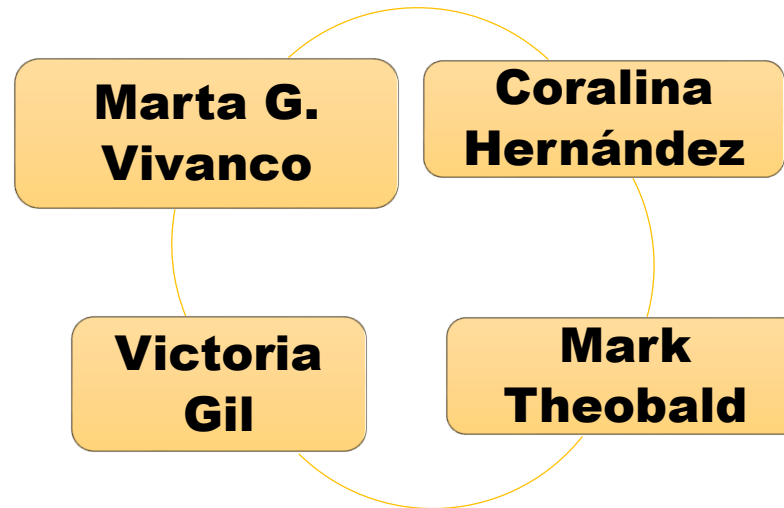


Advances in the modelling of O₃/VOC/SOA EMEP Intensive Measurement Period of 2022

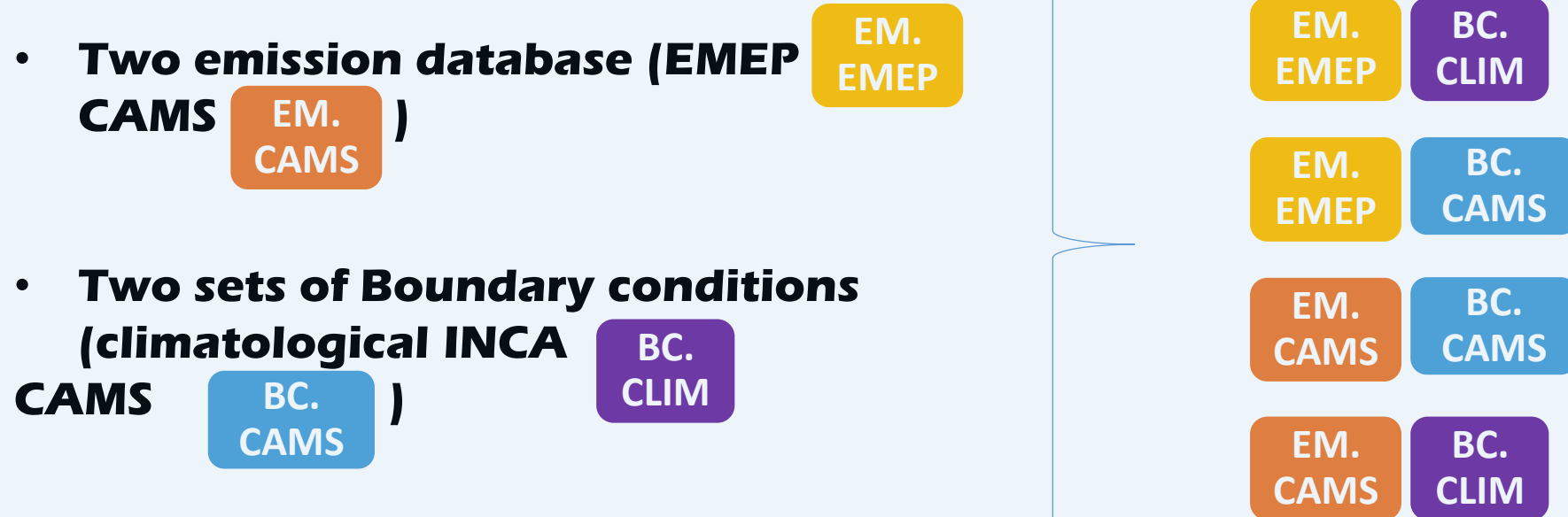
With the CHIMERE model



**Atmospheric Modelling Unit, CIEMAT,
Spain**

- Impact of the use of EMEP and CAMs emissions and different boundary conditions
- Impacts of anthropogenic and biogenic emissions
- Model performance (O3, NO2, HCHO)

4 combinations



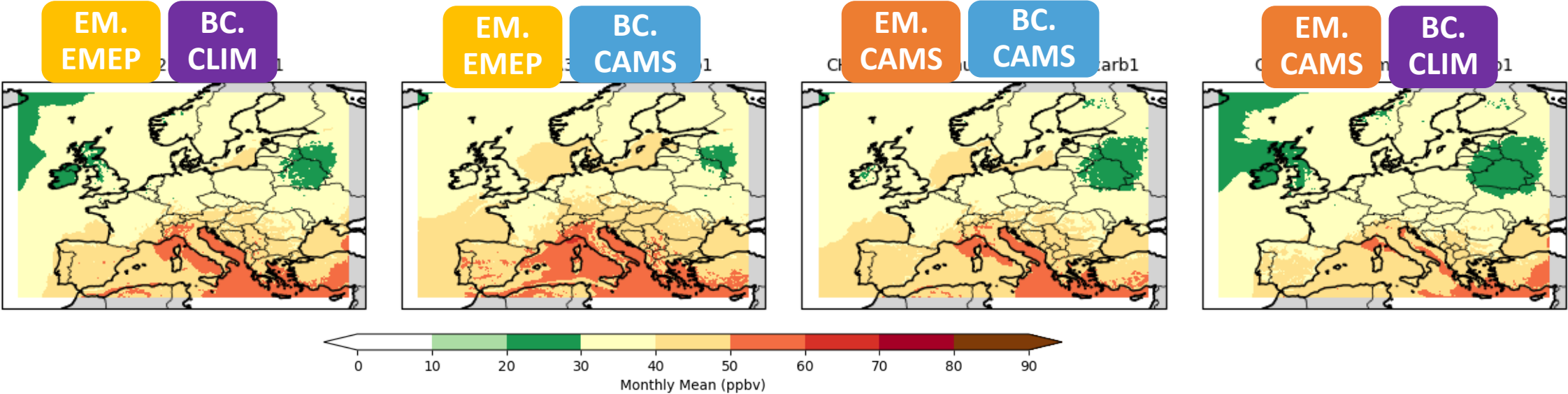
- And some slides with some results of the participants in the modelling of O₃/VOC/SOA EMEP Intensive Measurement Period of 2022

Model	Institution
EMEP4UKrv5.5	UKCEH
emep-EmChem19	Met_Norway
SILAM v6.0 (r605788)	FMI
MONARCH	BSC
ICON-ART	Empa
MINNI-PSEM	ENEA
MINNI-MEGAN	ENEA
CHIMERE 2023r2	INERIS
CHIMERE 2023r3	CIEMAT
CHIMERE 2013	CIEMAT

IOŚ-PIB (IEP-NRI)	IOŚ-PIB (IEP-NRI)	BSC	FMI	INERIS	ENEA	CIEMAT	ISSeP	MET Norway	UKCEH	Empa
Tomasz Przybyła	Aleksander Norowski	Oriol Jorba	Risto Hänninen, Mikhail I Sofiev	Augustin Colette, Florian Couvidat	Mihaela Mircea, Gino Briganti, Andrea Bolignano 3, Felicita Russo3	Marta G. Vivanco, Mark Theobald, Coralina Hernández, Victoria Gil	Marie Dury	David Simpson	Massimo Vieno, Janice Scheffler	Corina Keller, Dominik Brunner

03

Mean Value



03

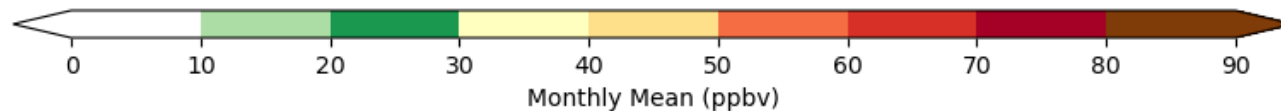
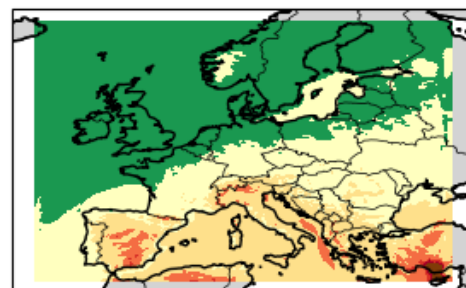
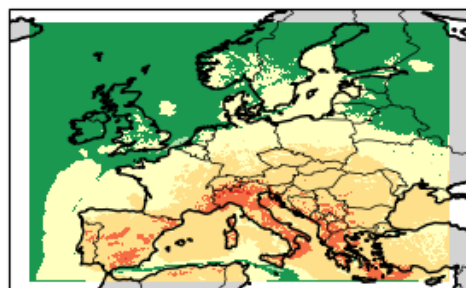
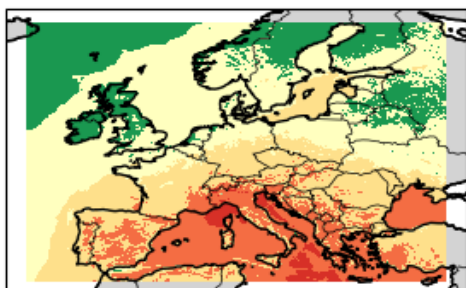
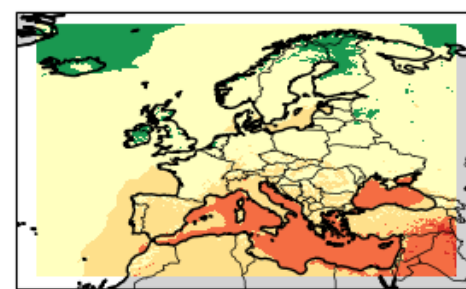
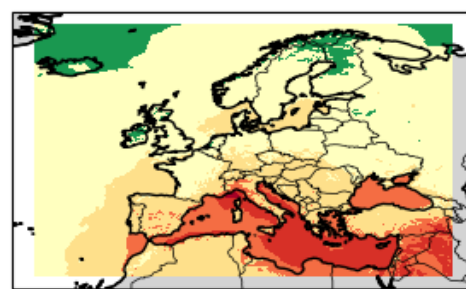
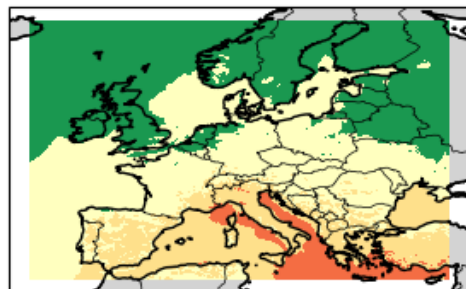
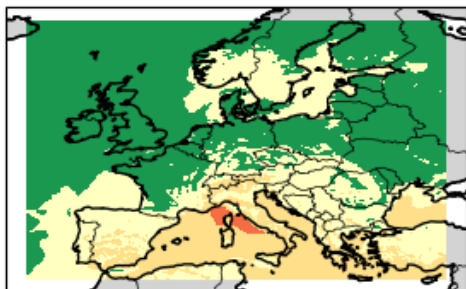
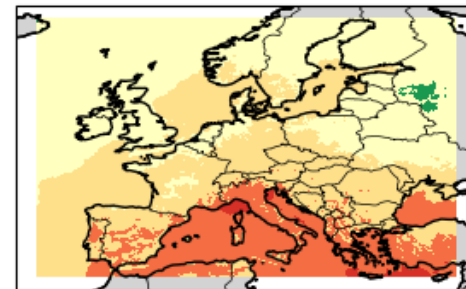
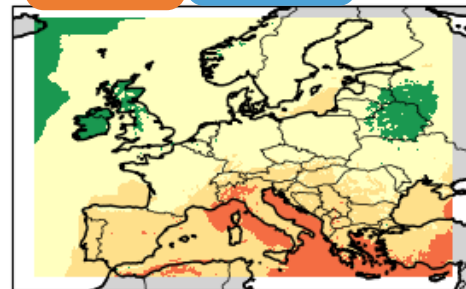
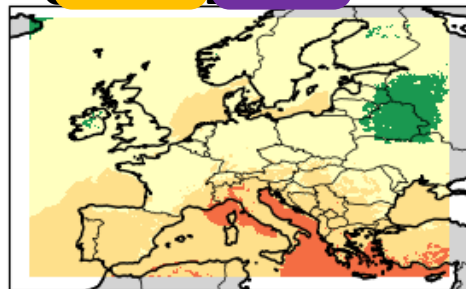
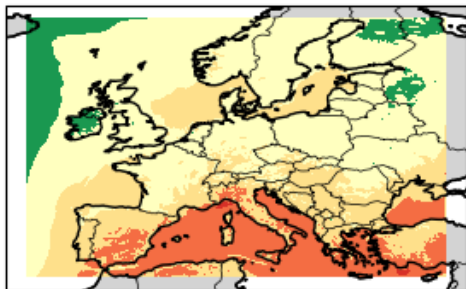
Mean Value

EM.
EMEP

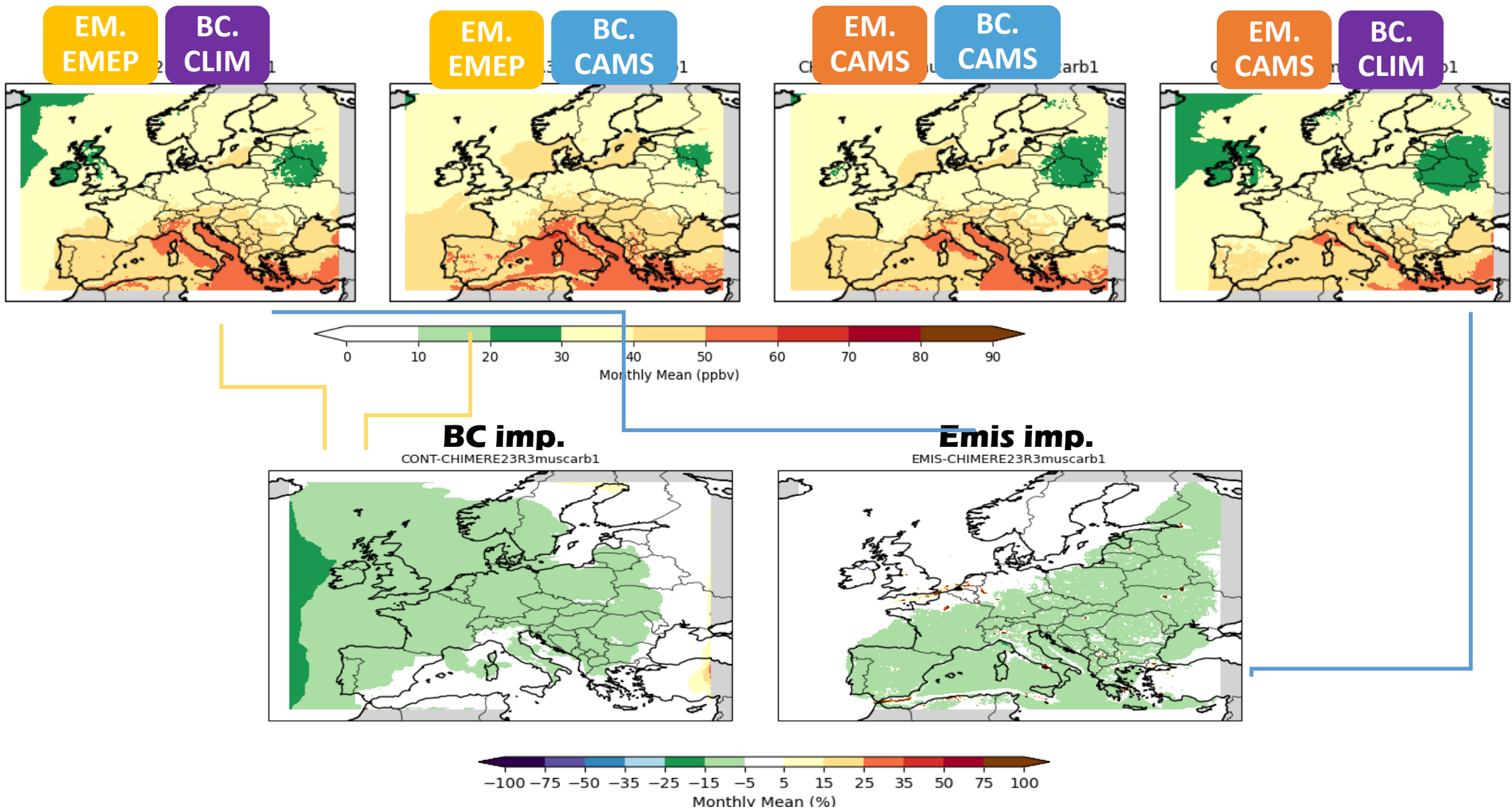
BC.
CLIM

EM.
CAMS

BC.
CAMS

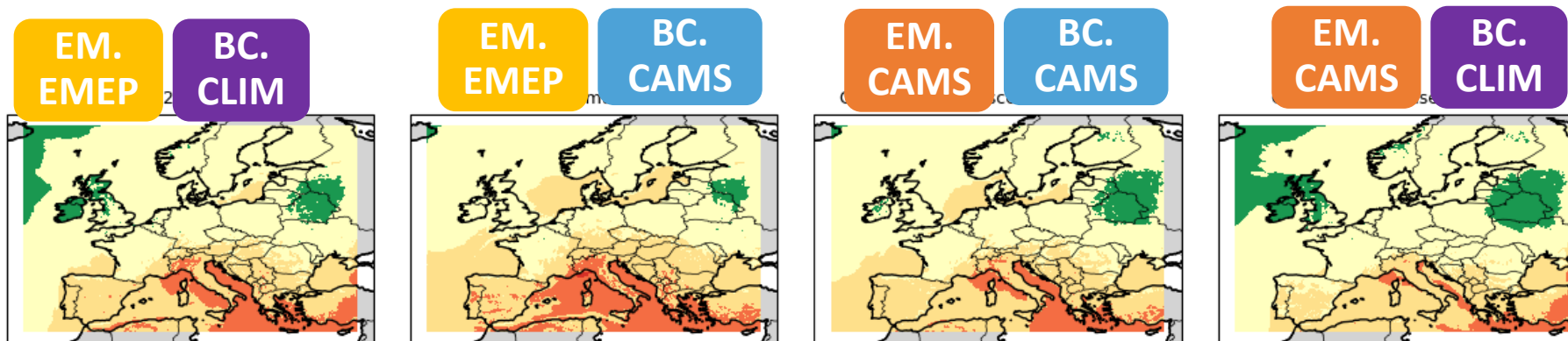


O3 Mean Value

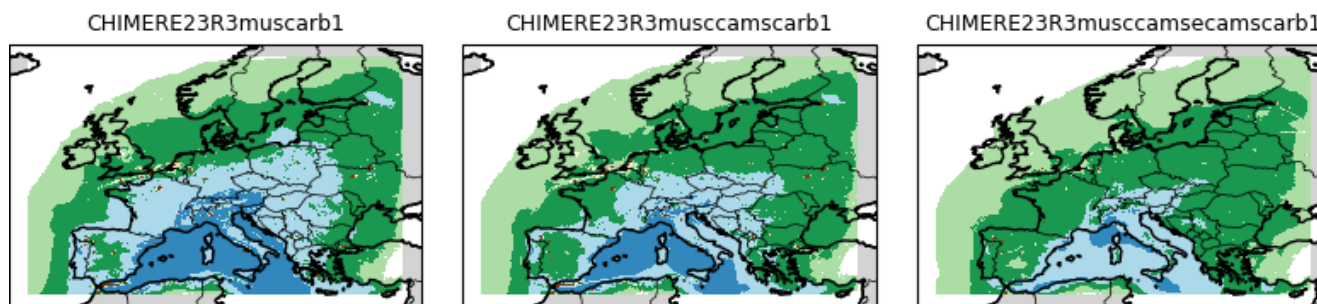


03

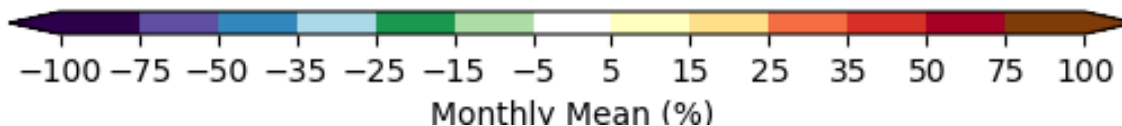
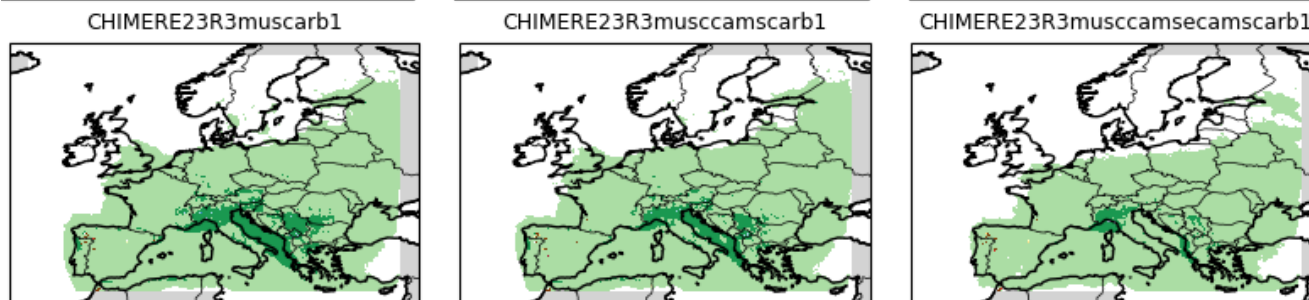
BASE



