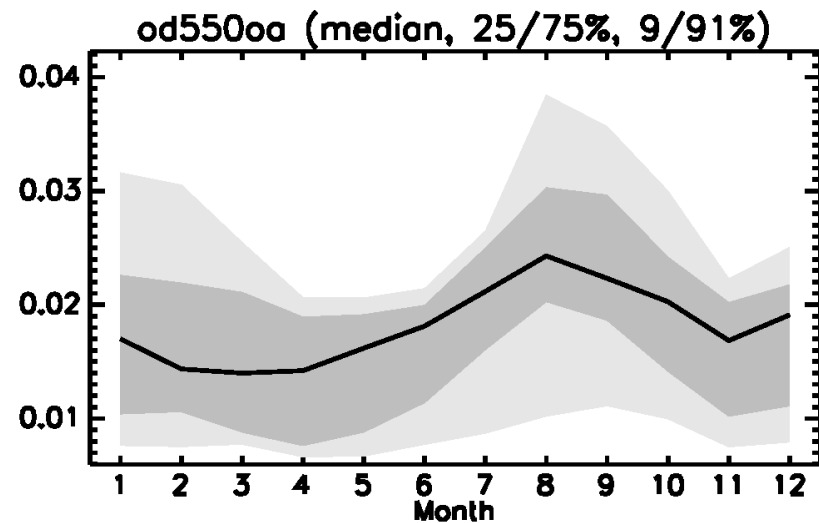
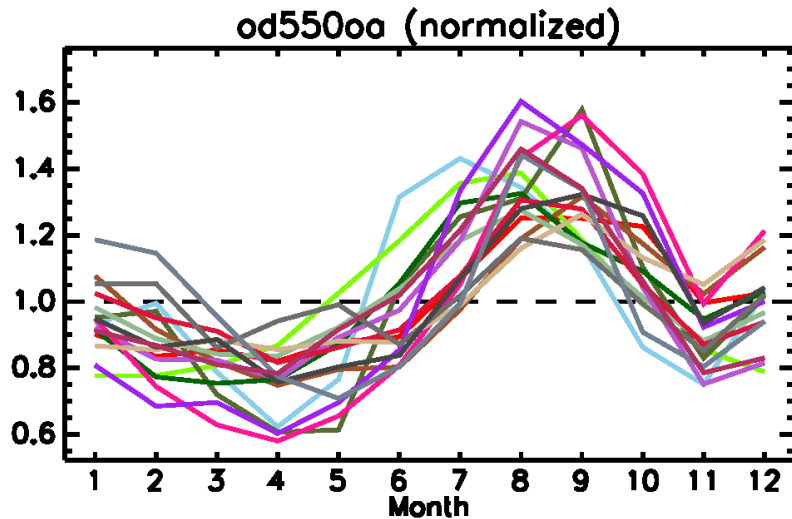
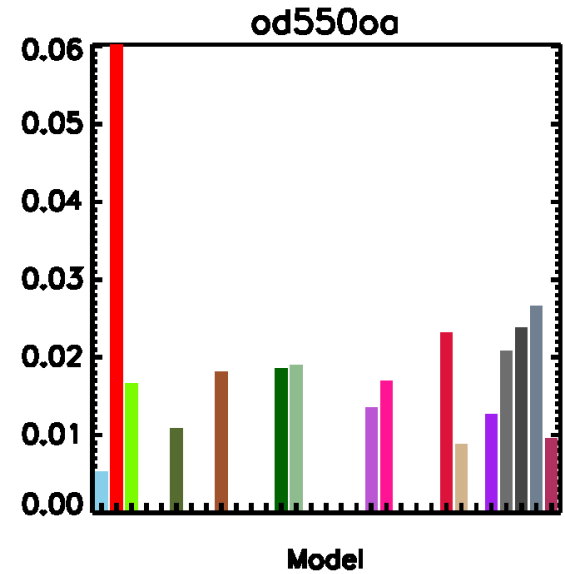
lifeso (median, 25/75%, 9/91%)