**Antr.
Impact
(and fires)**



**Biog.
Impact**



O₃

BE

CZ

DE

DE

DE

GB

GB

IT

ES

ES

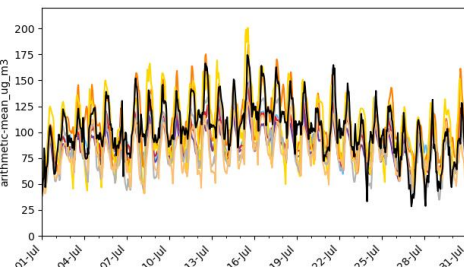
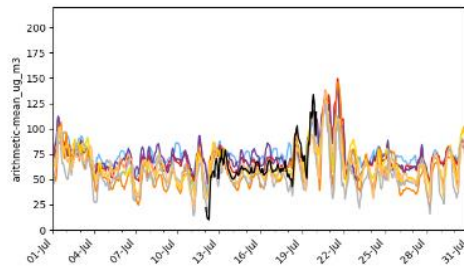
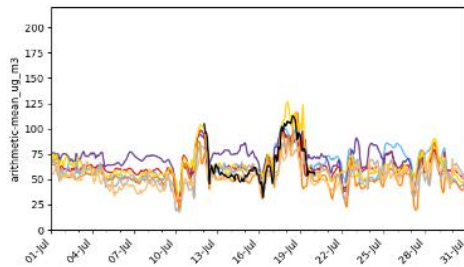
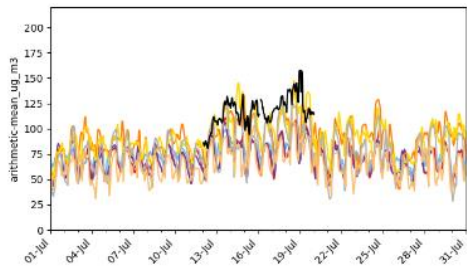
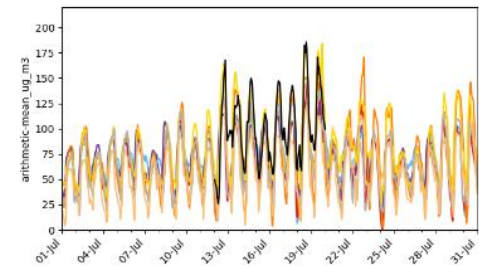
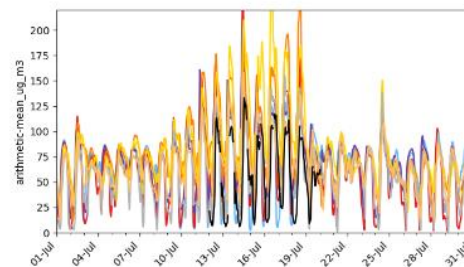
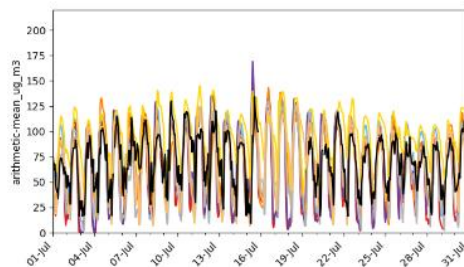
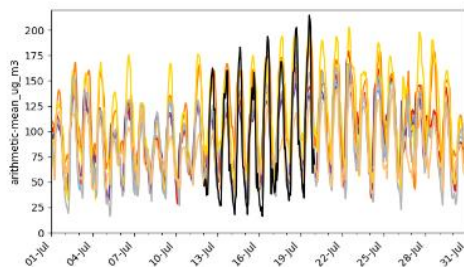
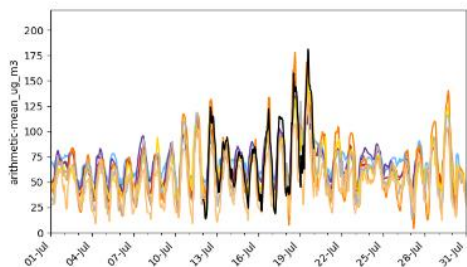
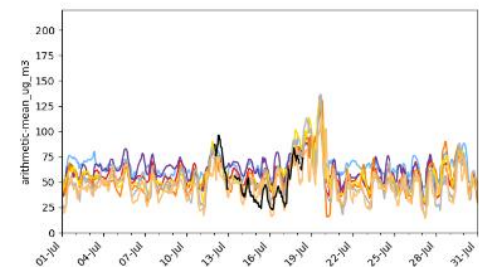
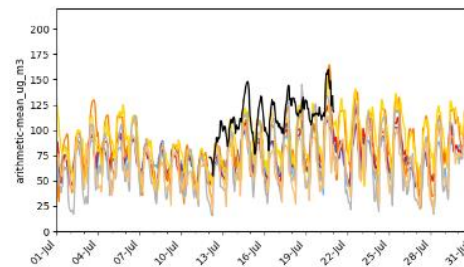
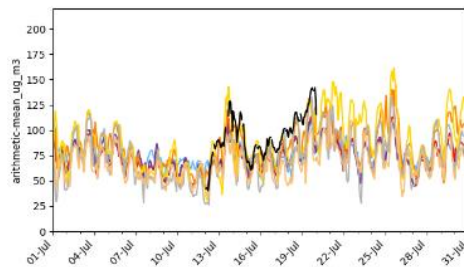
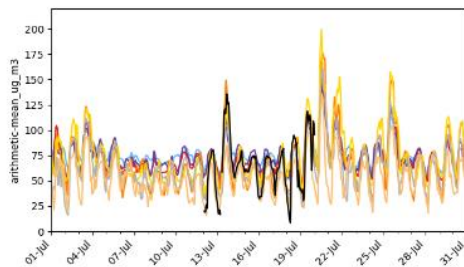
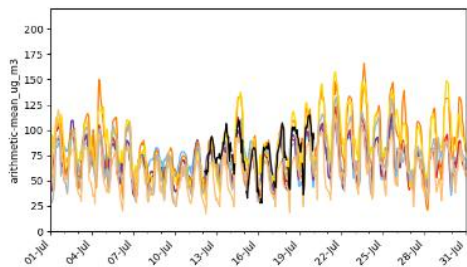
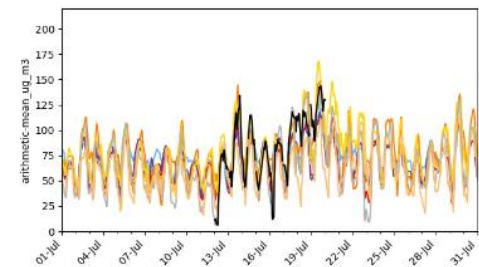
FR

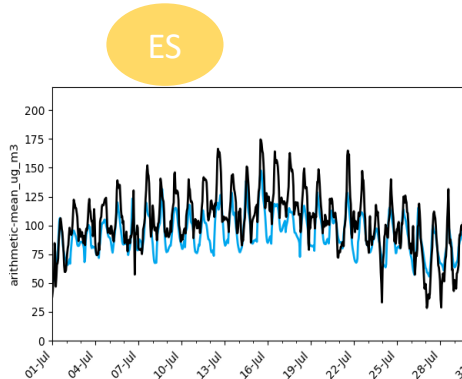
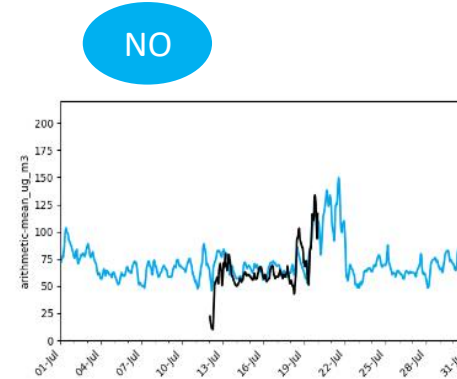
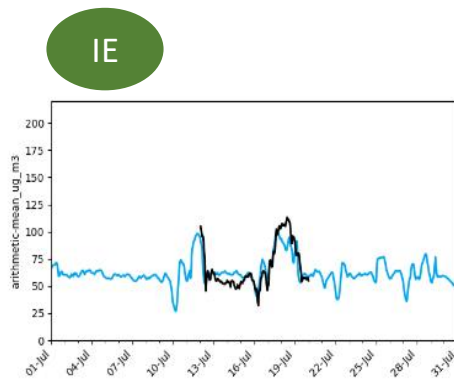
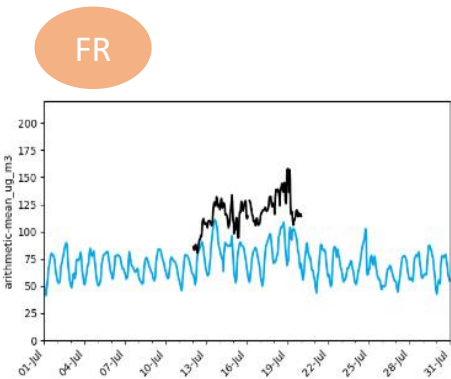
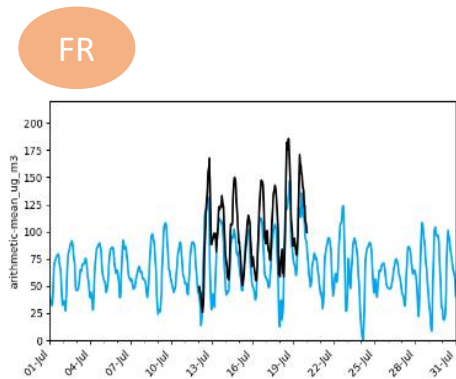
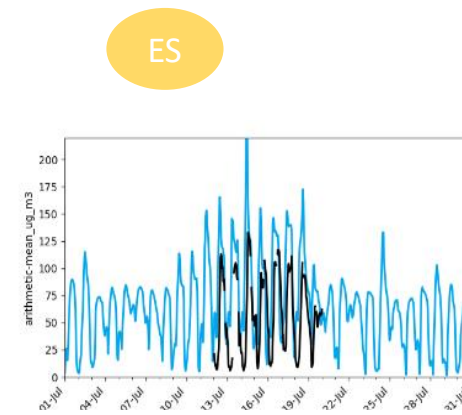
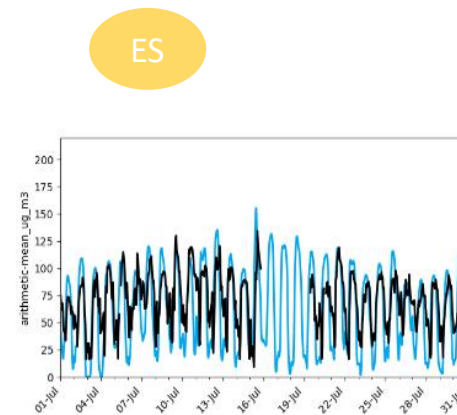
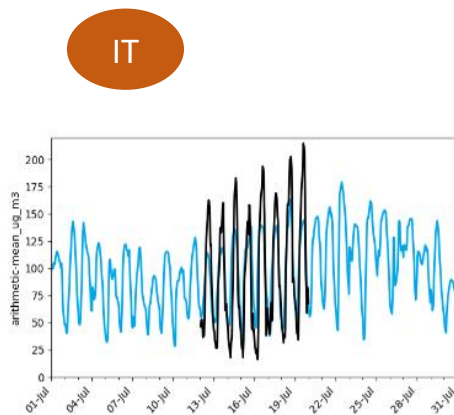
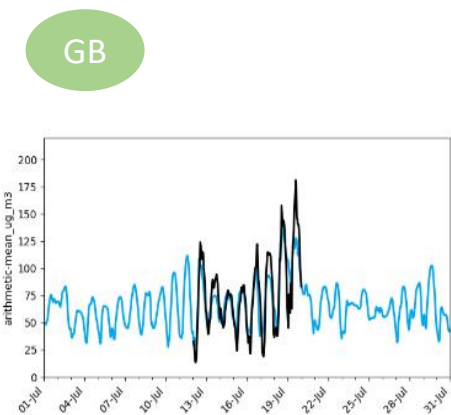
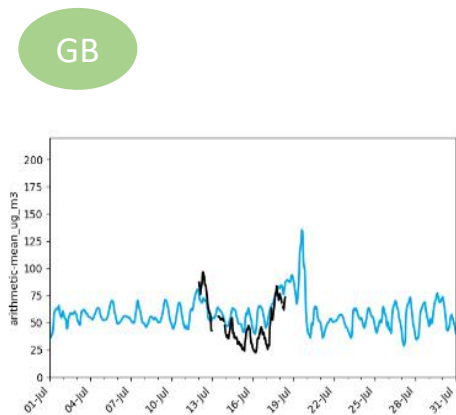
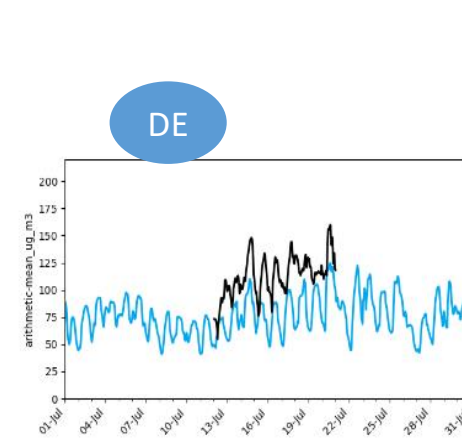
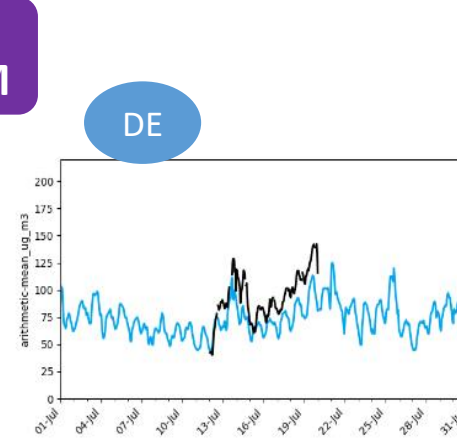
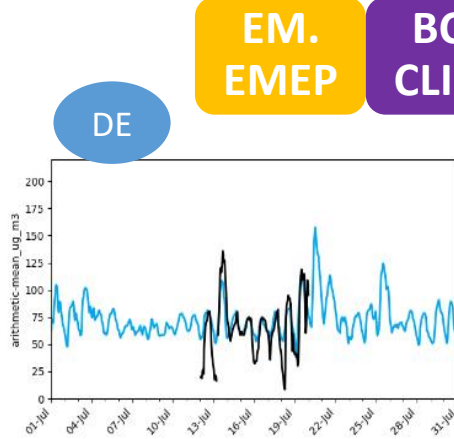
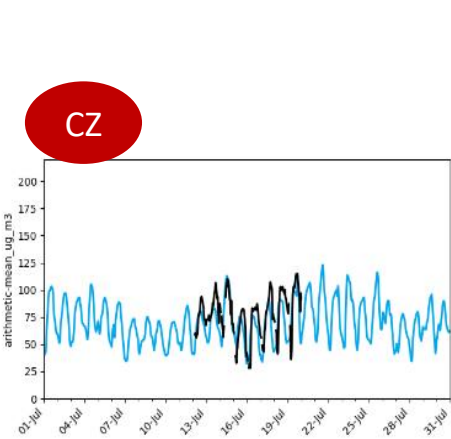
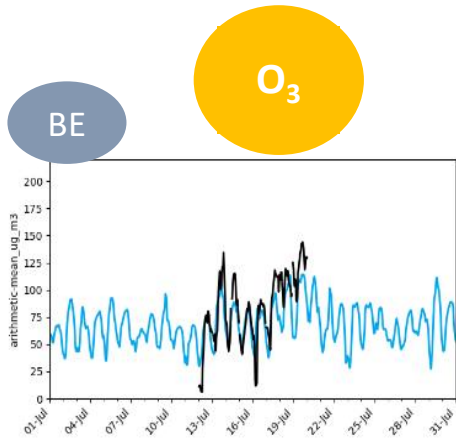
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IE

NO

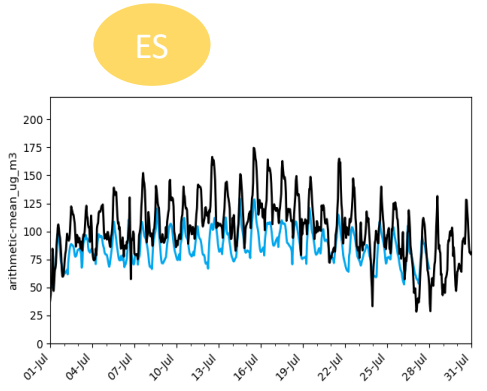
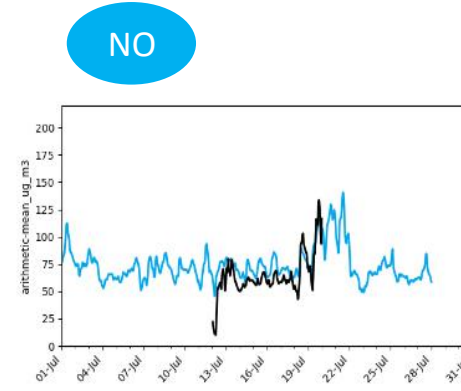
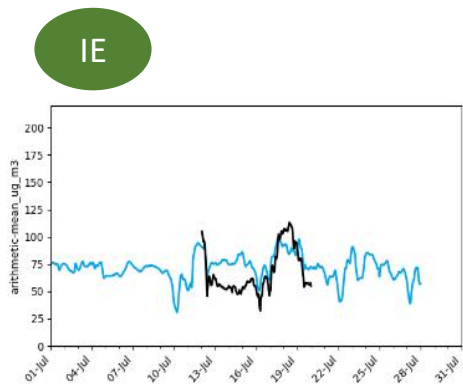
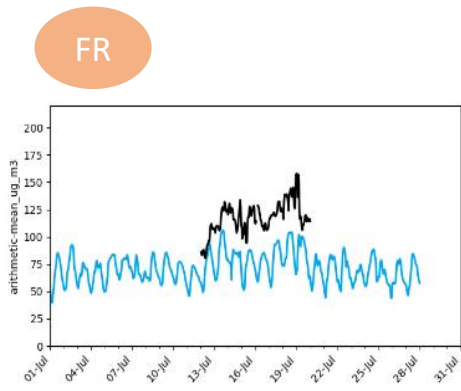
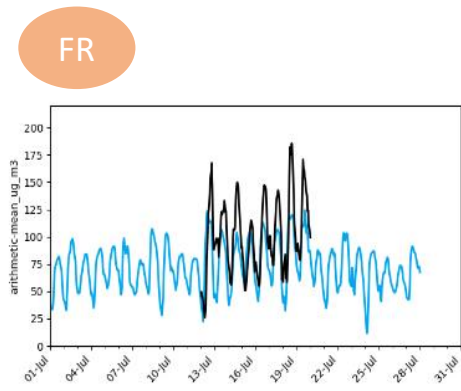
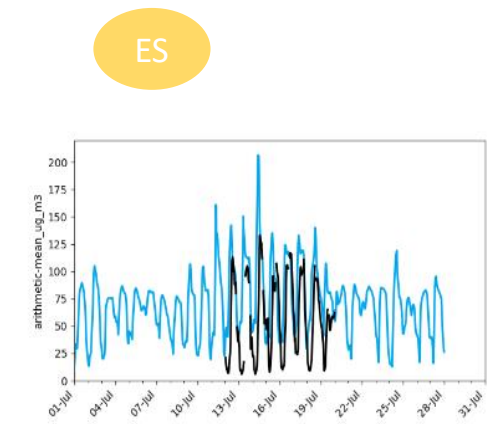
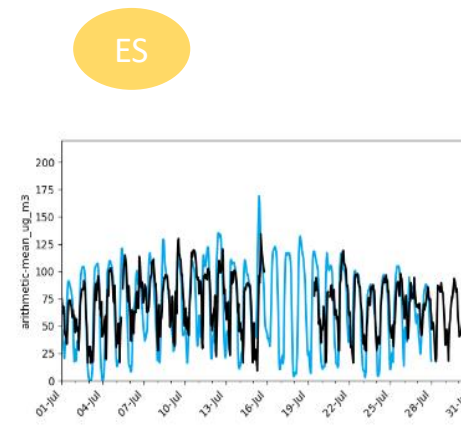
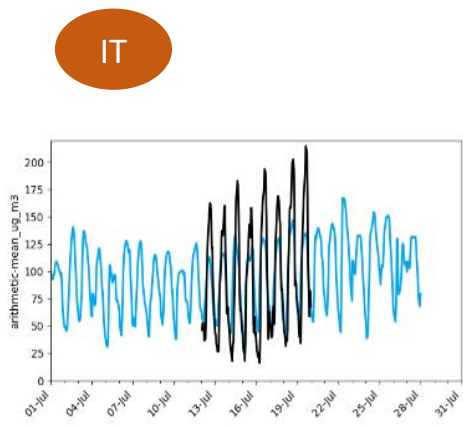
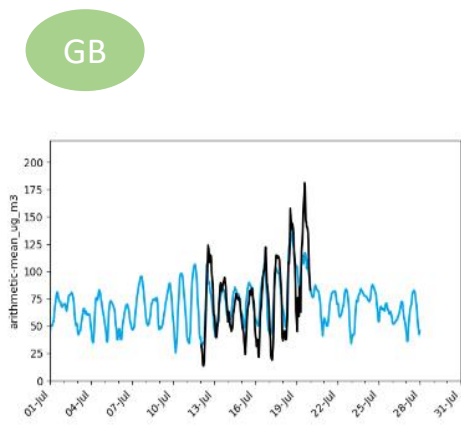
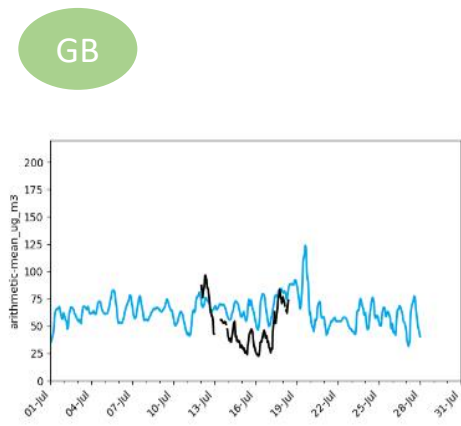
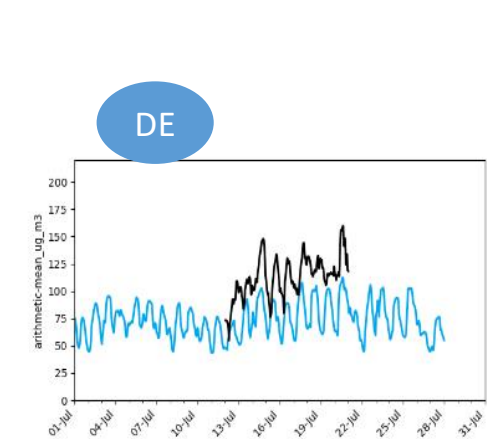
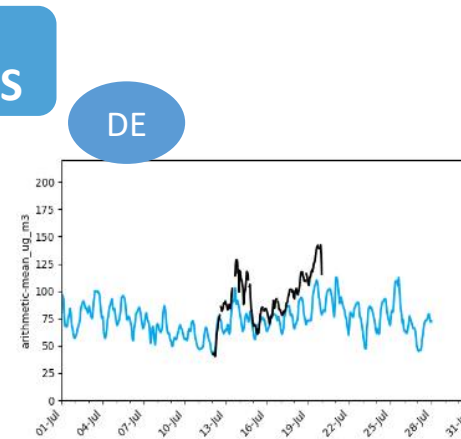
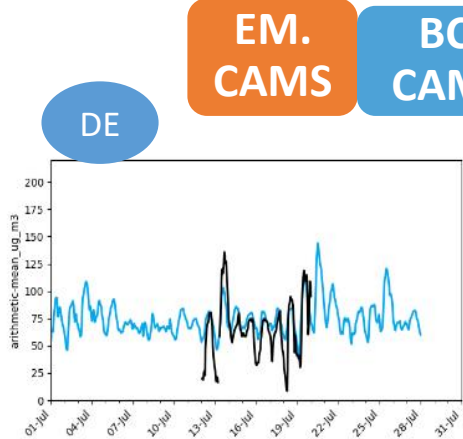
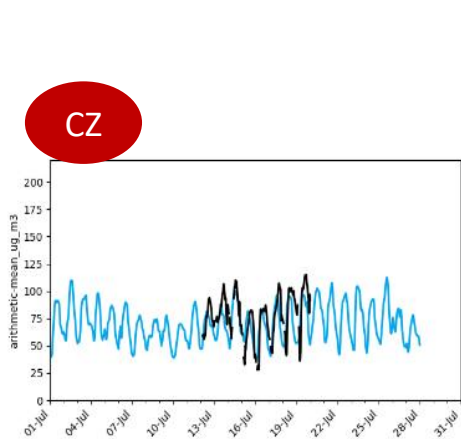
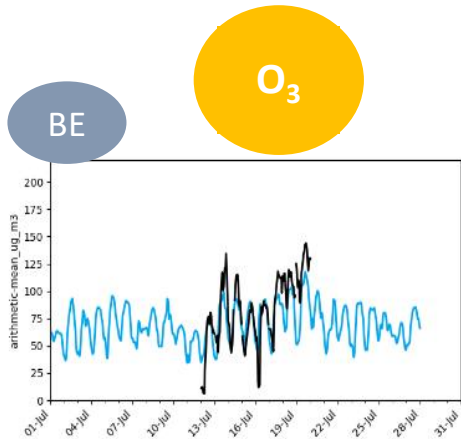
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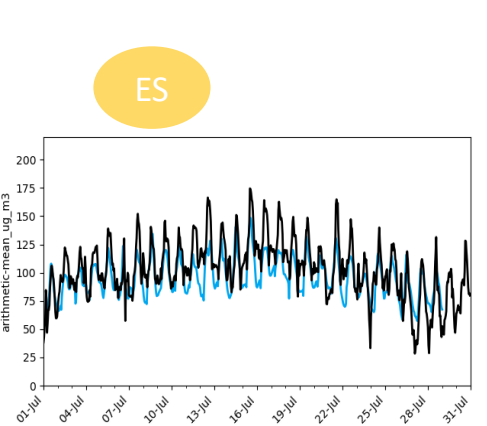
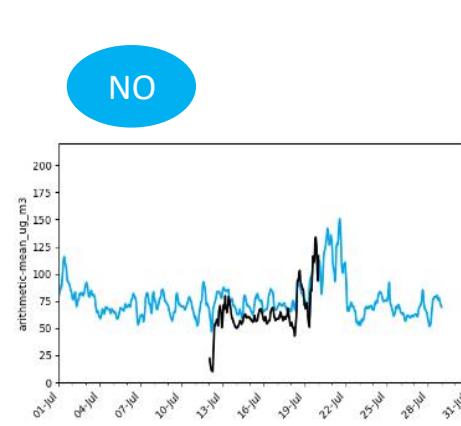
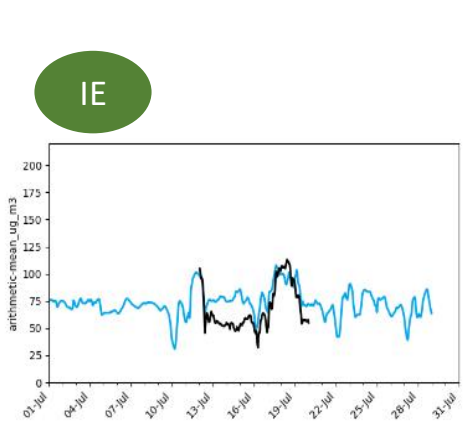
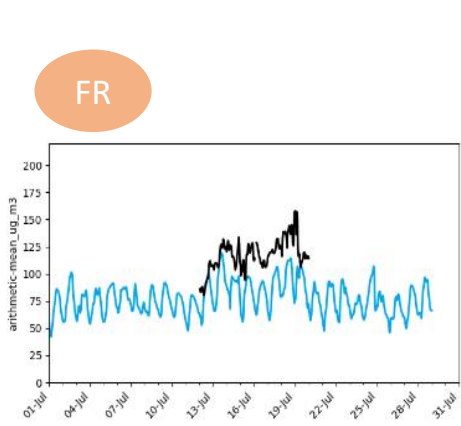
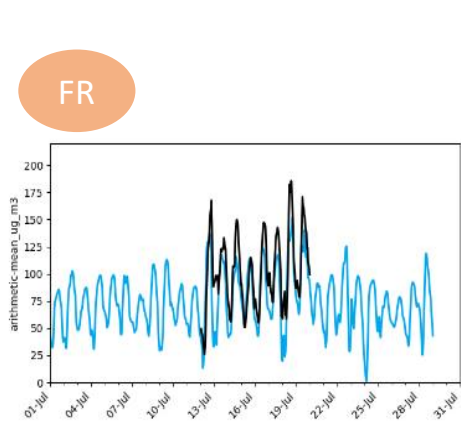
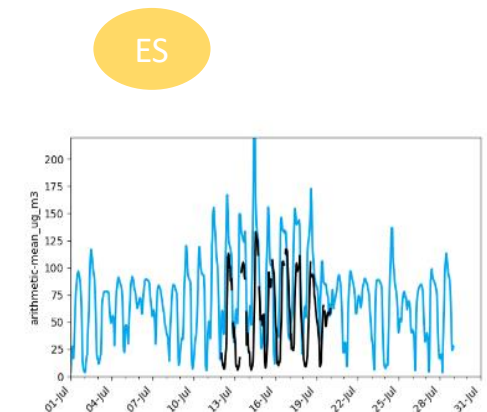
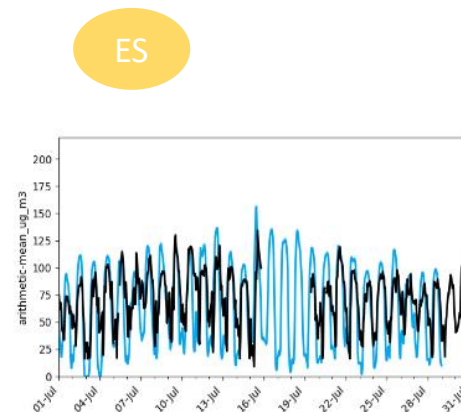
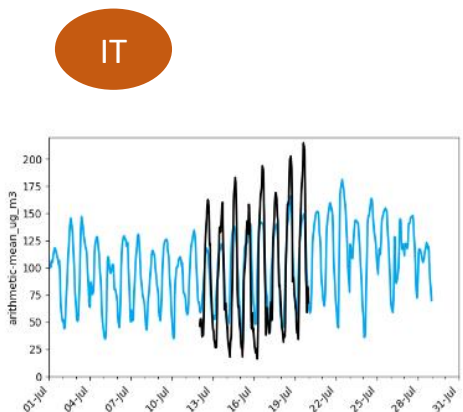
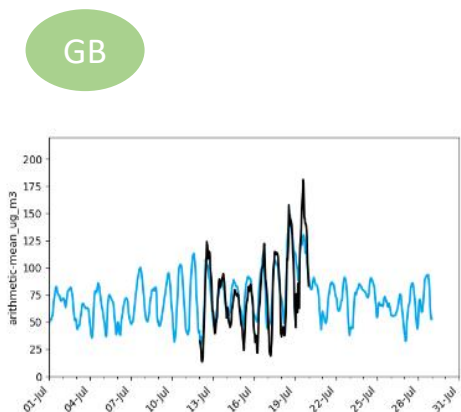
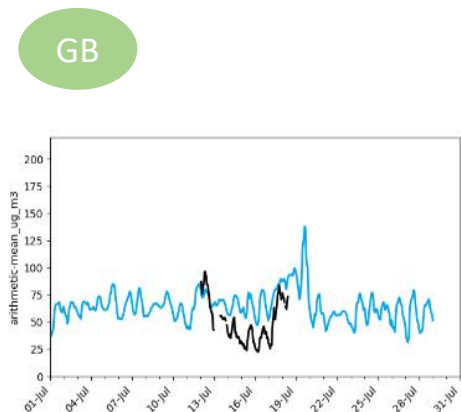
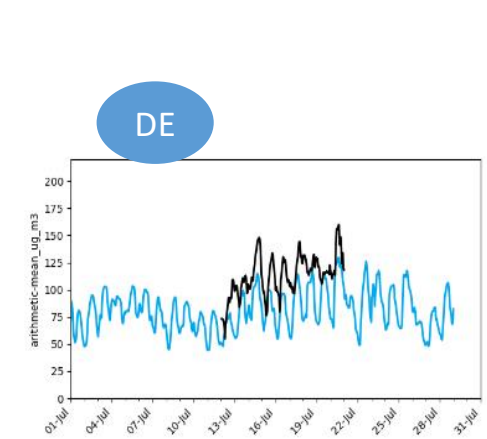
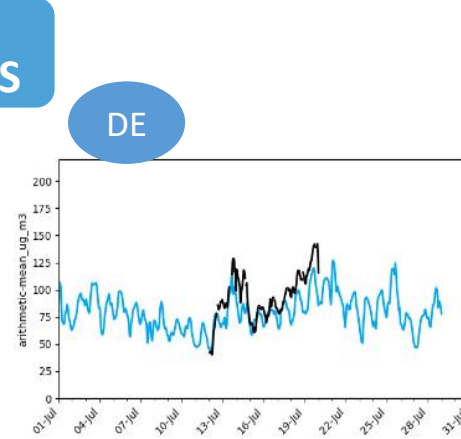
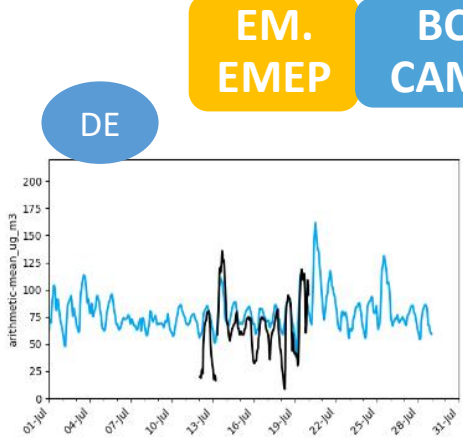
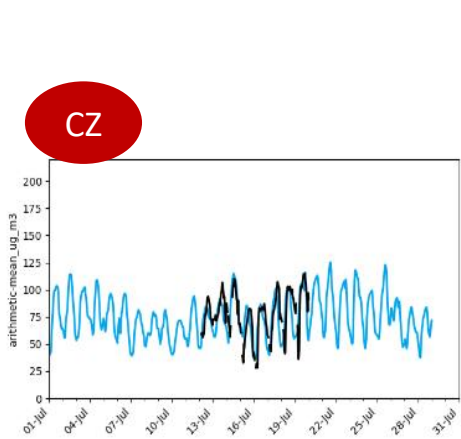
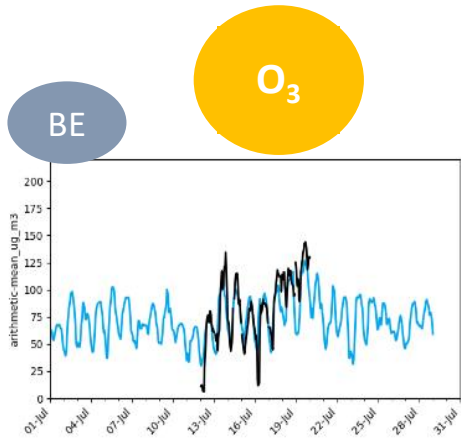
EM.
EMEP

BC.
CLIM



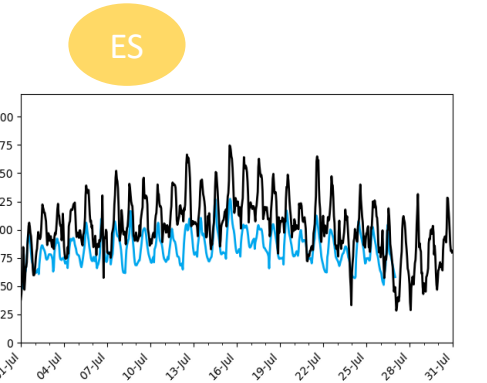
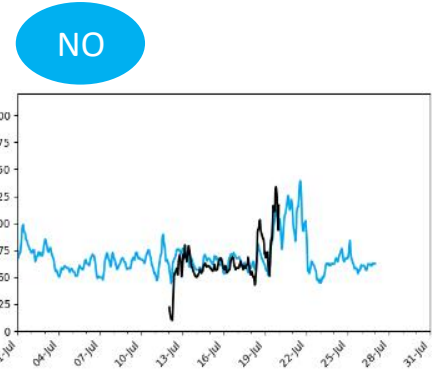
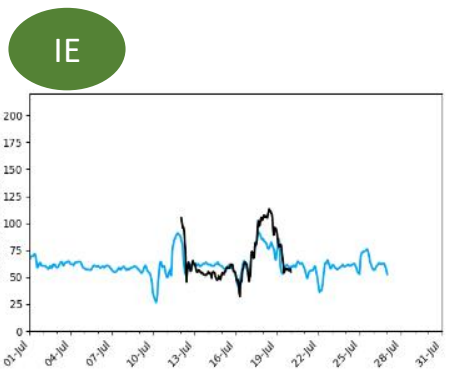
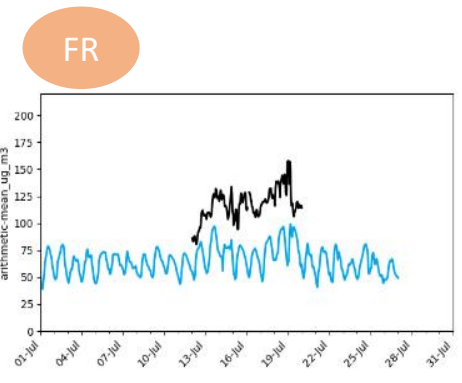
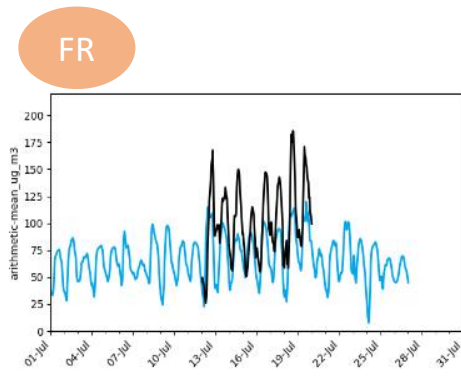
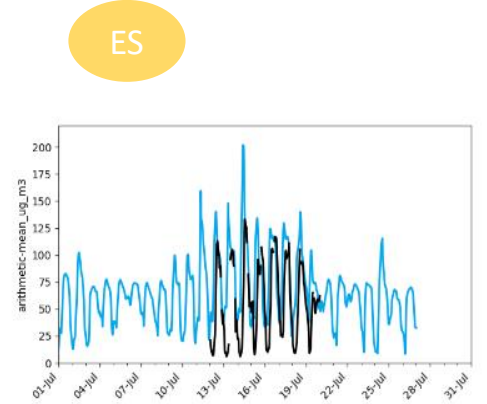
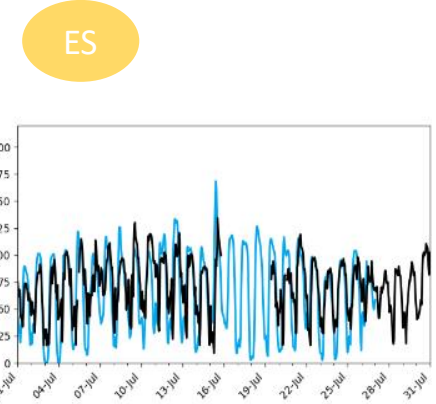
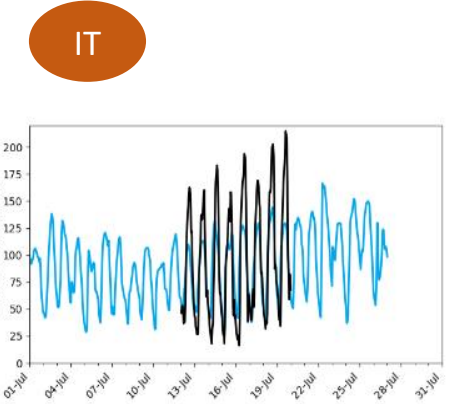
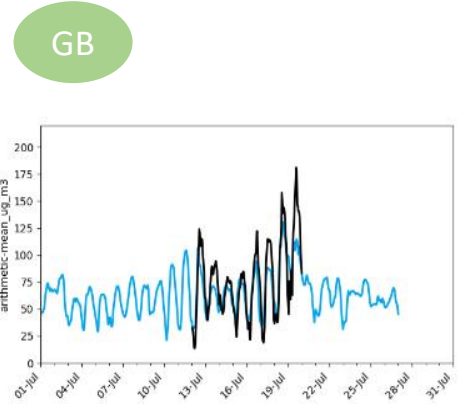
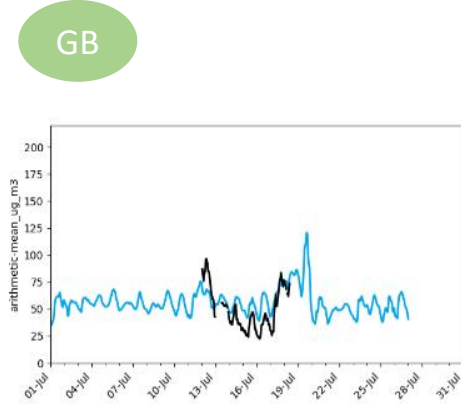
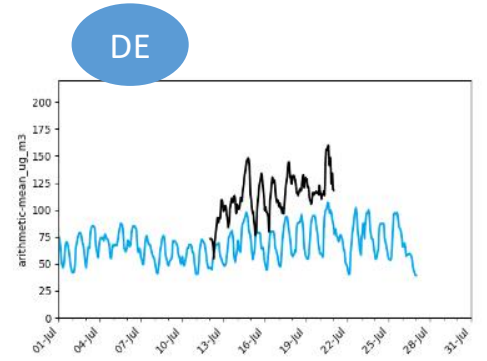
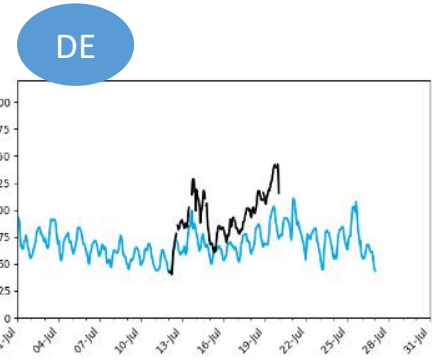
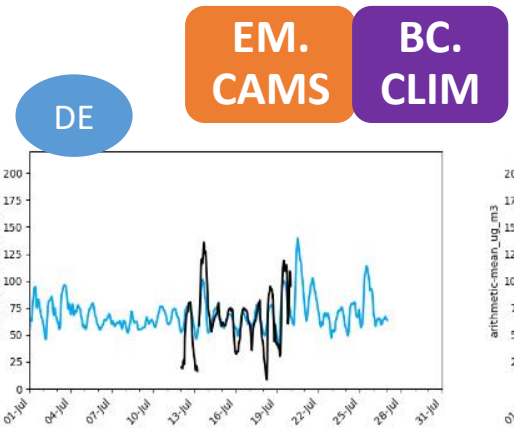
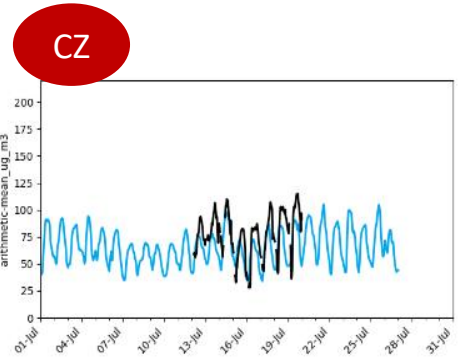
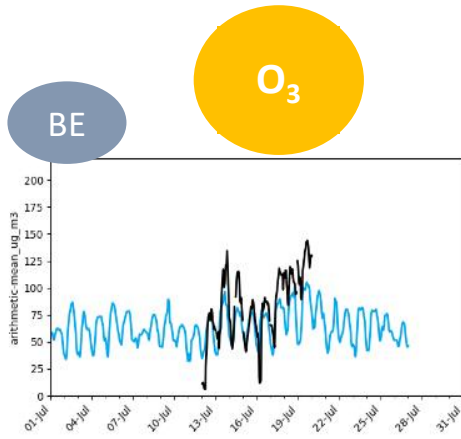
EM.
CAMS

BC.
CAMS

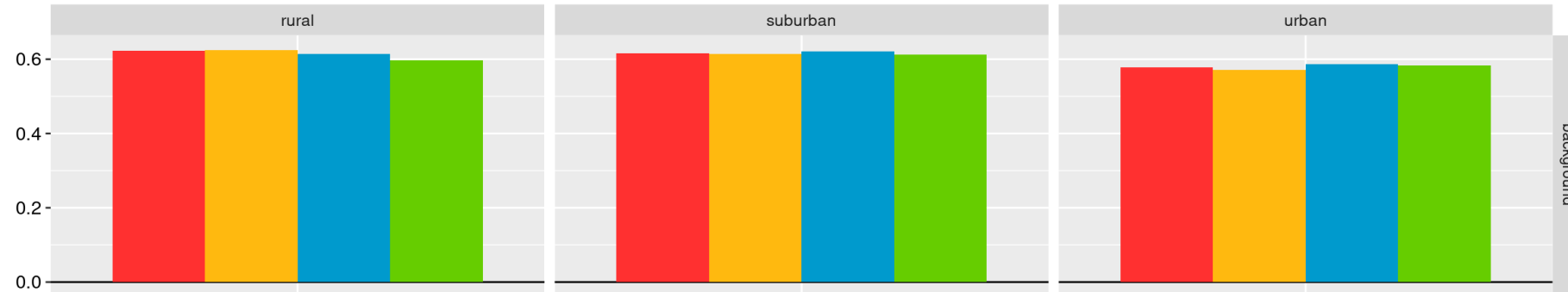


EM.
EMEP

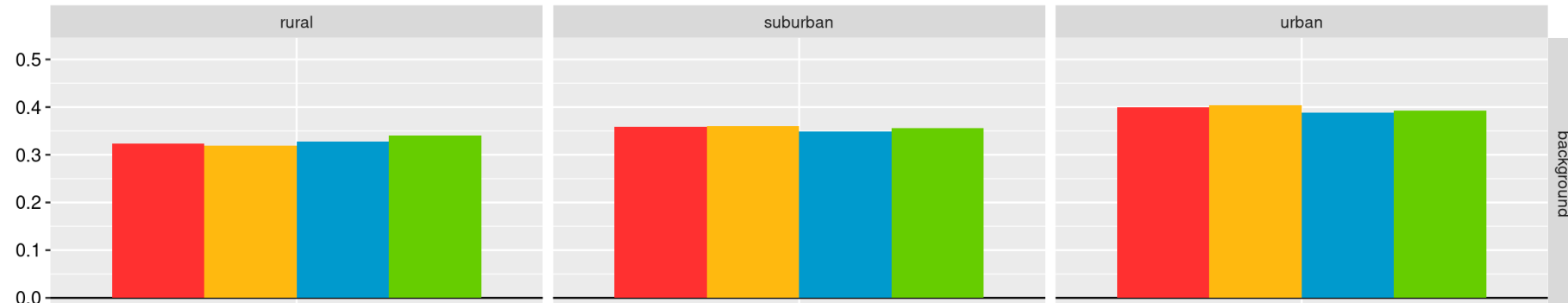
BC.
CAMS



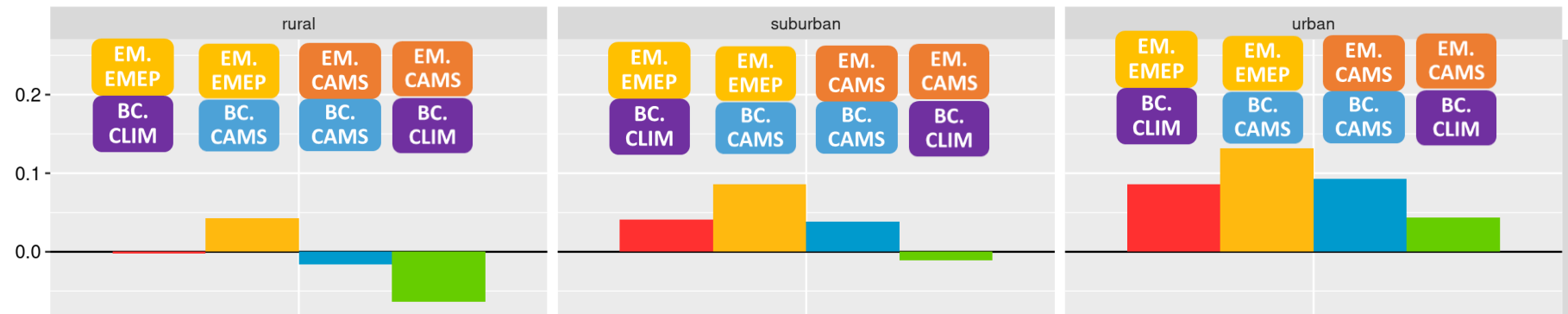
O3 (IOA)