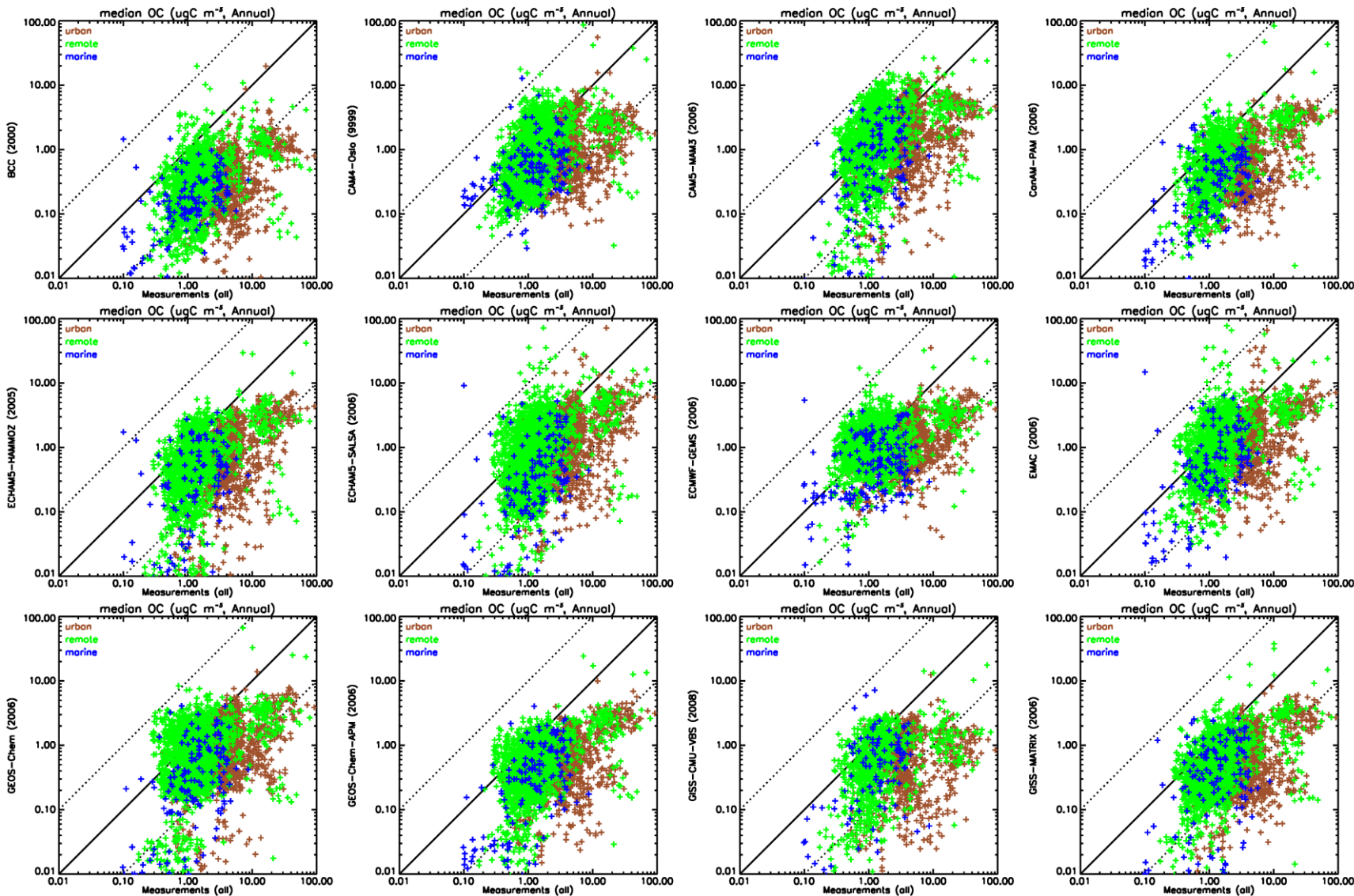


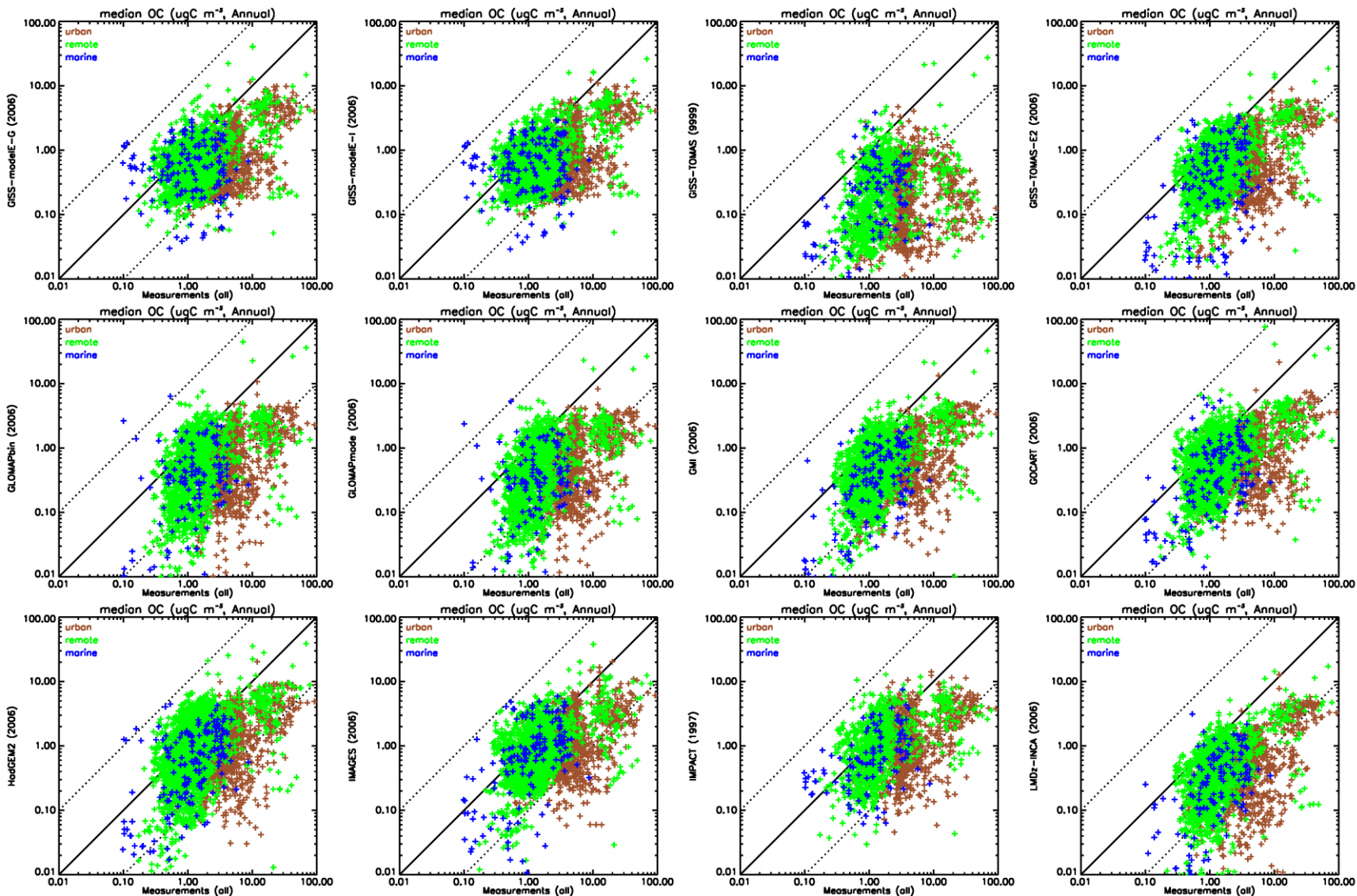
Aerosol optical depth – all sky

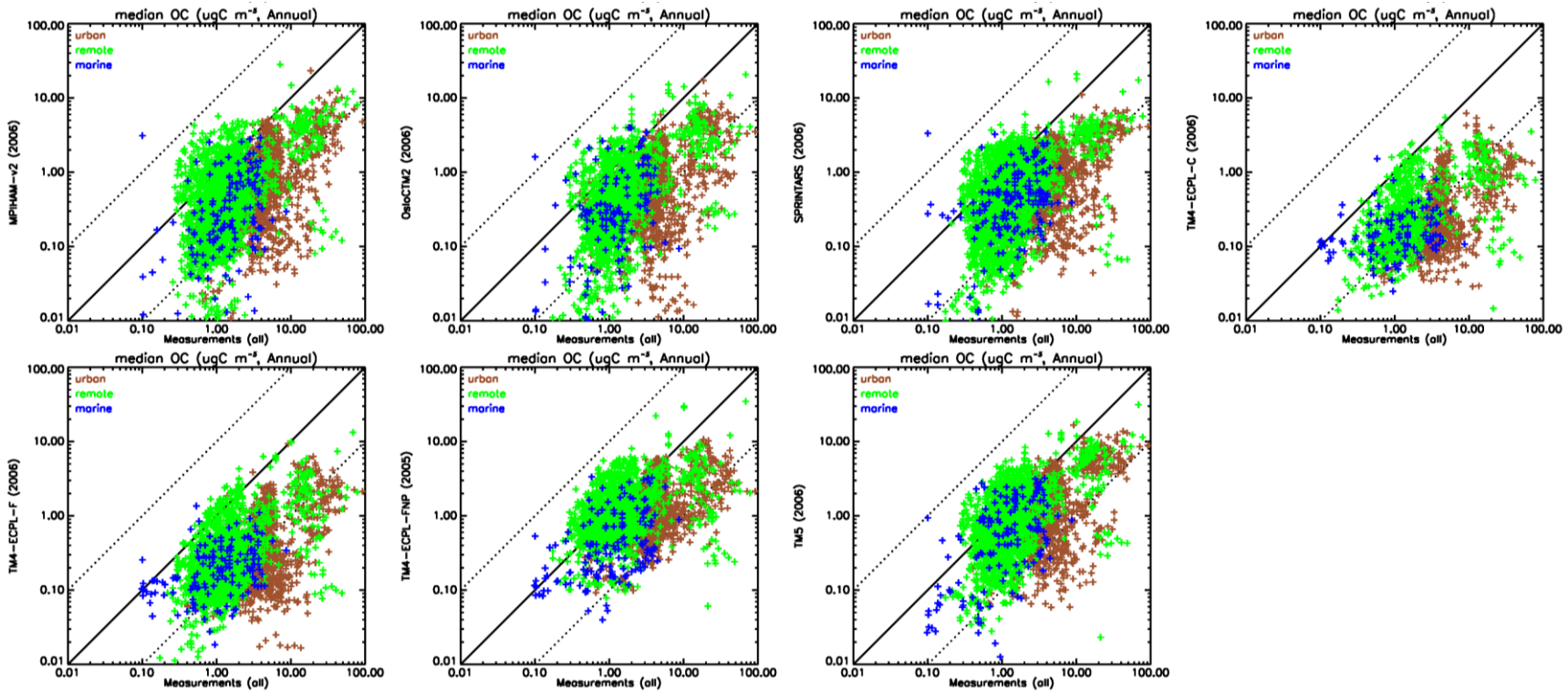


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