O3 (NRMSE)



O3 (NMB)



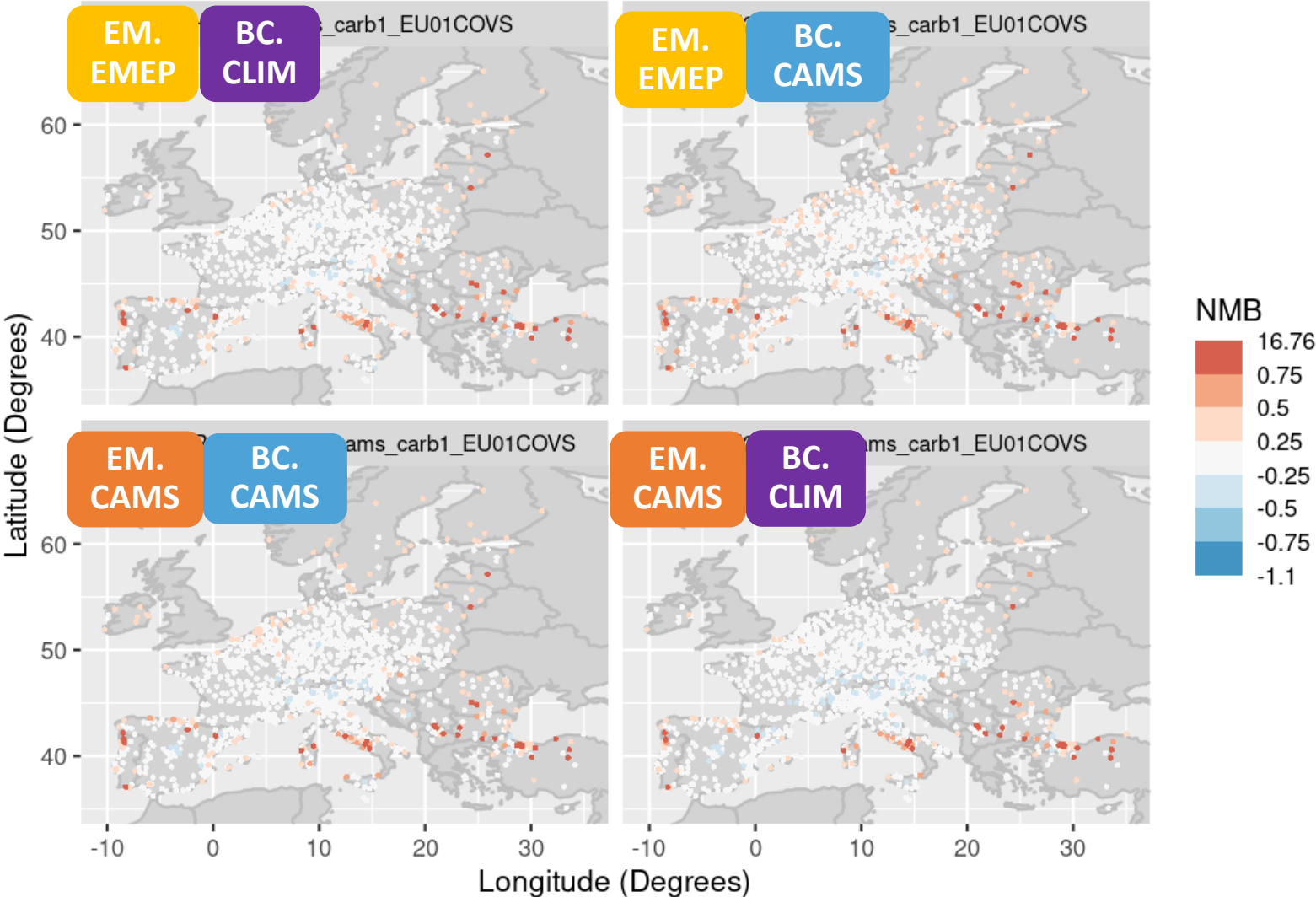
IOA: Index of Agreement
NRMSE: Normalized Root Mean Square Error

NMB: Normalized Mean Bias

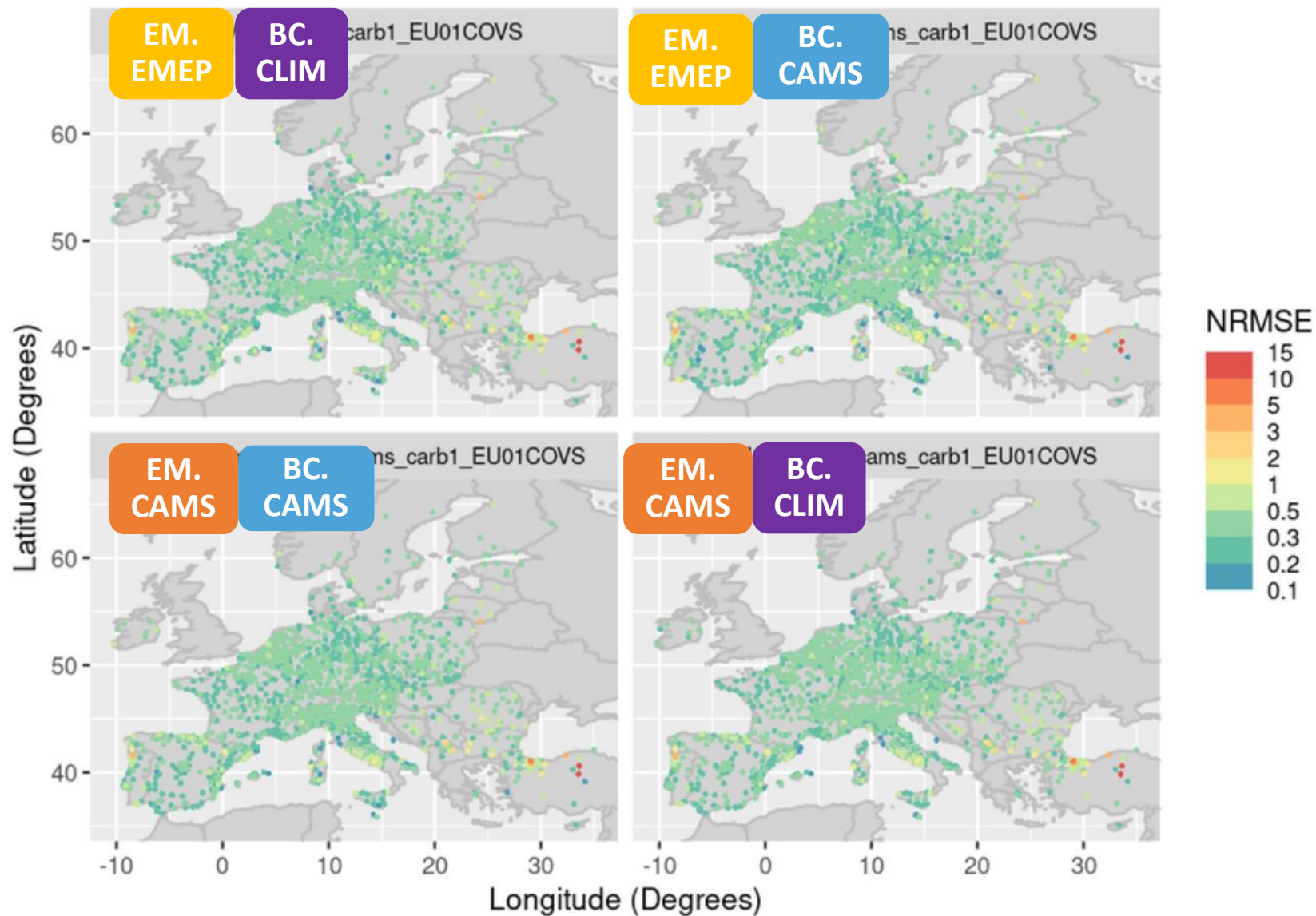
Model



O3 NMB BACKGROUND



O3 NRMSE BACKGROUND



EM.
EMEP

BC.
CLIM

EM.
EMEP

BC.
CAMS

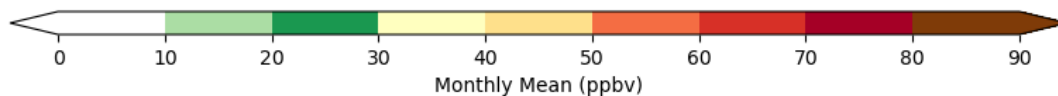
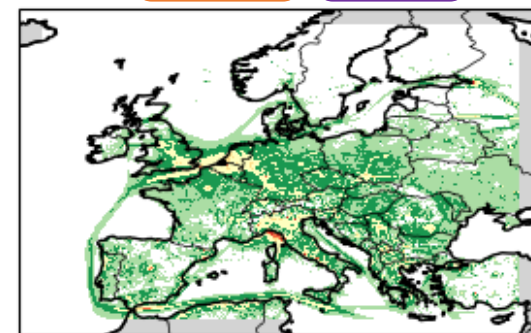
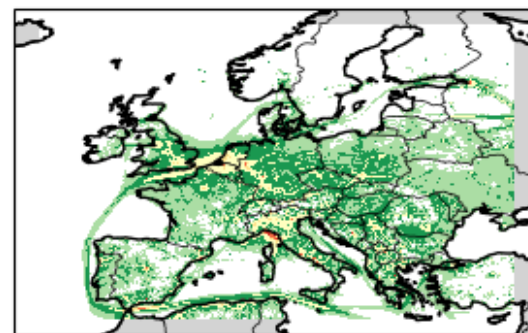
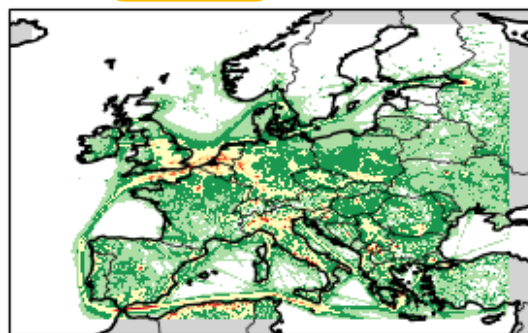
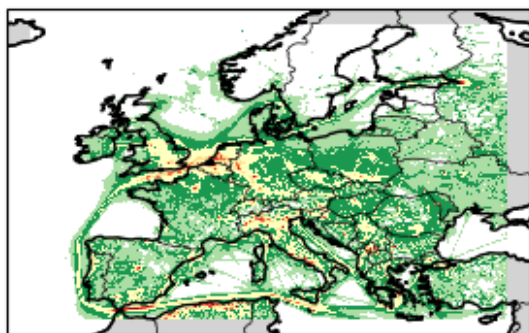
EM.
CAMS

BC.
CAMS

EM.
CAMS

BC.
CLIM

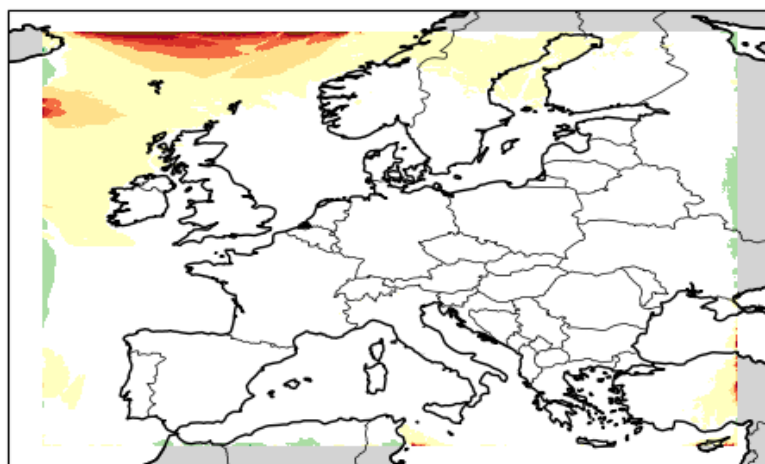
BASE



NO2

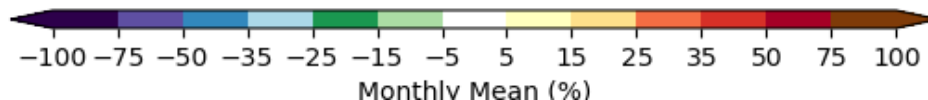
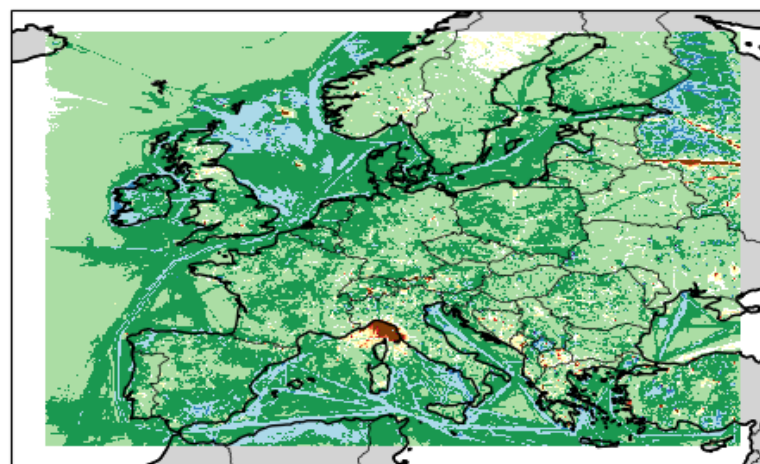
BC imp.

CONT-CHIMERE23R3muscarb1

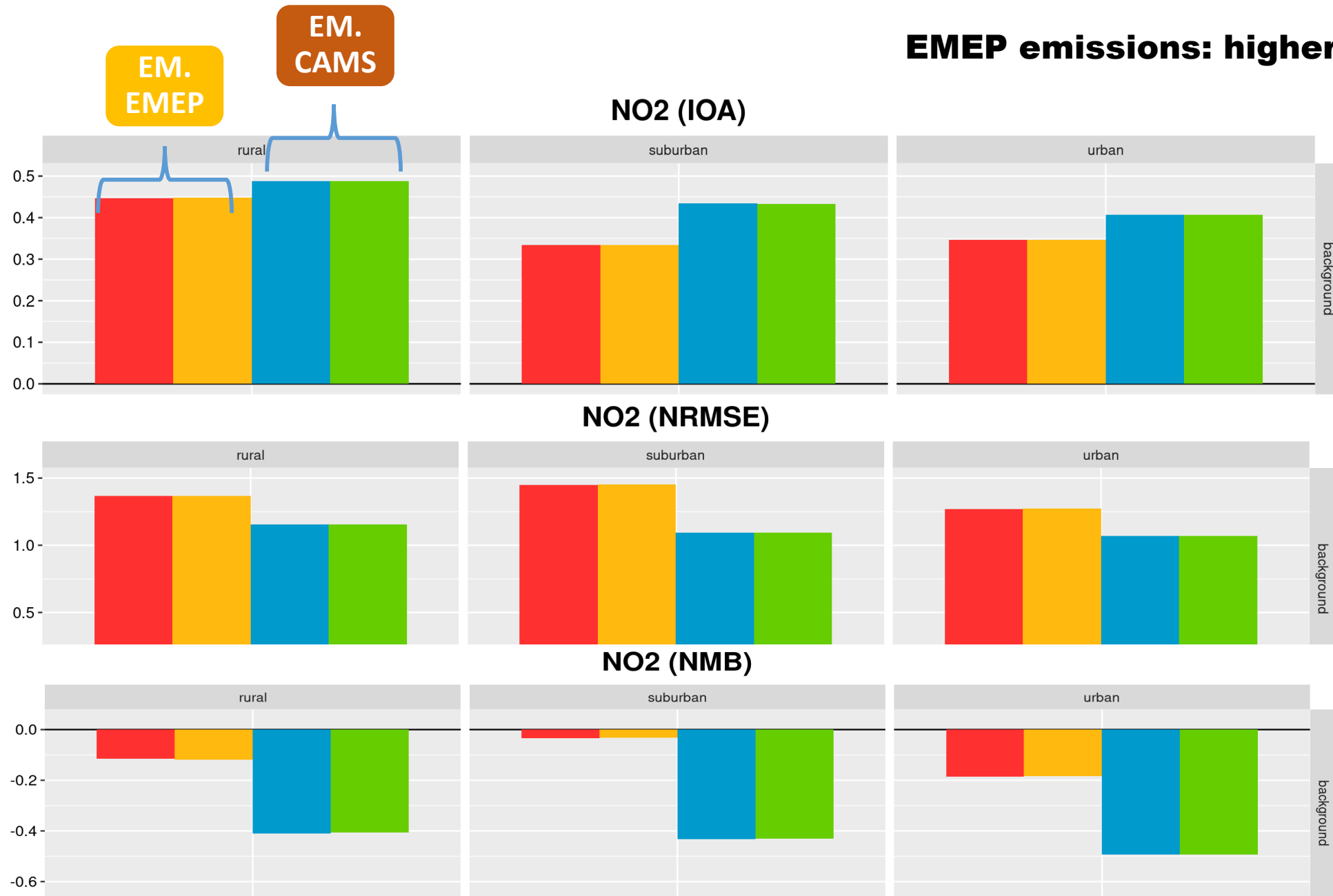


Emis imp.