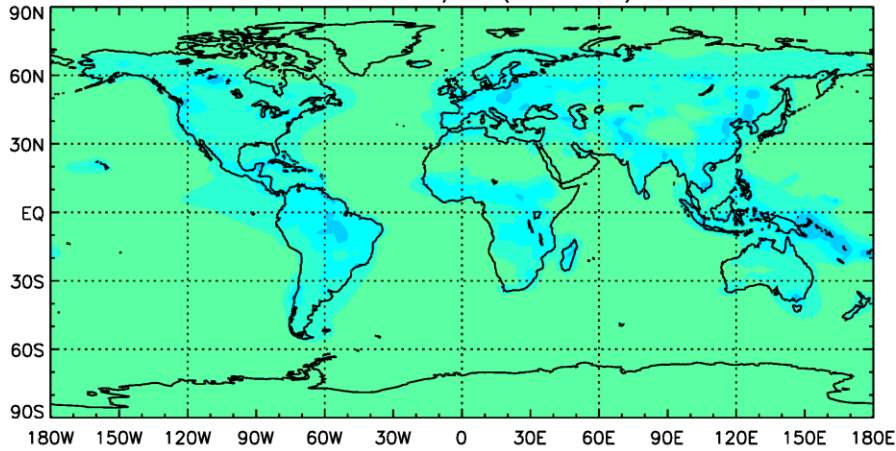


Drivers of model differences

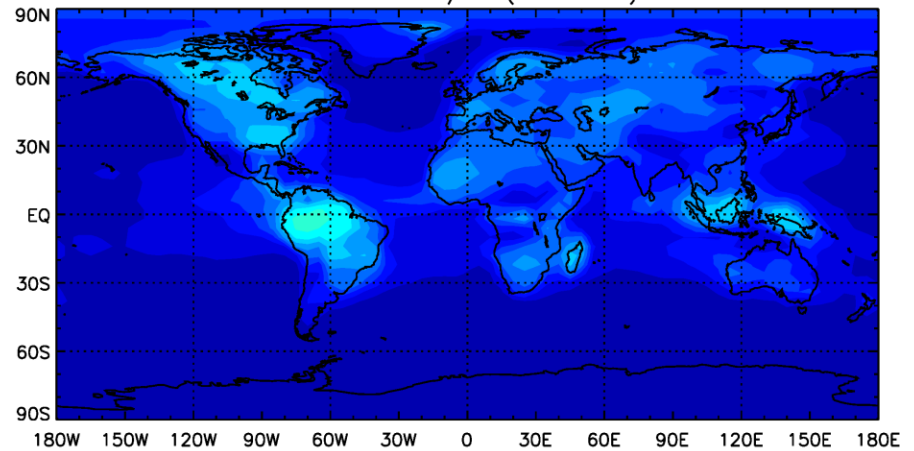
- Host model
- OM/OC
- Missing or different sources
- Atmospheric processing
- OA properties

OM/OC

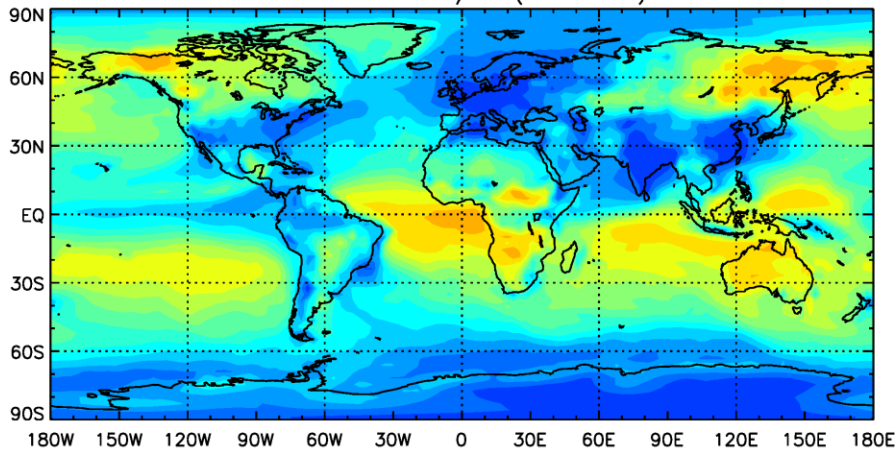
IMAGES - OM/OC (ANN 2006)



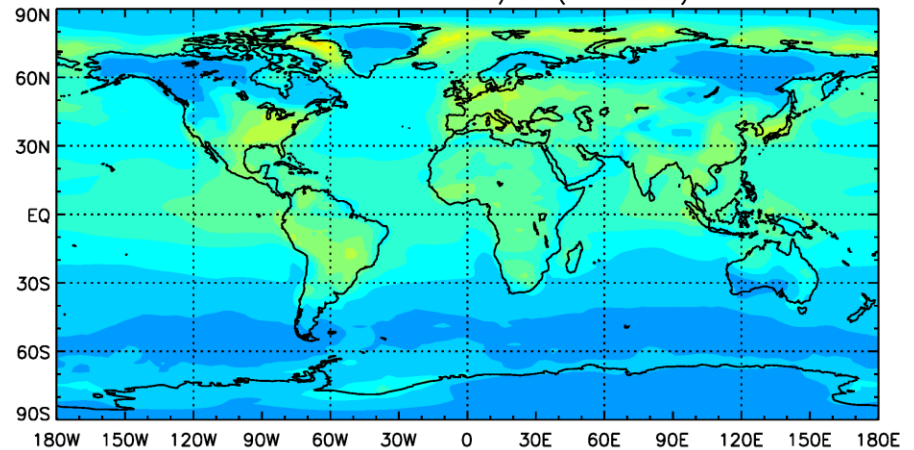
IMPACT - OM/OC (ANN 1997)