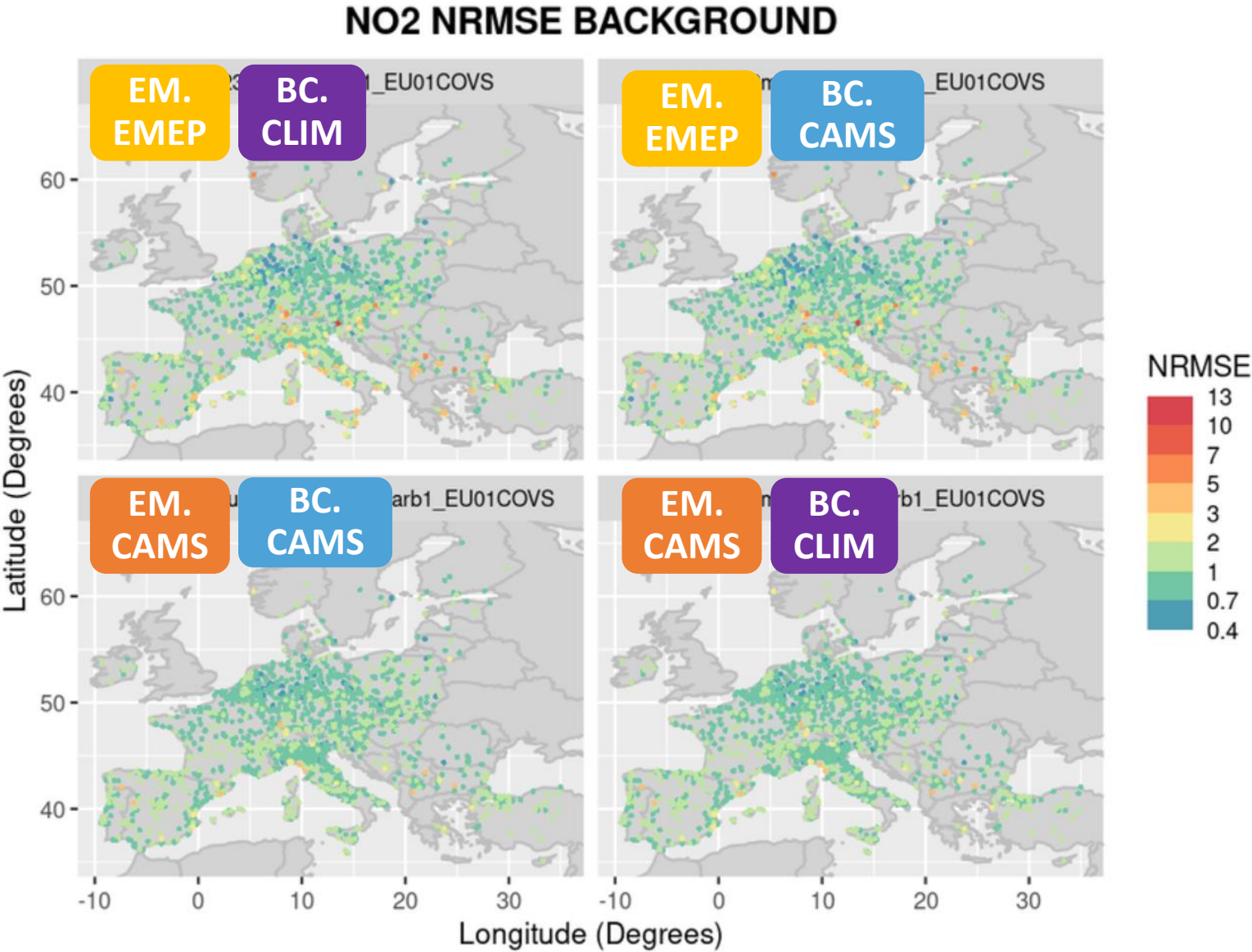
EMIS-CHIMERE23R3muscarb1



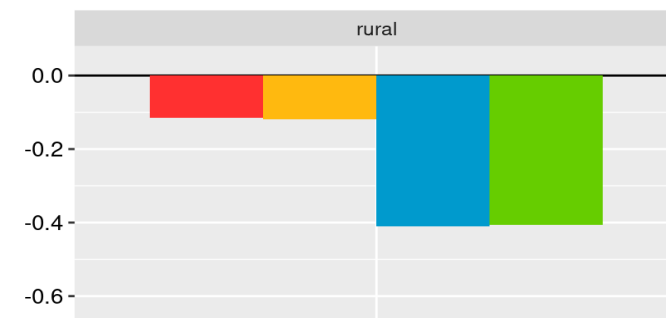
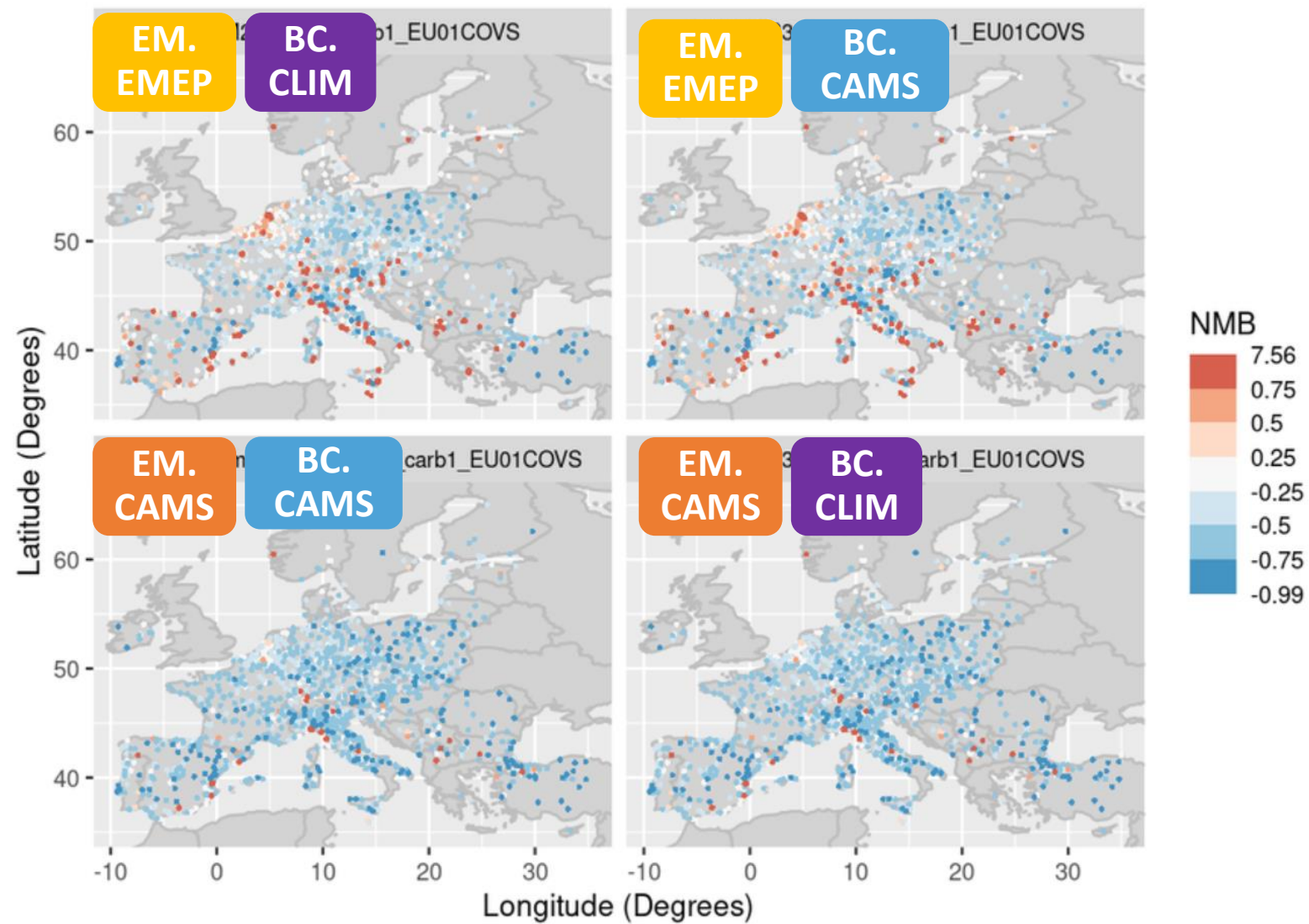
EMEP emissions: higher NRMSE



EMEP emissions: higher NRMSE



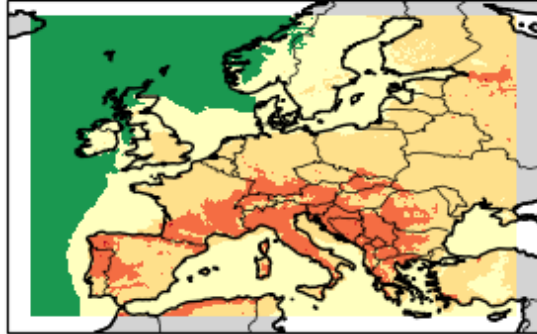
NO2 NMB BACKGROUND



HCHO

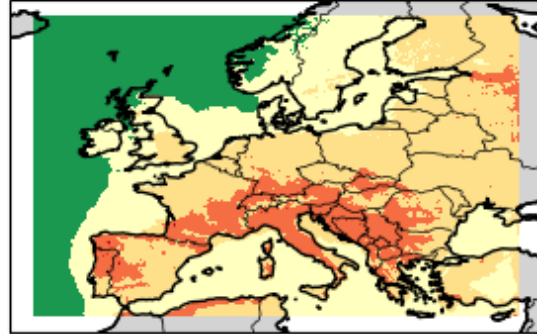
EM.
EMEP

BC.
CLIM



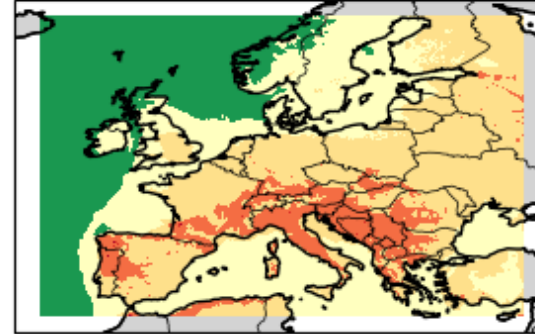
EM.
EMEP

BC.
CAMS



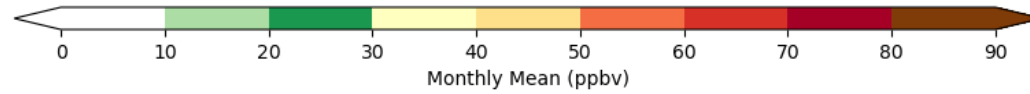
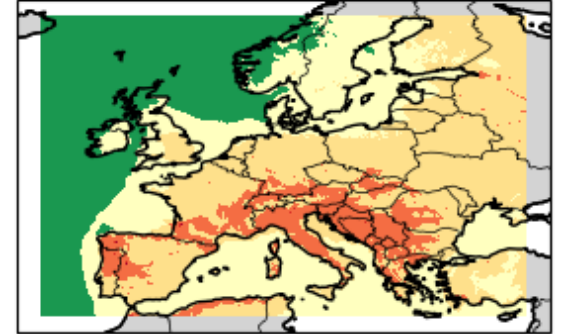
EM.
CAMS

BC.
CAMS



EM.
CAMS

BC.
CLIM



HCHO

Monthly mean BASE: HCHO 2022-07

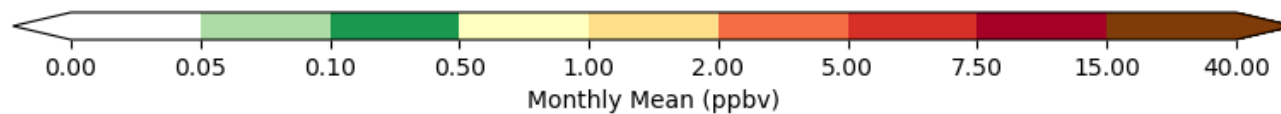
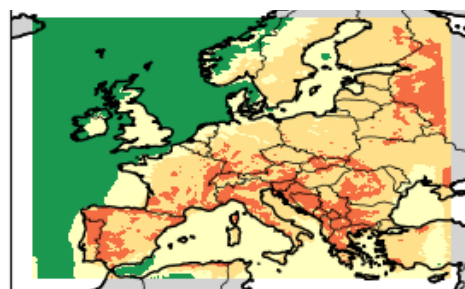
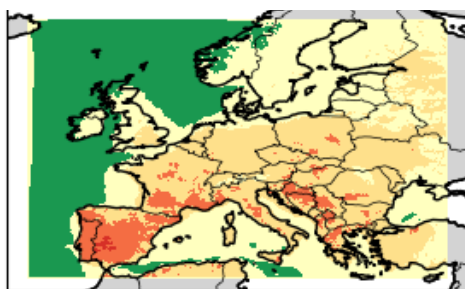
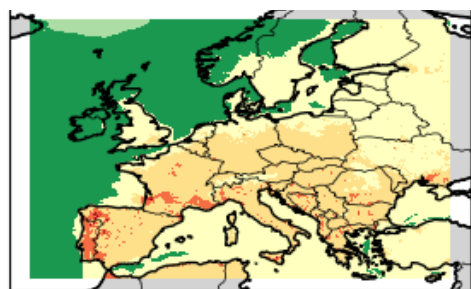
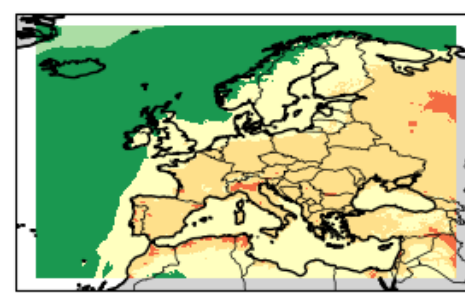
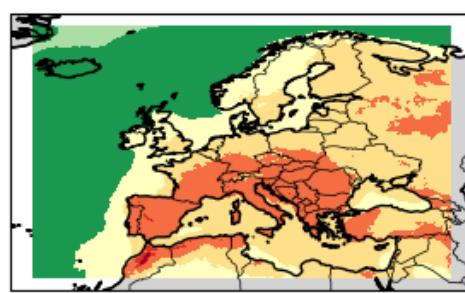
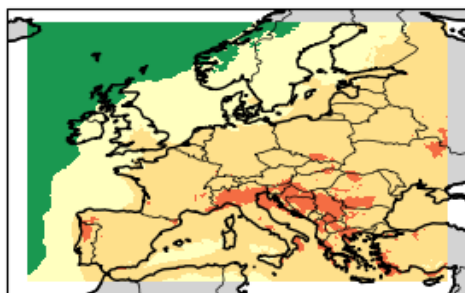
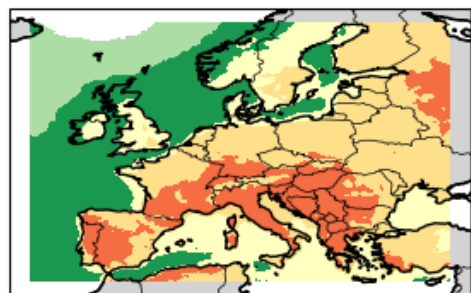
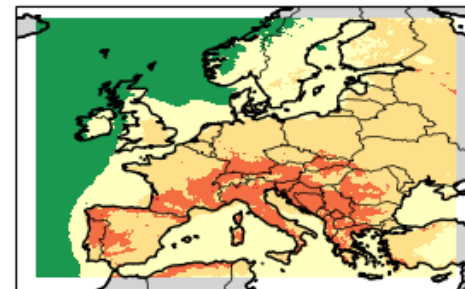
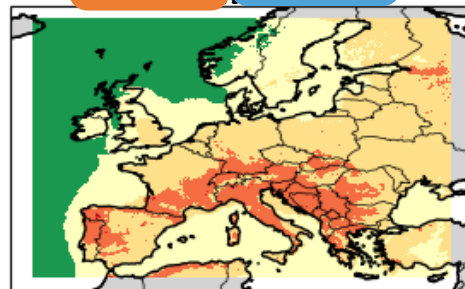
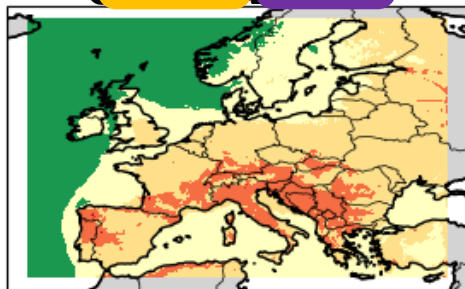
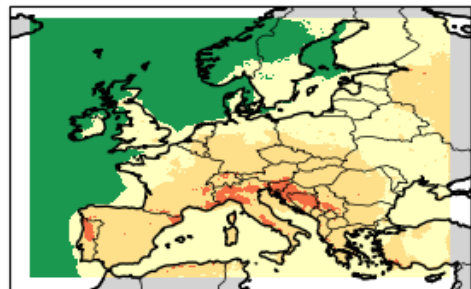
CIEMAT

EM.
EMEP

BC.
CLIM

EM.
CAMS

BC.
CAMS



HCHO

BASE

EM.
EMEP

BC.
CLIM

EM.
EMEP

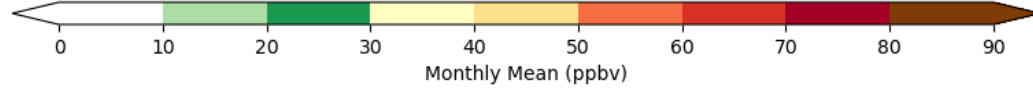
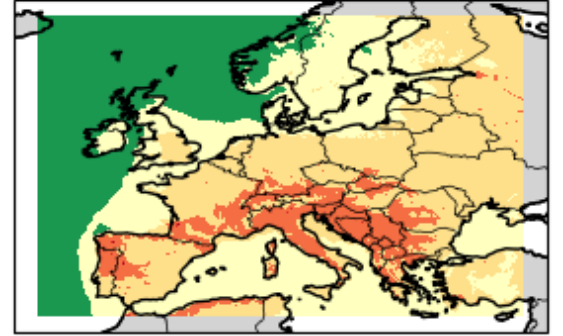
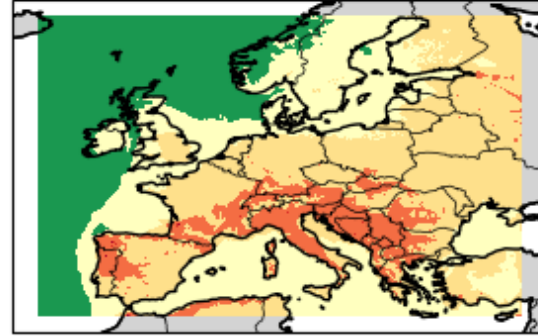
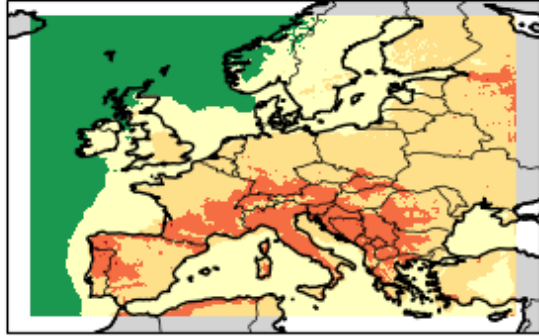
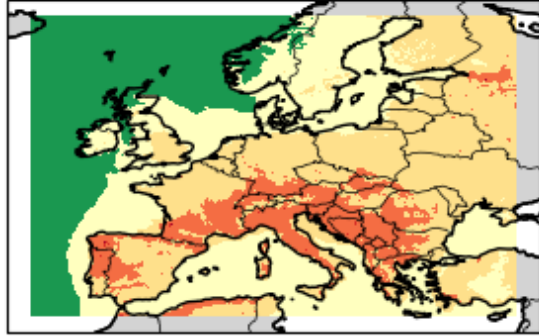
BC.
CAMS

EM.
CAMS

BC.
CAMS

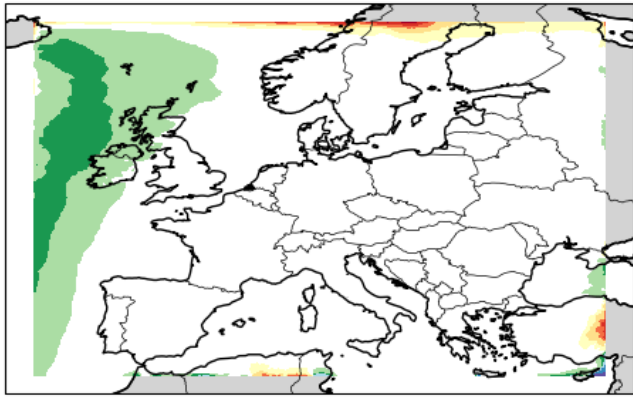
EM.
CAMS

BC.
CLIM



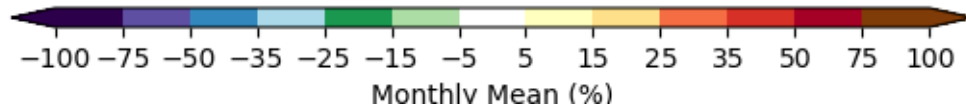
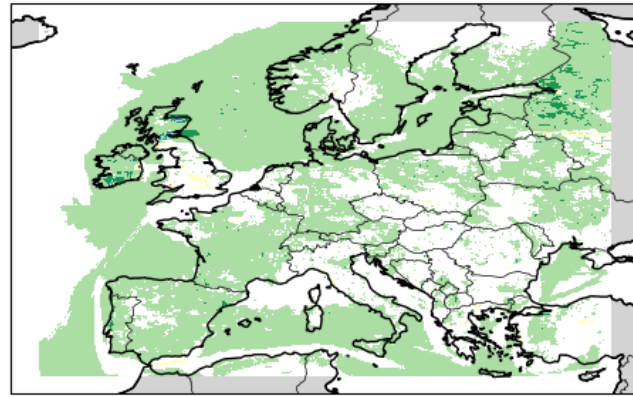
Imp. BC

CONT-CHIMERE23R3muscarb1



Imp. Emis

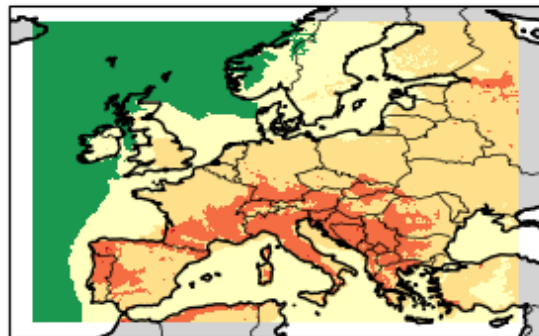
EMIS-CHIMERE23R3muscarb1



HCHO

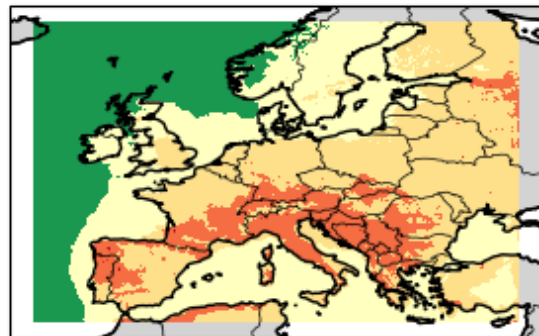
EM.
EMEP

BC.
CLIM



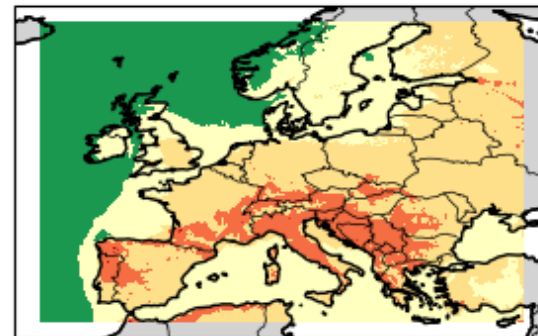
EM.
EMEP

BC.
CAMS



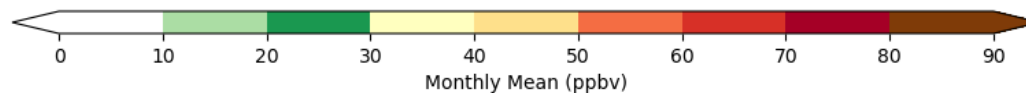
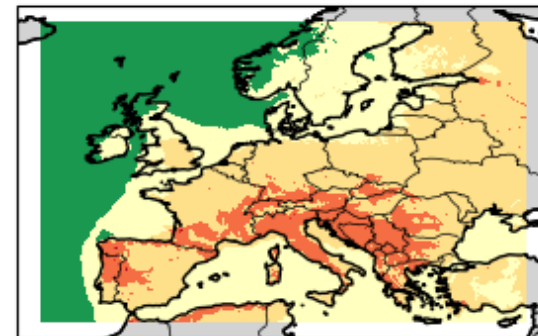
EM.
CAMS

BC.
CAMS



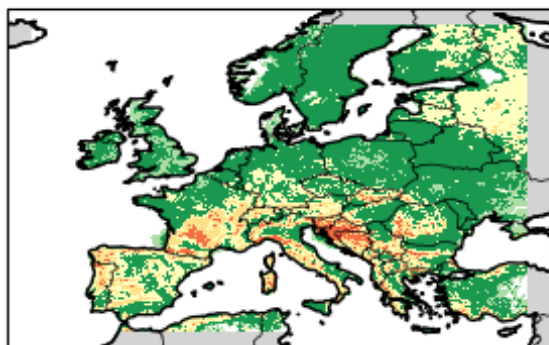
EM.
CAMS

BC.
CLIM

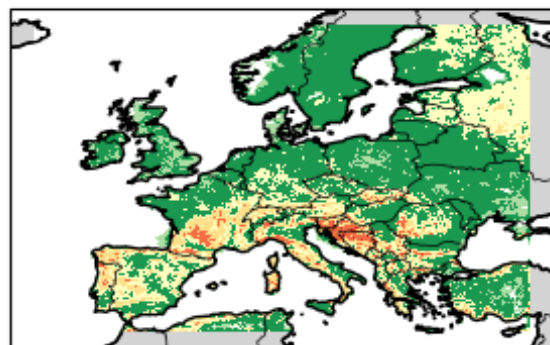


ISOP

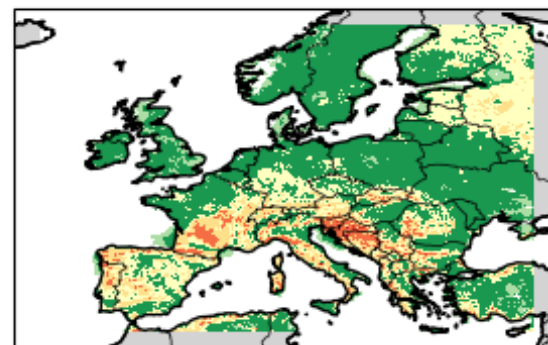
CHIMERE23R3muscarb1



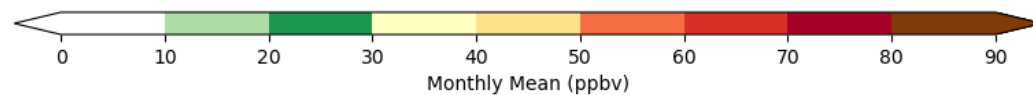
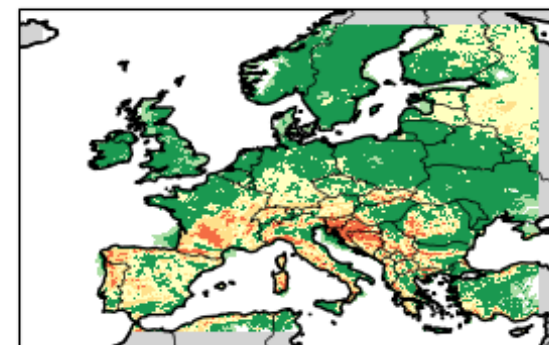
CHIMERE23R3musccamscarb1