OsloCTM2 - OM/OC (ANN 2006)



TM4-ECPL-FNP - OM/OC (ANN 2005)



1.40

1.68

1.96

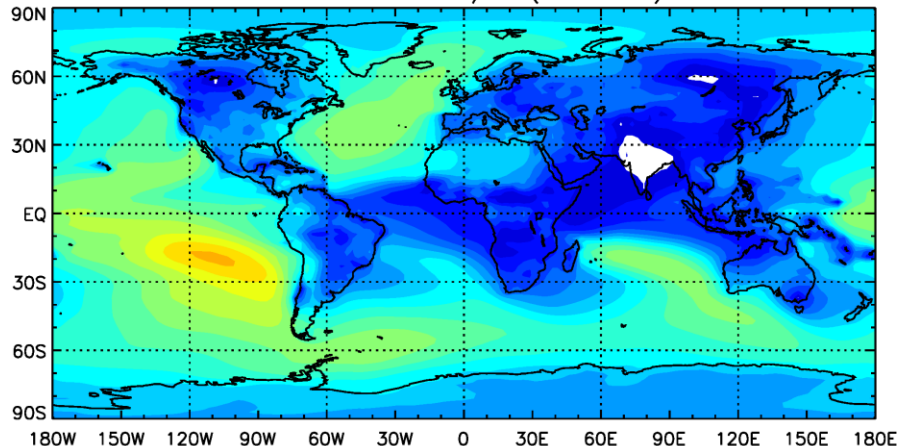
2.24

2.52

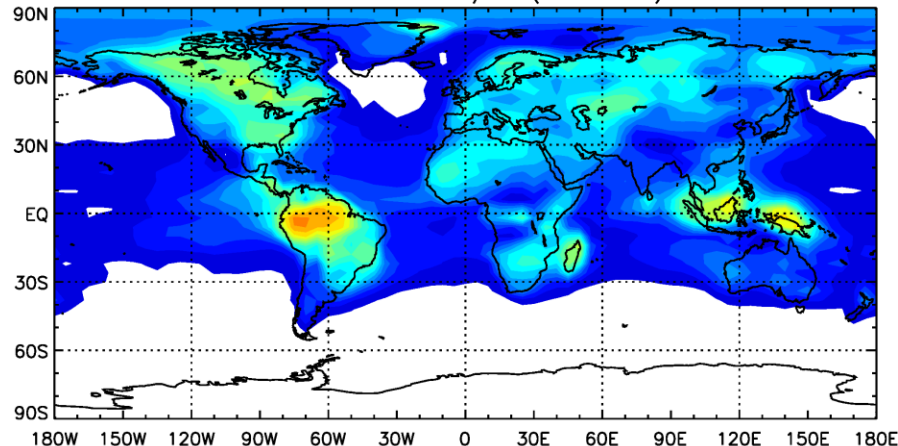
2.80

ntrSOC/OC

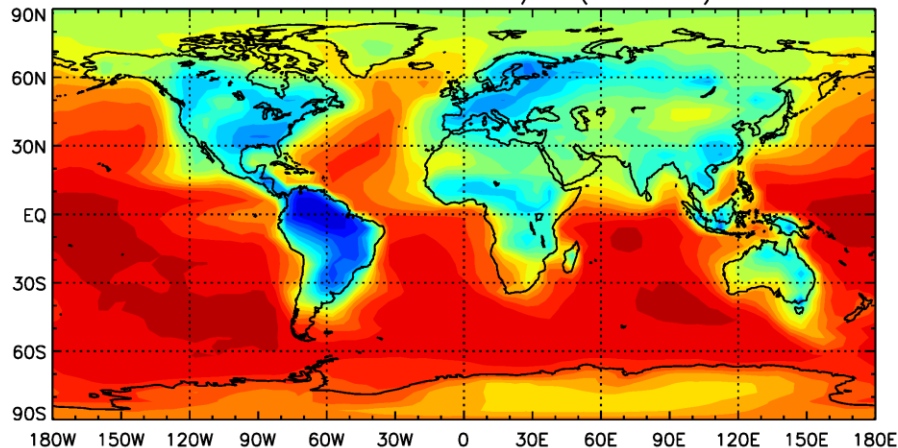
IMAGES – NTRSOC/OC (ANN 2006)



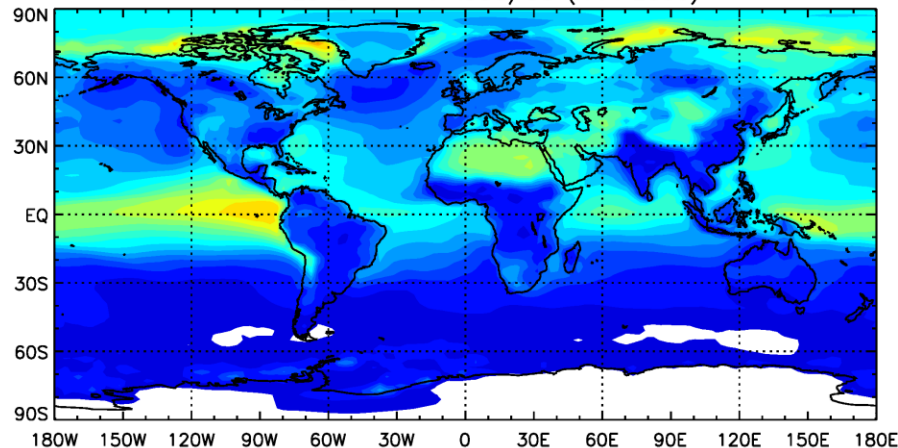
IMPACT – NTRSOC/OC (ANN 1997)



GISS-CMU-VBS – NTRSOC/OC (ANN 2008)

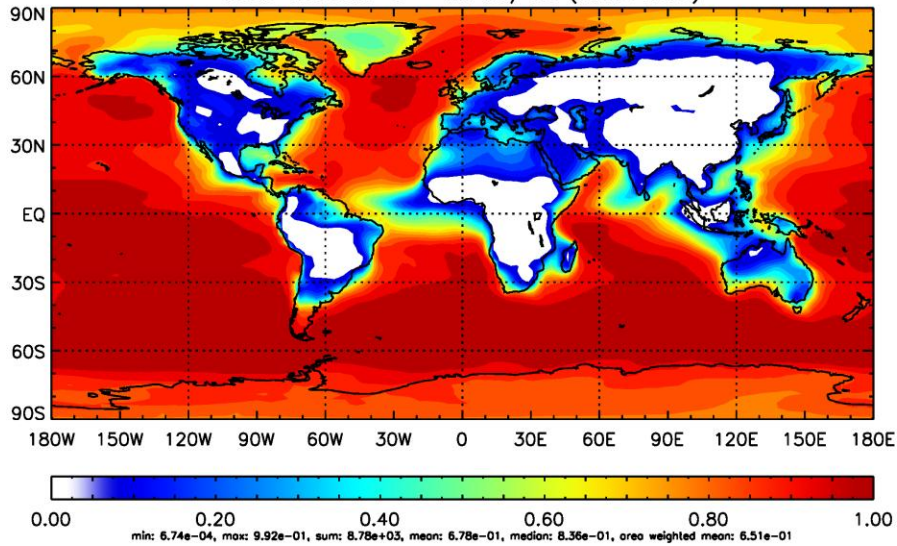


TM4-ECPL-F – NTRSOC/OC (ANN 2006)

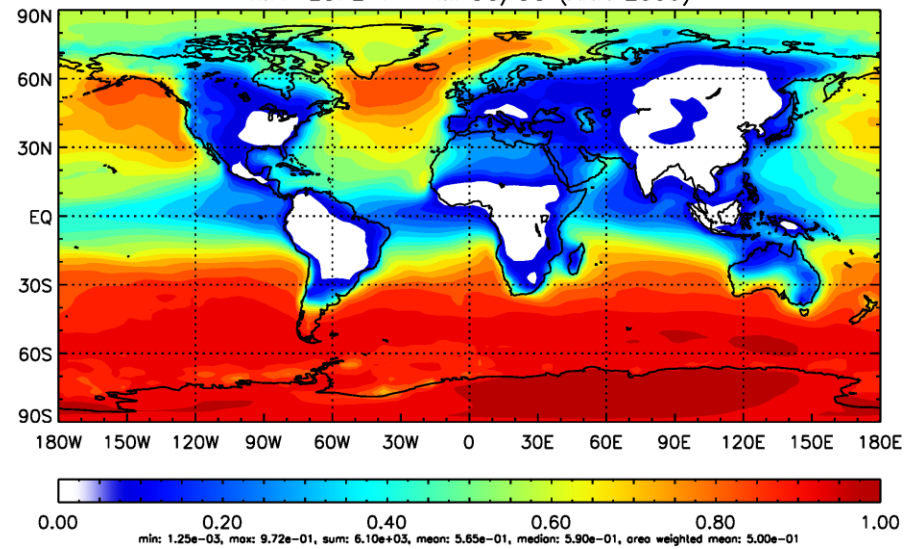


mPOC/OC

GISS-modelE-G – MPOC/OC (ANN 2006)