CHIMERE23R3musccamsecamscarb1

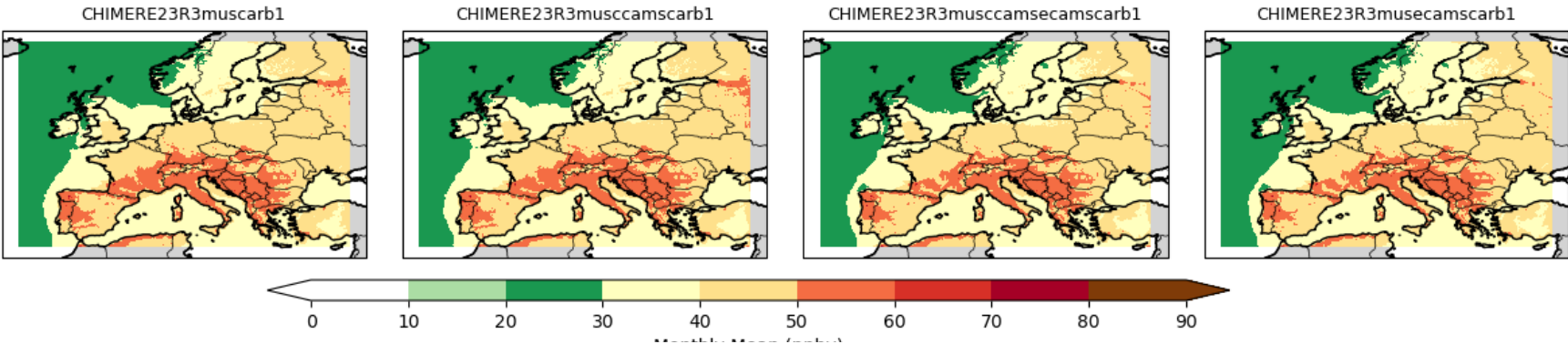


CHIMERE23R3musecamscarb1

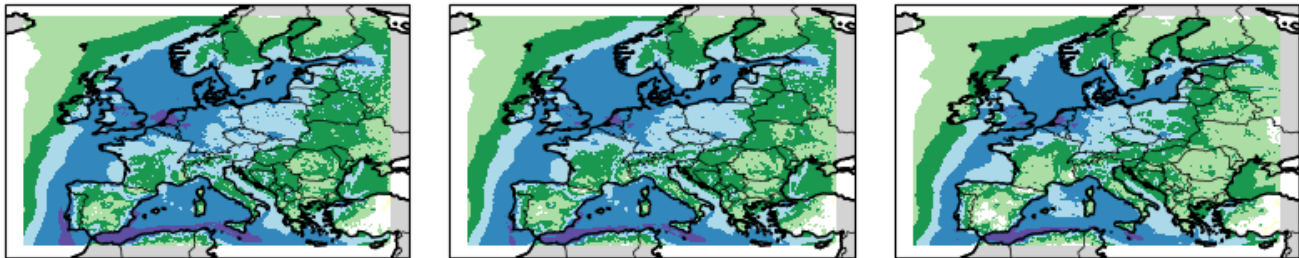


HCHO

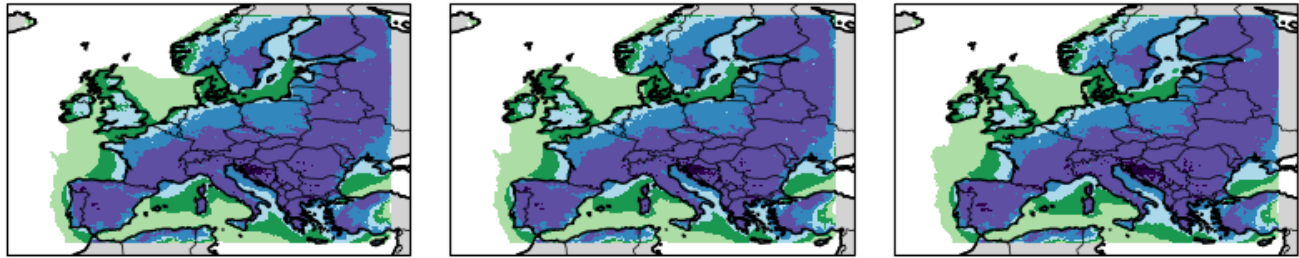
BASE



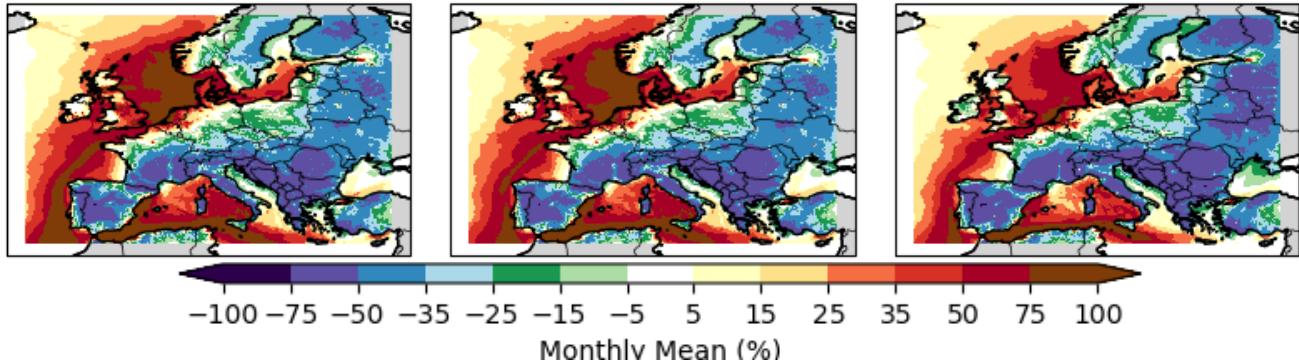
**Antr.
Impact
(and fires)**



**Biog.
Impact**

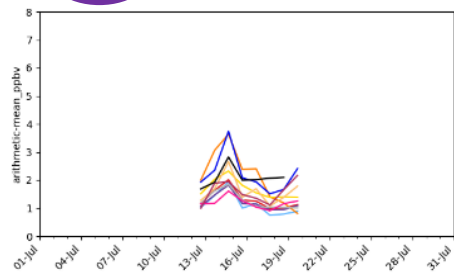


**Difference
of Ant.
And Biog.
Impacts**

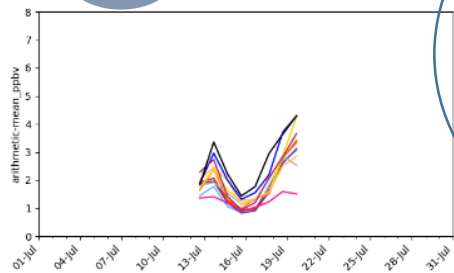


HCHO

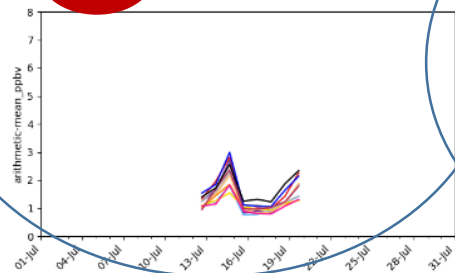
AT



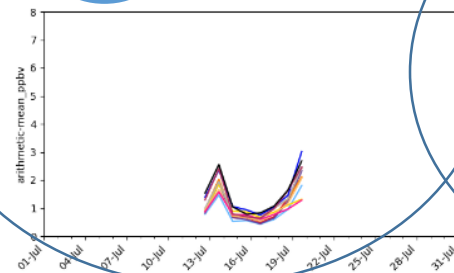
BE



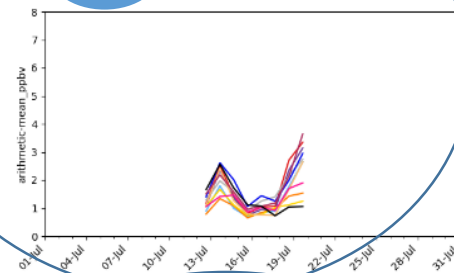
CZ



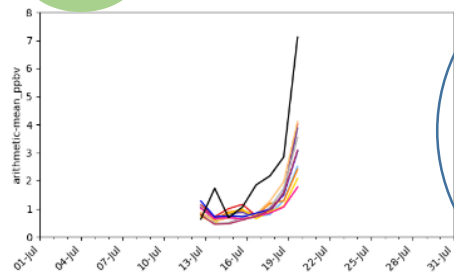
DE



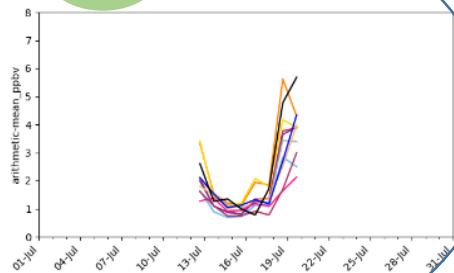
DE



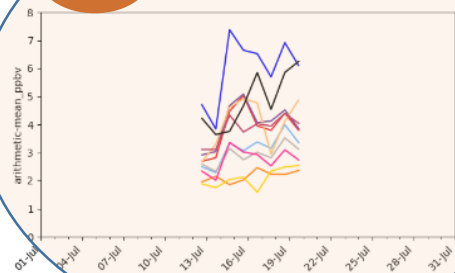
GB



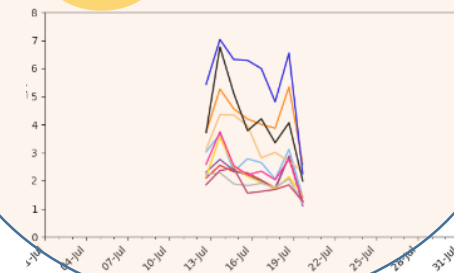
GB



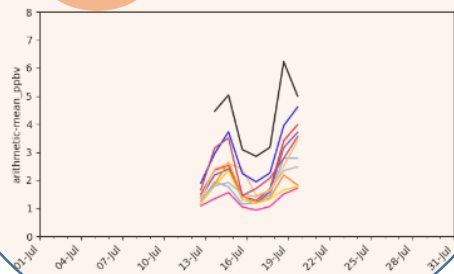
IT



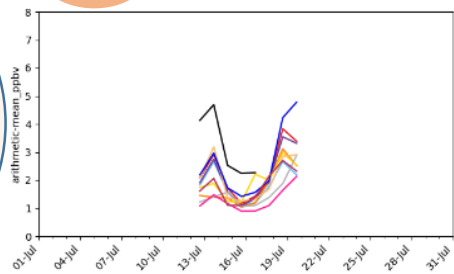
ES



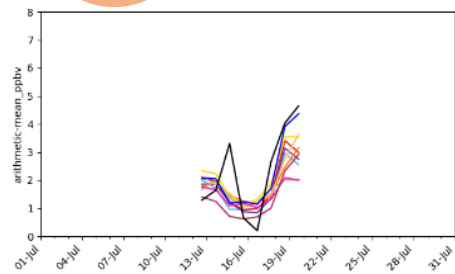
FR



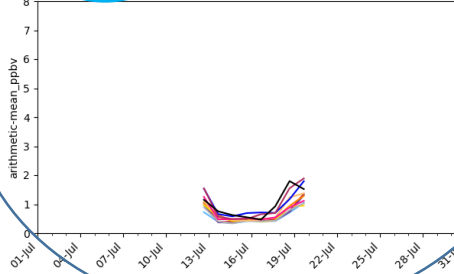
FR



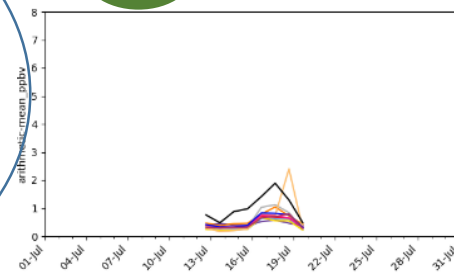
FR



NO

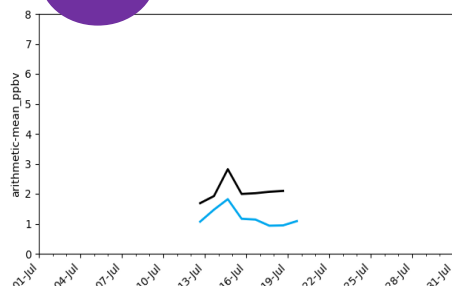


IE

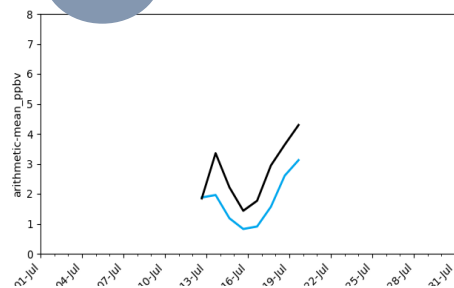


HCHO

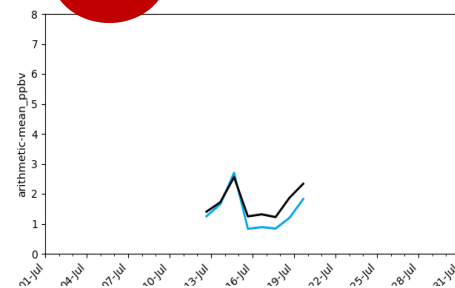
AT



BE



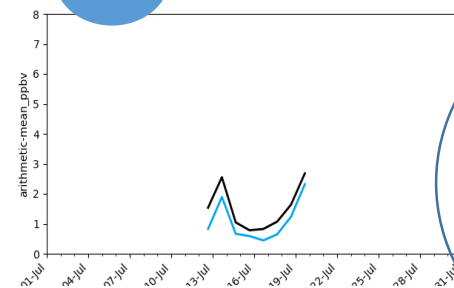
CZ



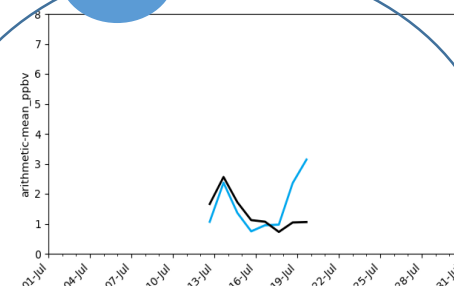
EM.
CAMS

BC.
CAMS

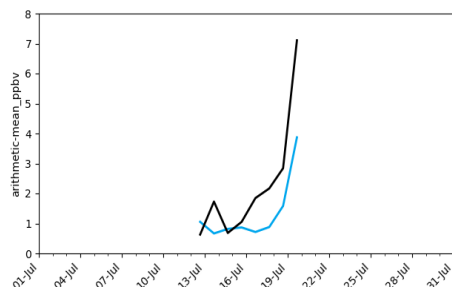
DE



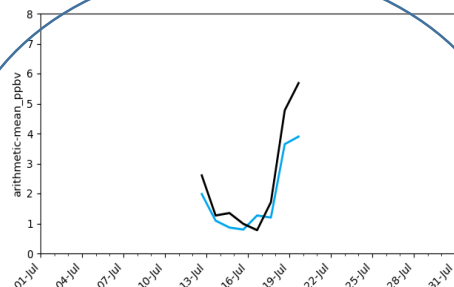
DE



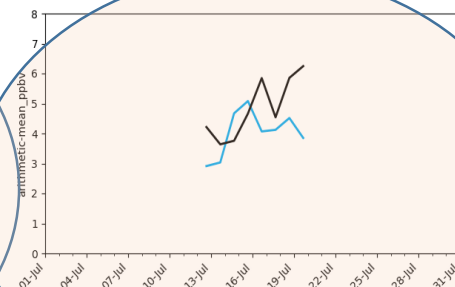
GB



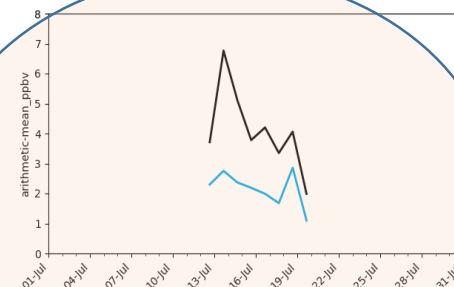
GB



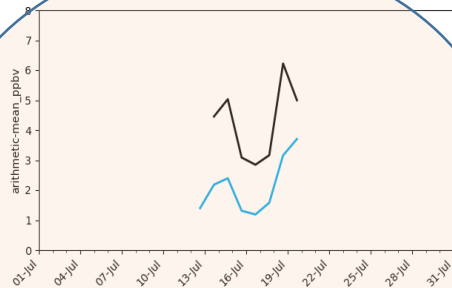
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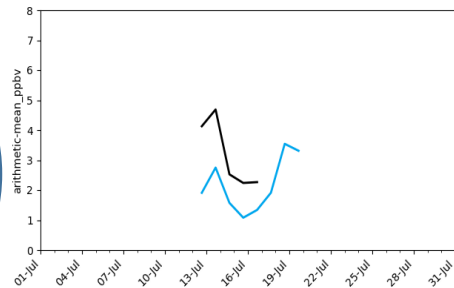
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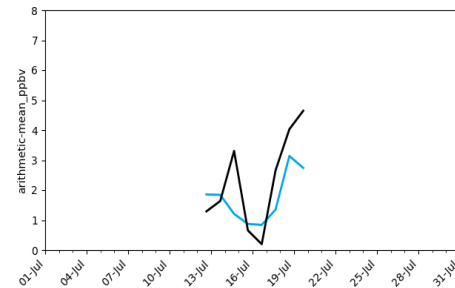
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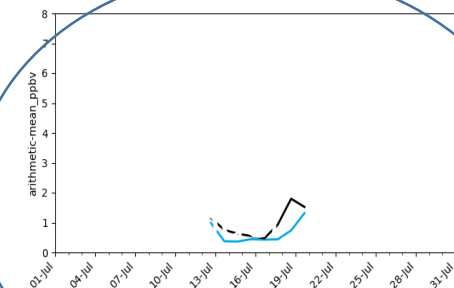
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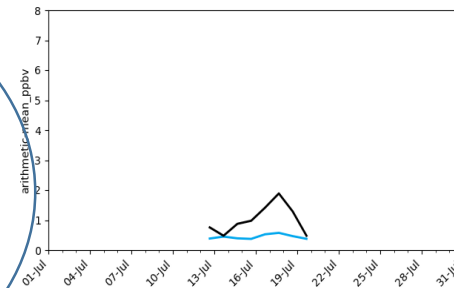
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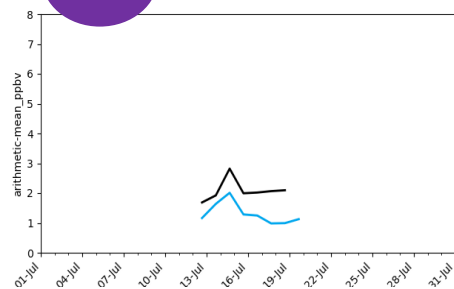


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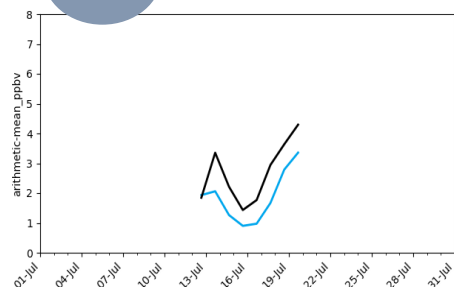


HCHO

AT



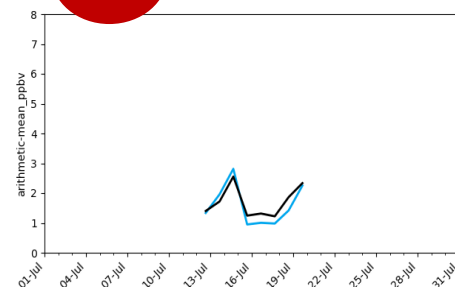
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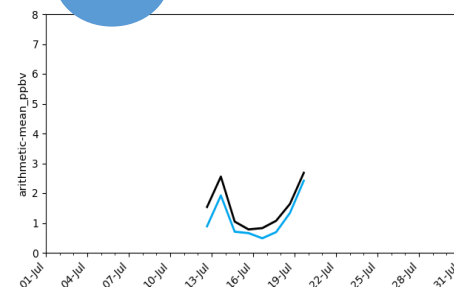
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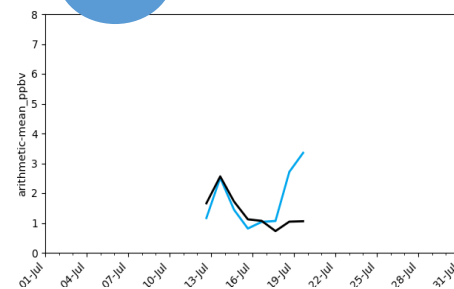
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CLIM



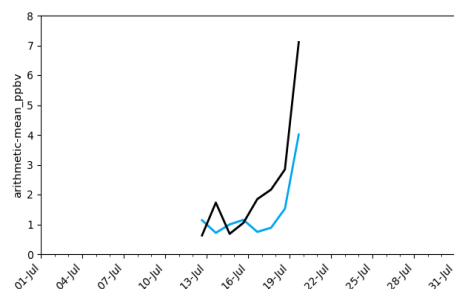
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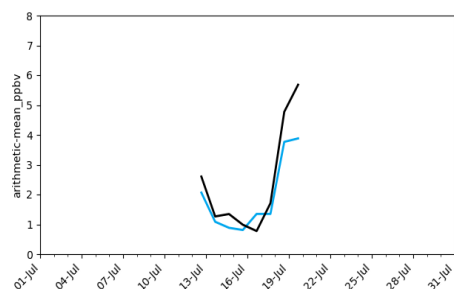
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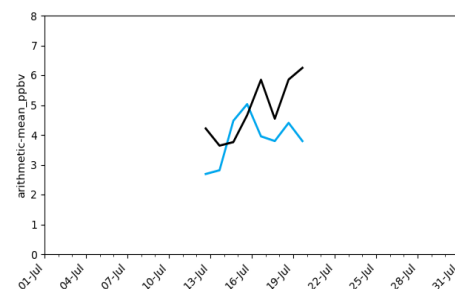
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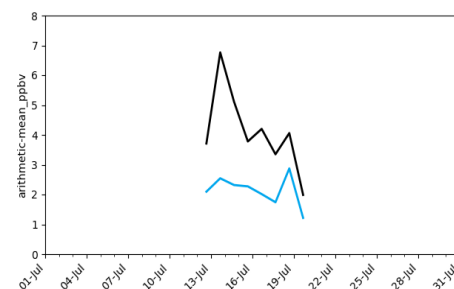
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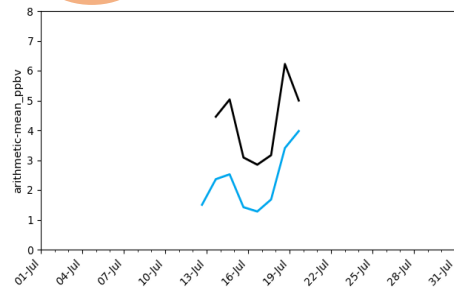
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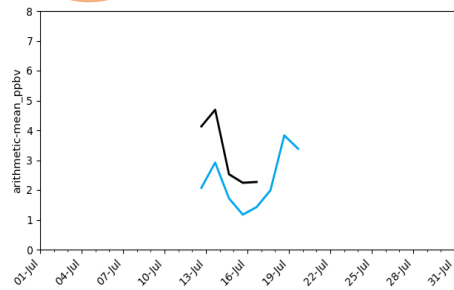
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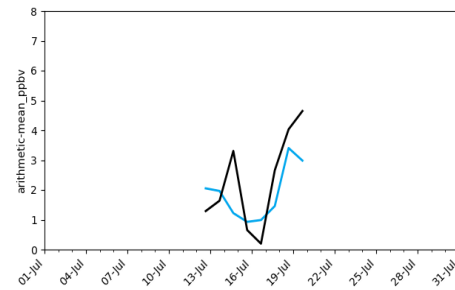
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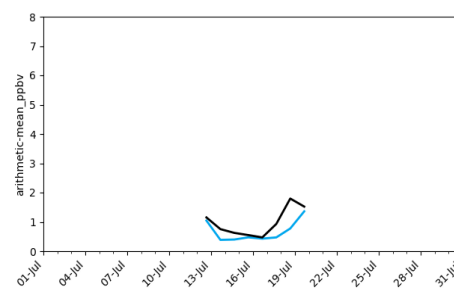
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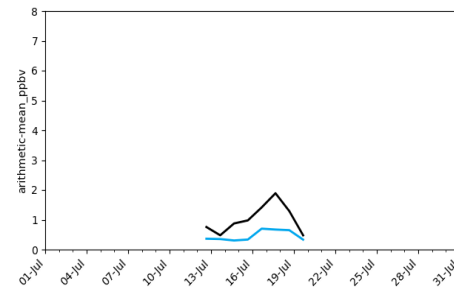
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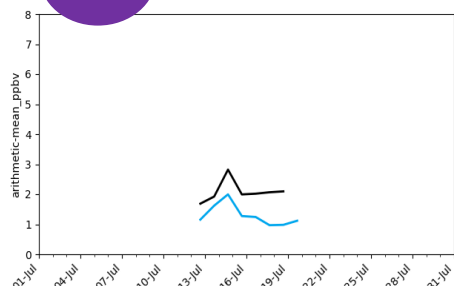


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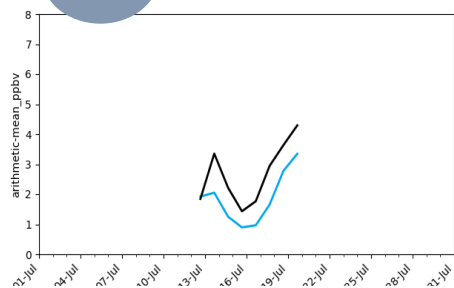


HCHO

AT



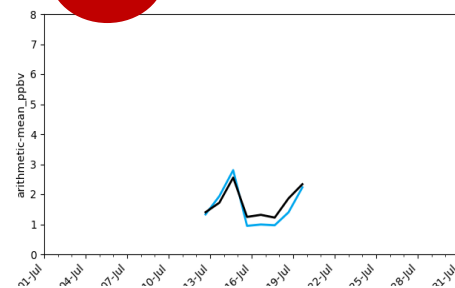
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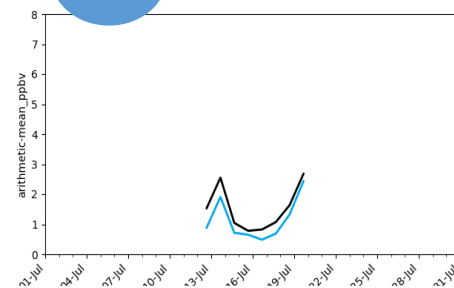
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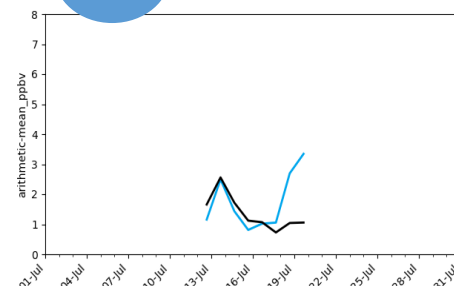
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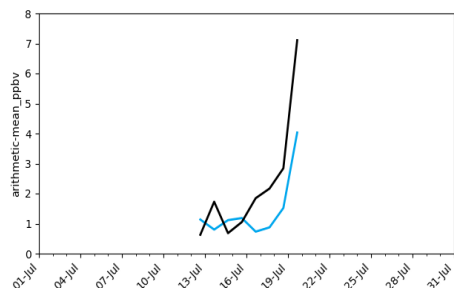
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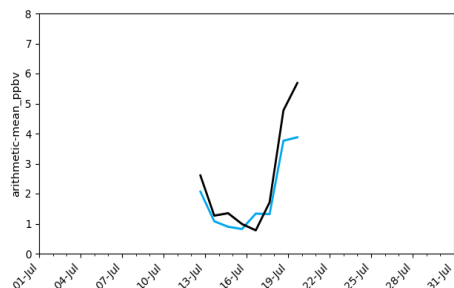
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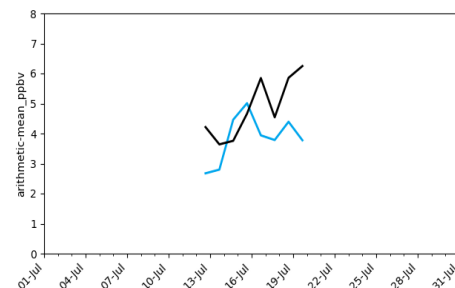
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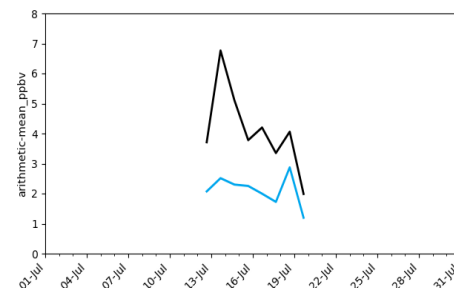
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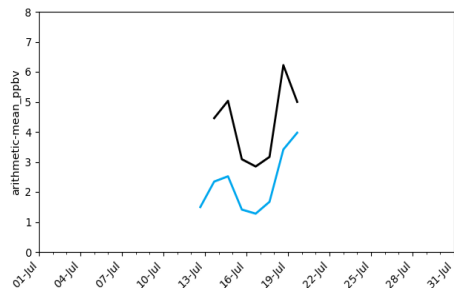
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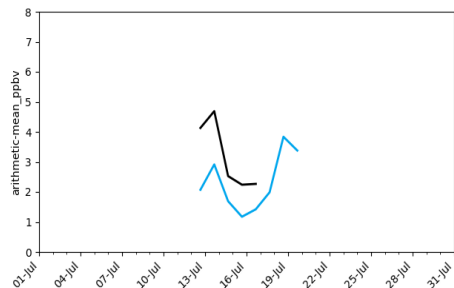
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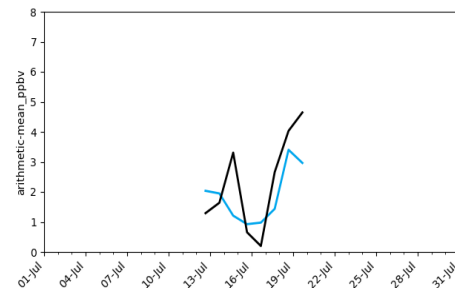
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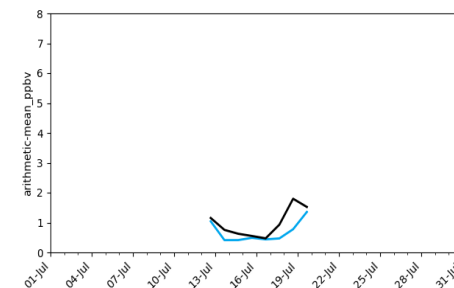
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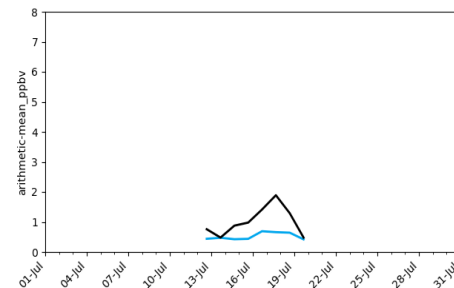
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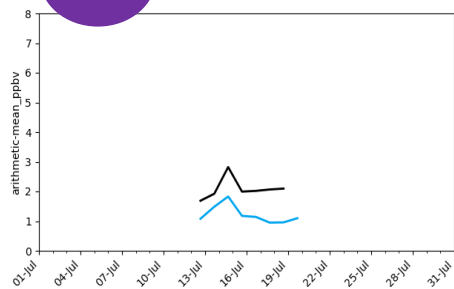


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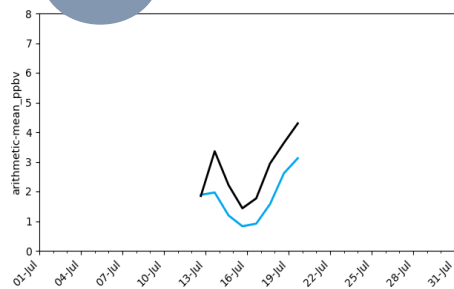


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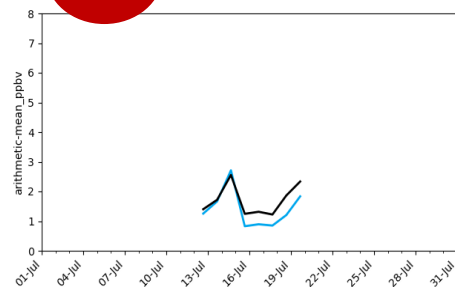
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BE



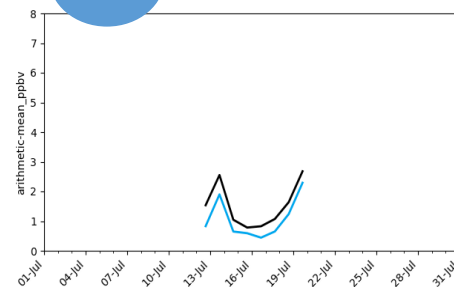
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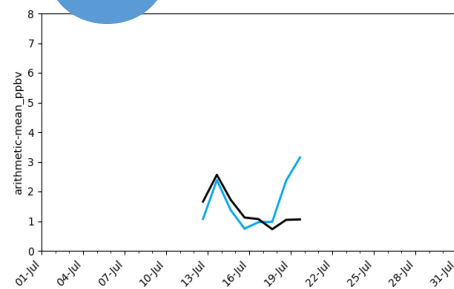
EM.
CAMS

BC.
CLIM

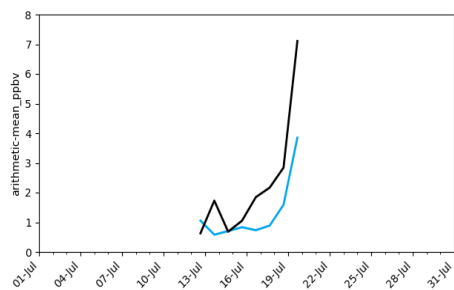
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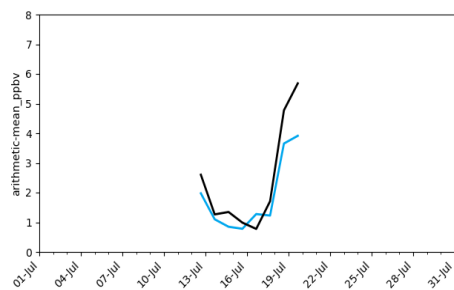
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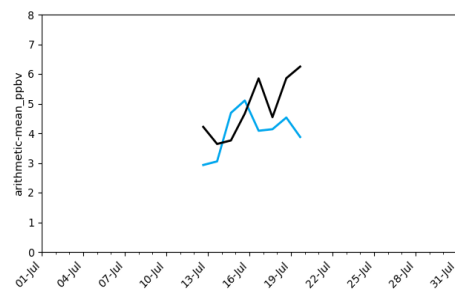
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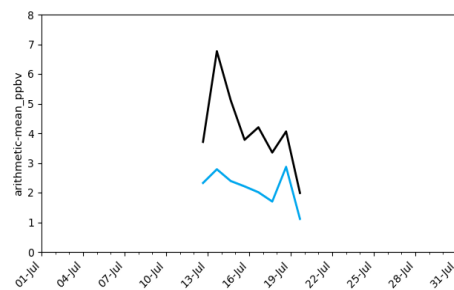
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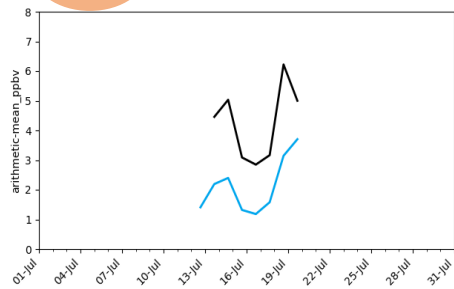
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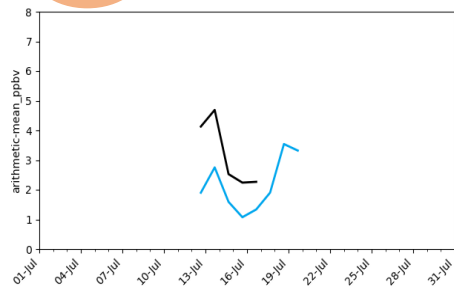
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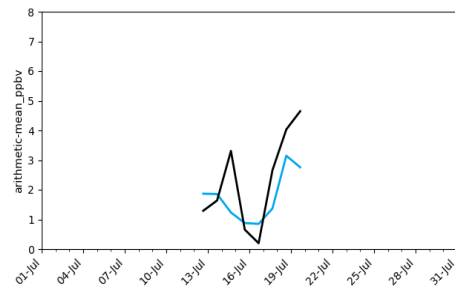
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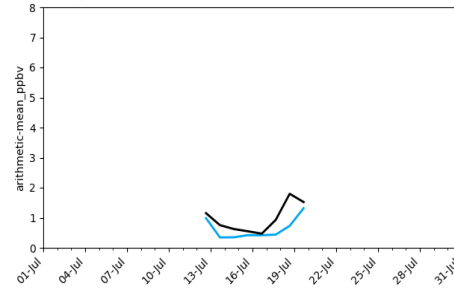
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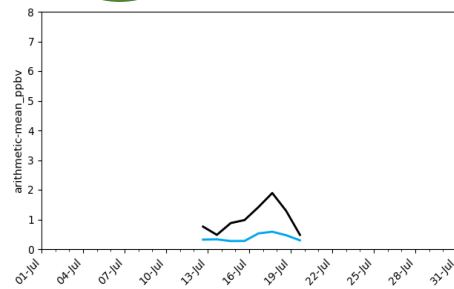
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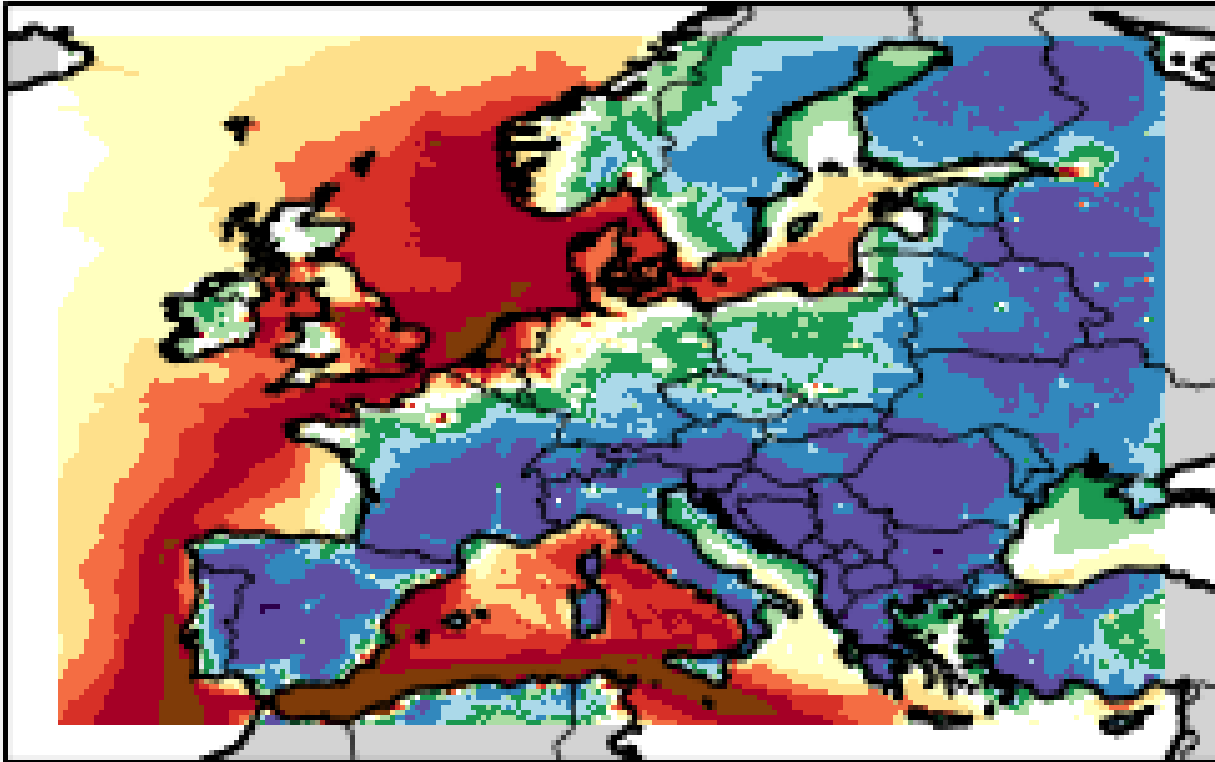
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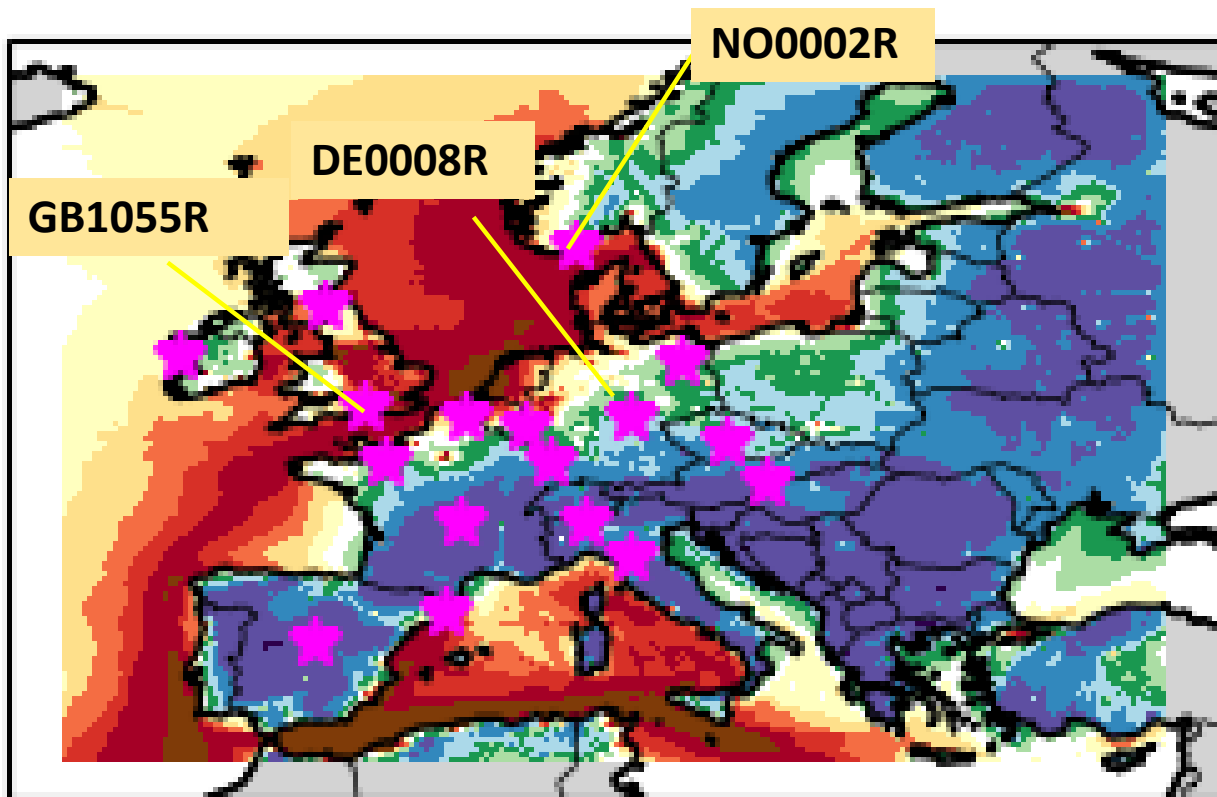
IE