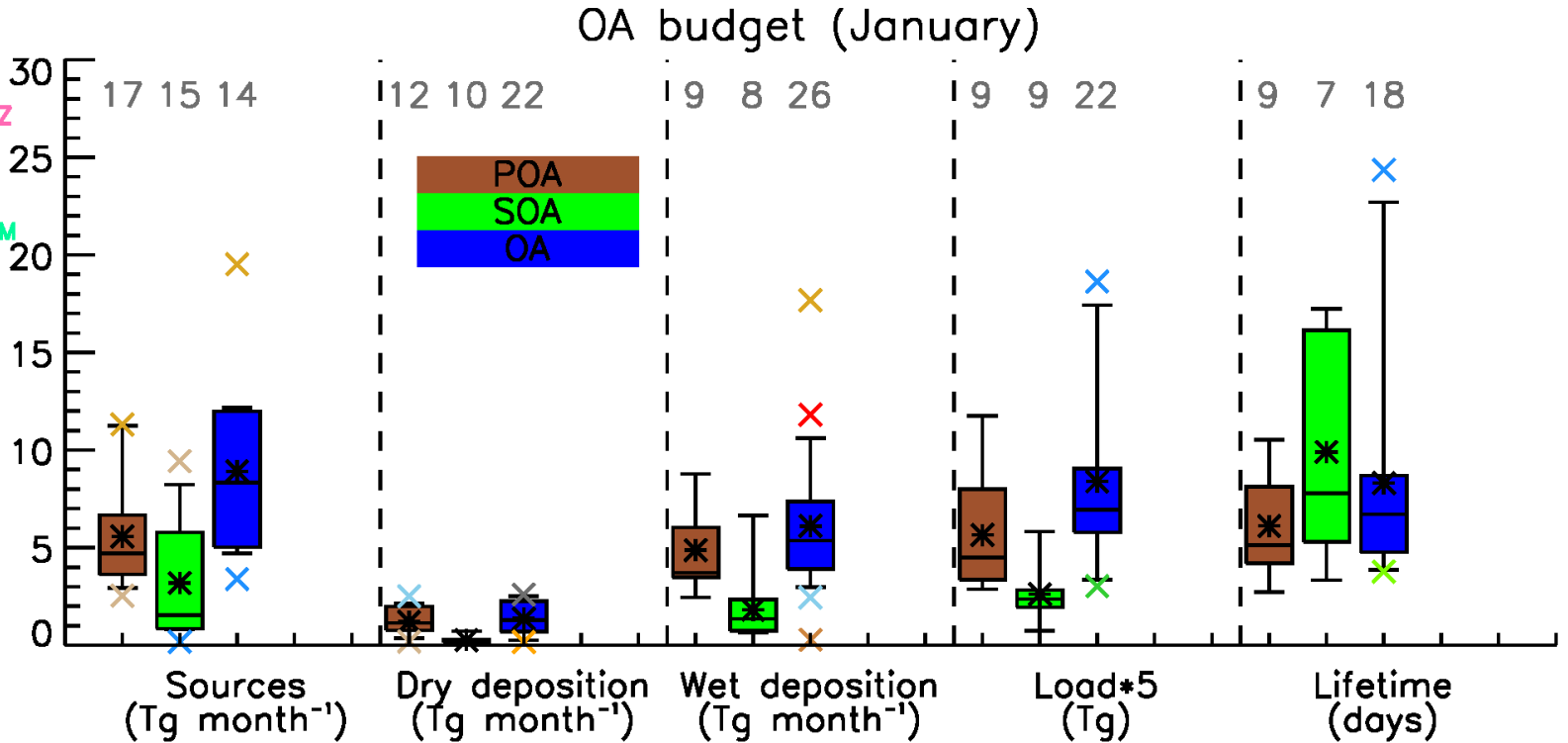
TM4-ECPL-F – MPOC/OC (ANN 2006)



OA global budget

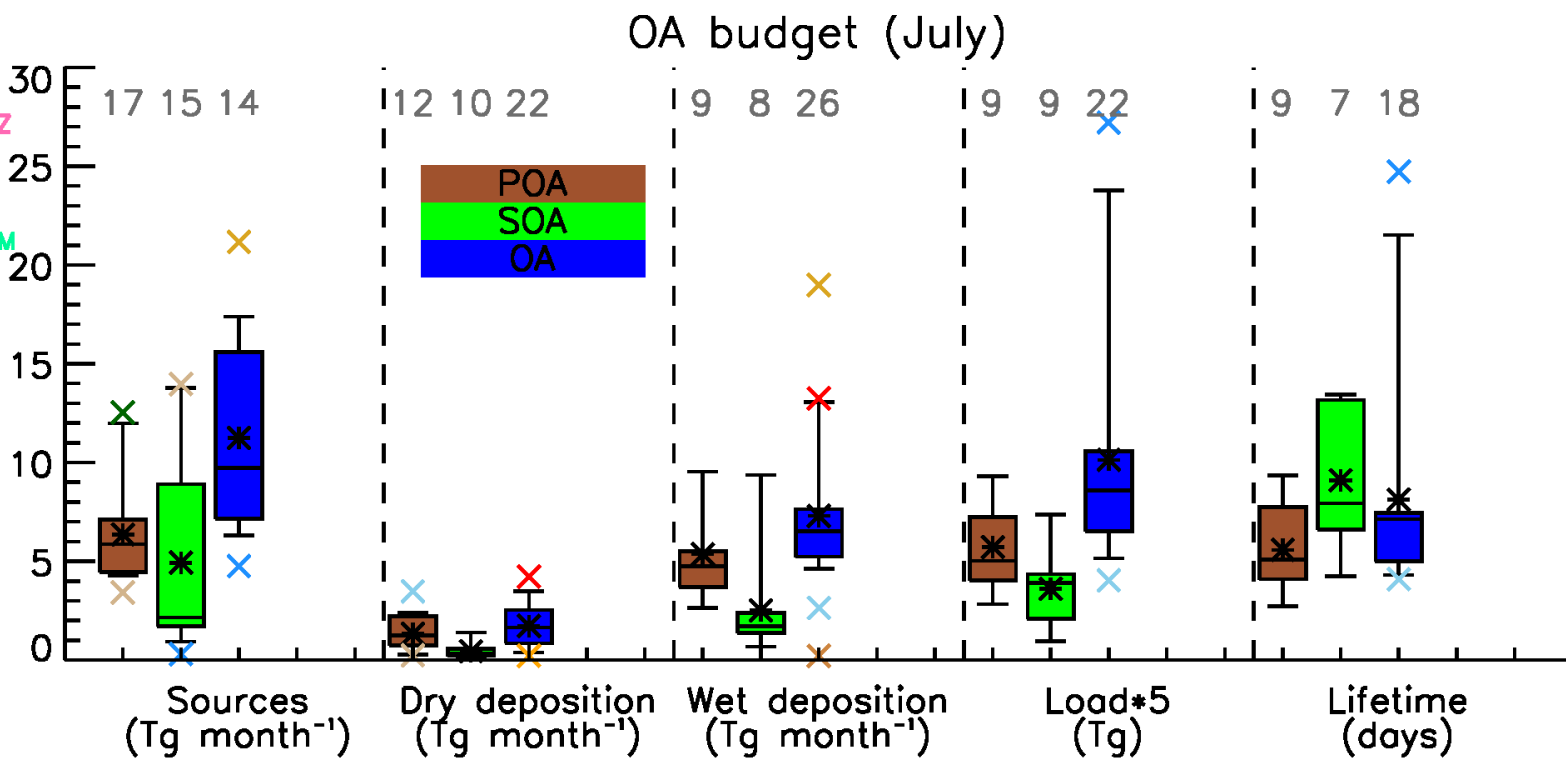
OA budget (January)

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OA budget (July)

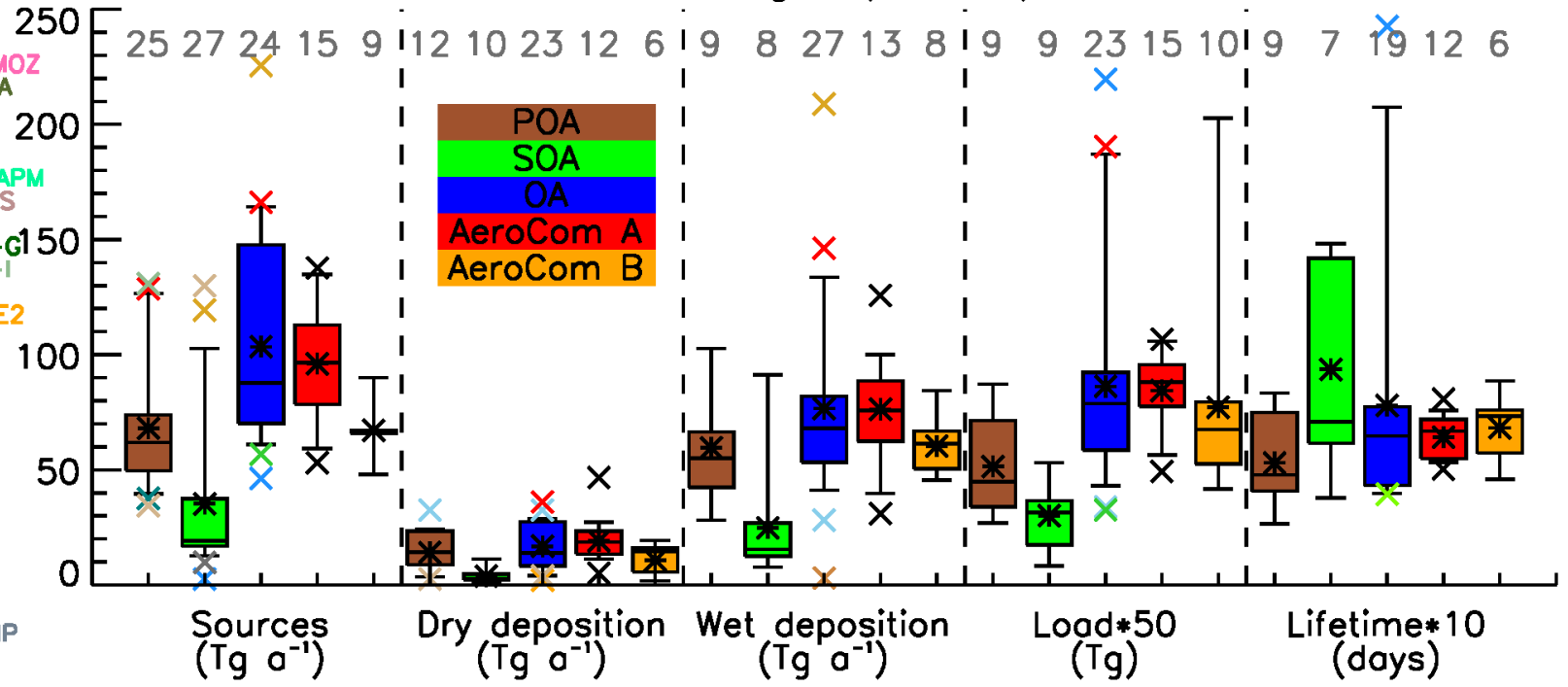
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OA budget (Annual)

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OA budget (Annual)



Concluding remarks

- More OA processes
 - More unknowns
 - Higher variability
- Background OA underestimated
 - Marine OA big uncertainty
- OM/OC not yet constrained
- Goal is to have paper submitted in October

Please submit your OA monthly budgets a.s.a.p., if you haven't already done so