Difference of Ant. And Biog. Impacts



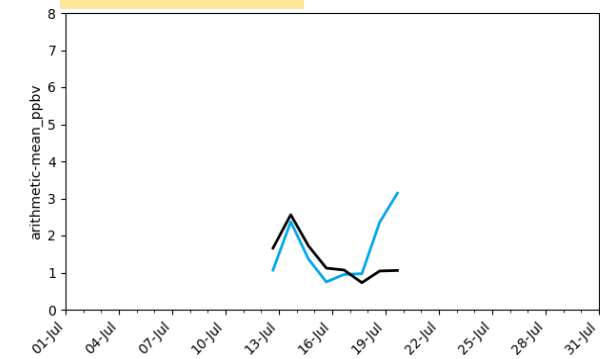
Difference of Ant. And Biog. Impacts



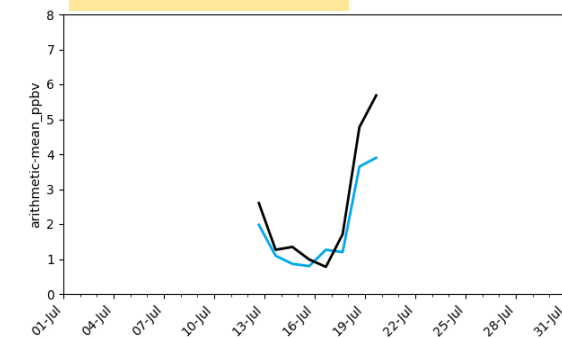
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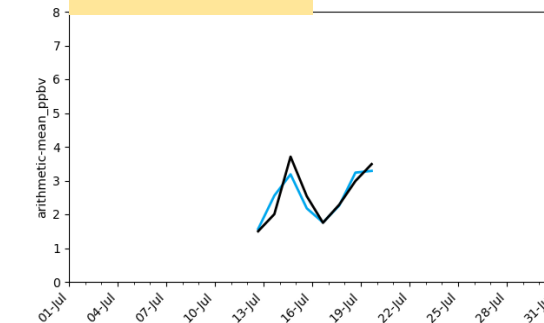
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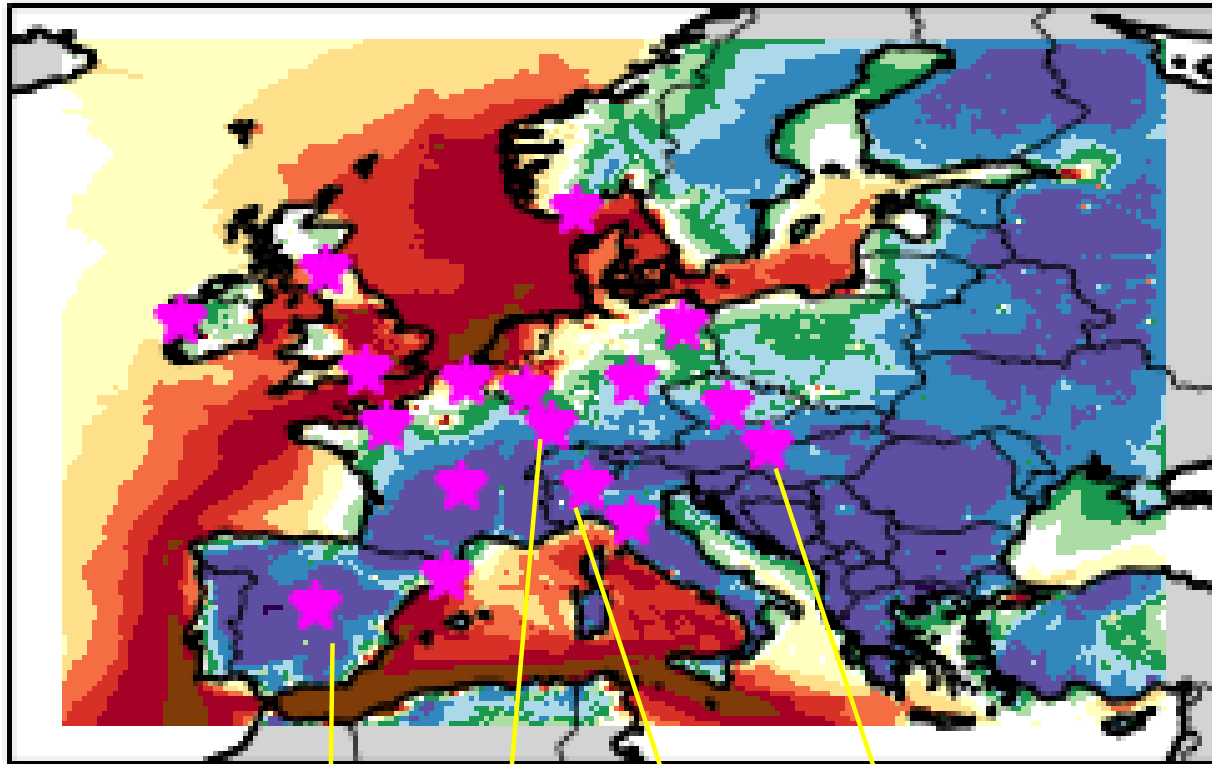
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NO0002R



Difference of Ant. And Biog. Impacts

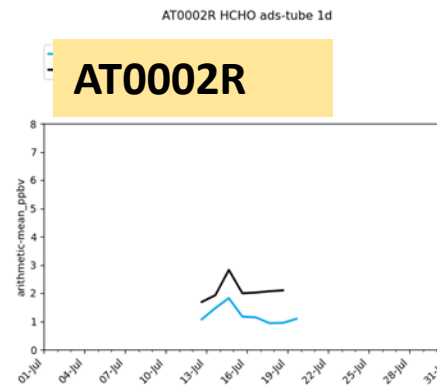
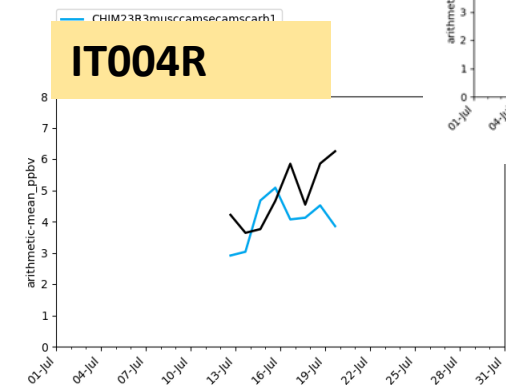
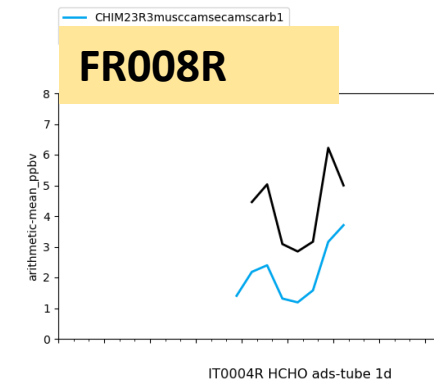
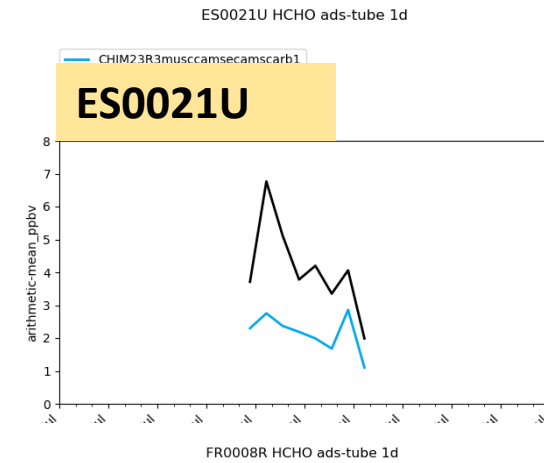


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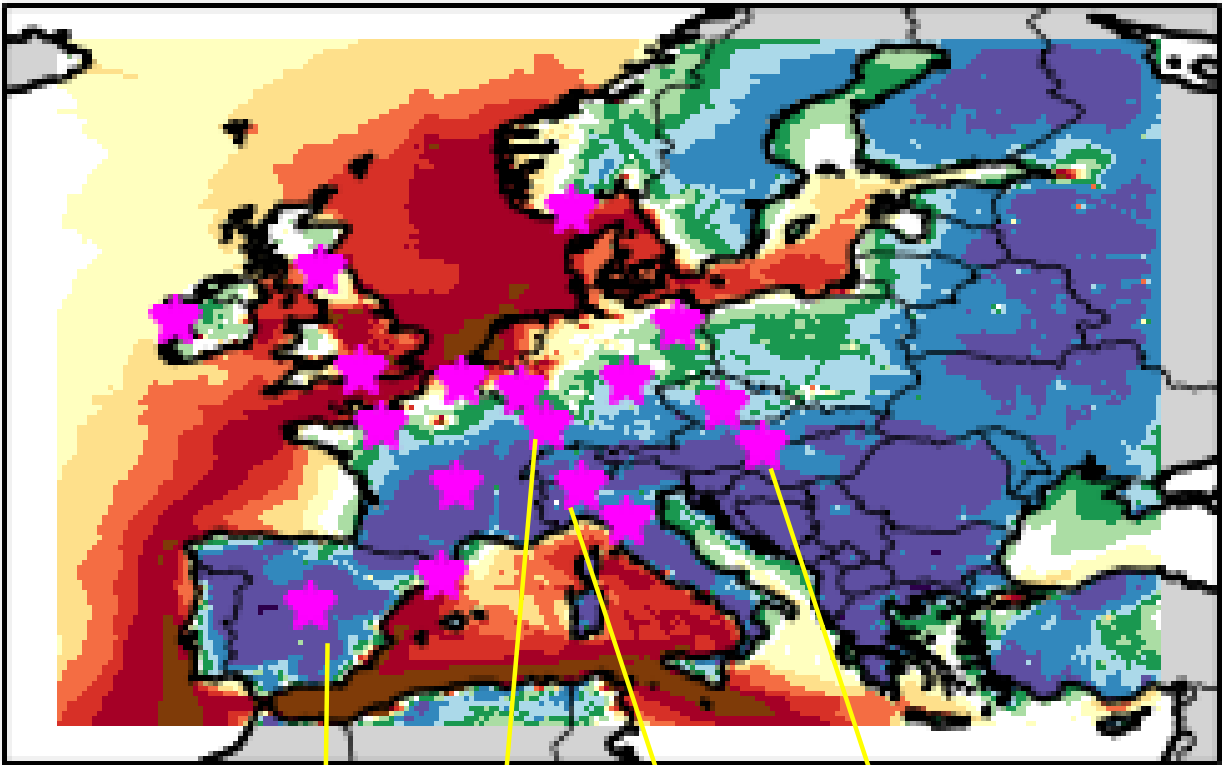
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AT0002R





Difference of Ant. And Biog. Impacts

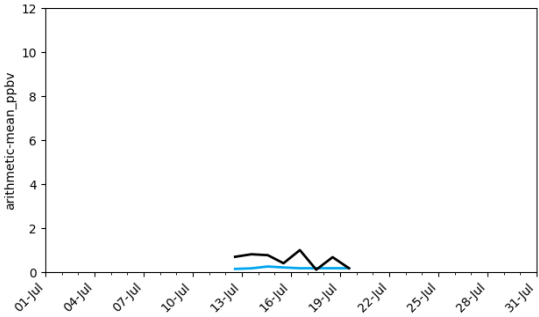


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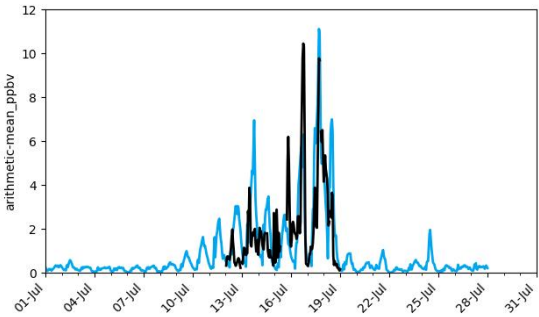
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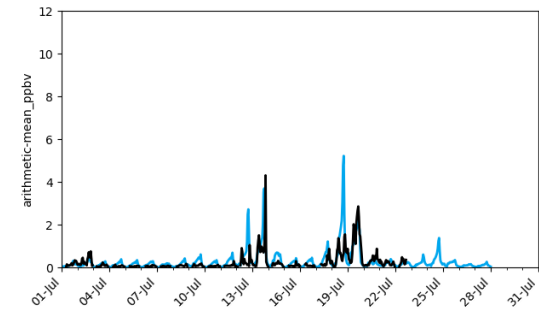
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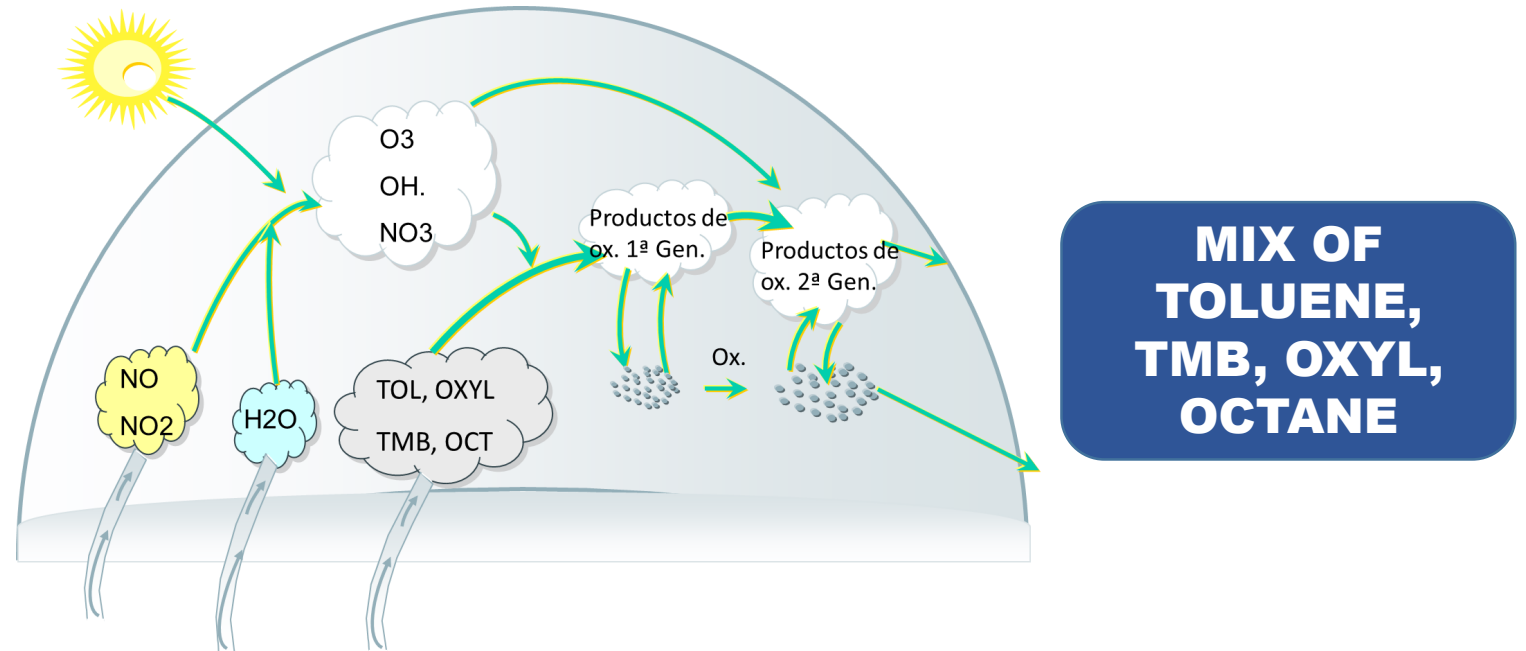


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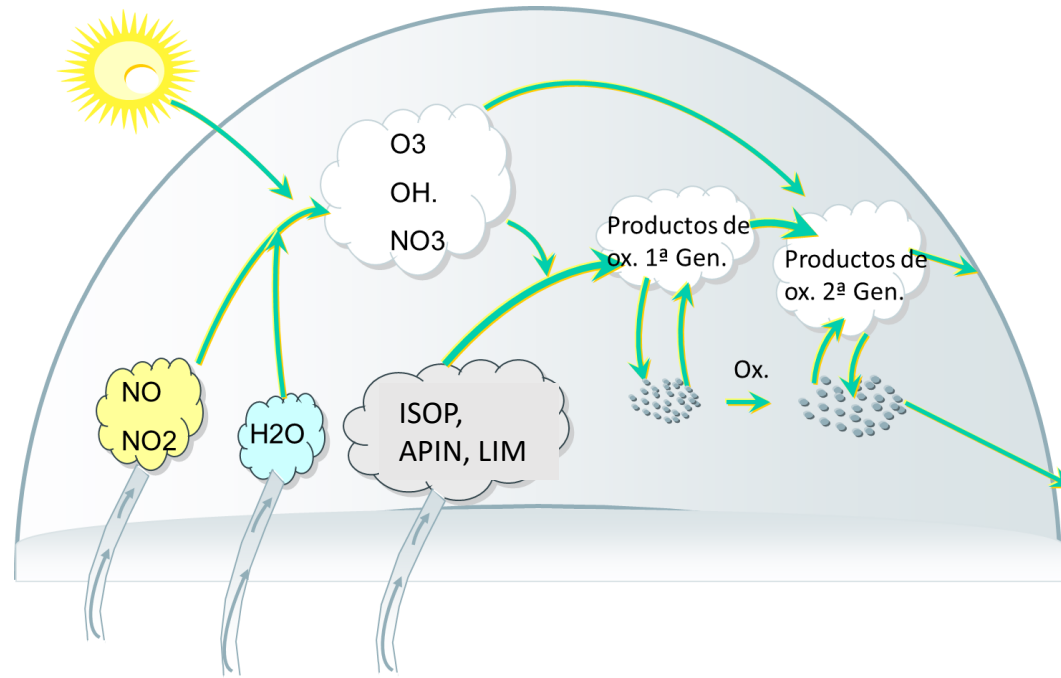
EUPHORE (CEAM, Valencia). Experiments in 2008, 2009, 2010 y 2011

**MAOS
Project**



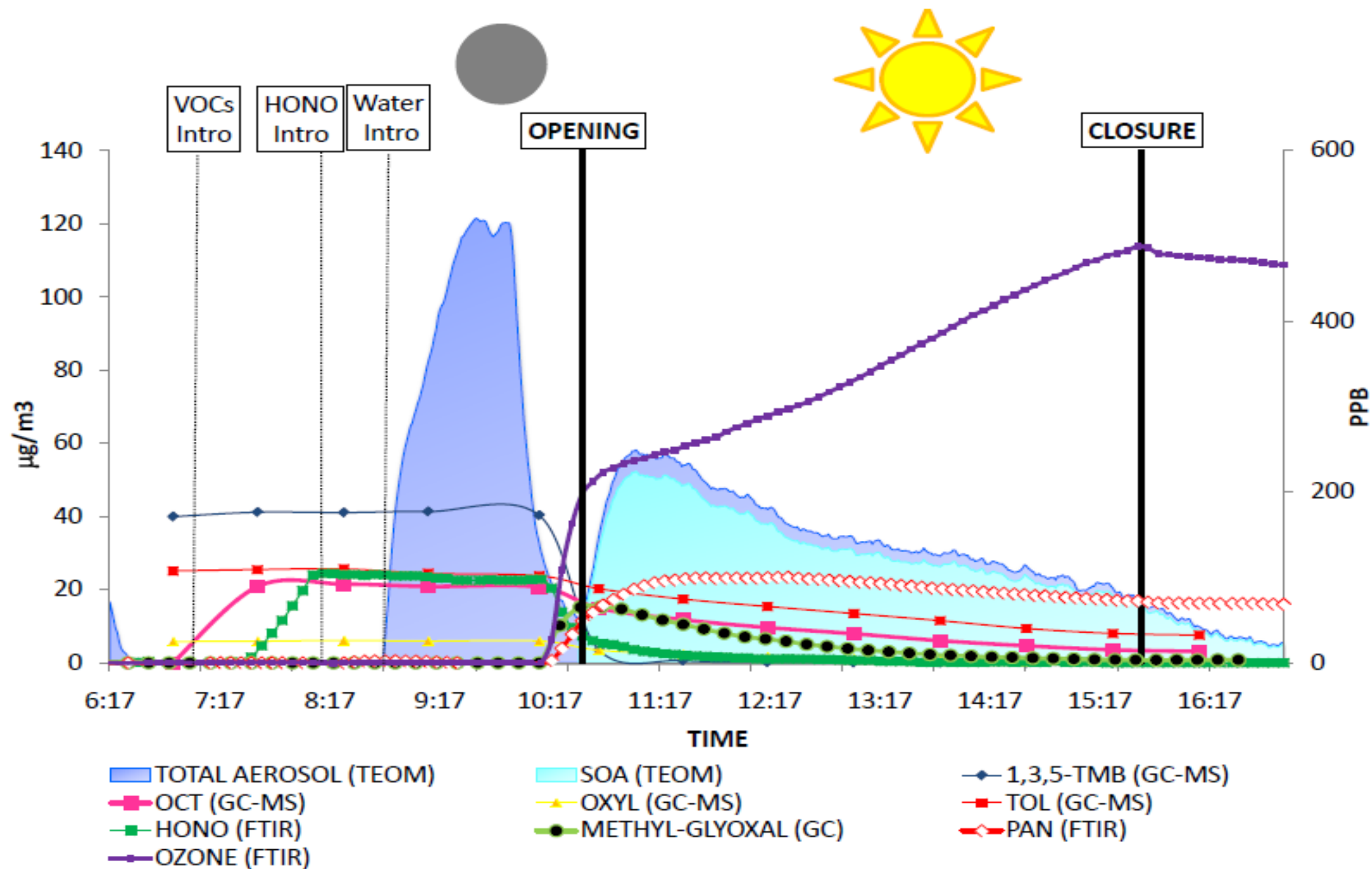


- Vivanco, M.G., M Santiago, M Sánchez, MA Clavero, E Borrás, M Ródenas, F. Alacreu, M. Vázquez, E. Clemente, R. Porrás, A. Muñoz, A. Stein..(2013). *Experimental data on SOA formation from mixtures of anthropogenic and biogenic organic compounds*. *Atmósfera* 26 (1), **59-73**.
- Vivanco, M.G., Santiago, M., A. Martínez-Tarifa, E. Borrás, M. Ródenas, C. García-Diego, and M. Sánchez (7/1) (2011): *SOA formation in a photoreactor from a mixture of organic gases and HONO for different experimental conditions*. *Atmospheric Environment*. 45 (3), 708-715.



**MIX OF
ISOPRENE,
LIMONENE
AND A-PINEN**

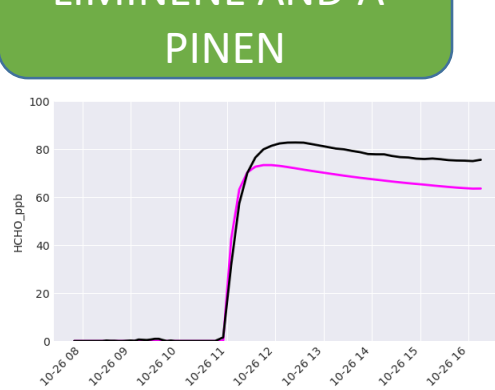
- Vivanco, M.G., M Santiago, M Sánchez, MA Clavero, E Borrás, M Ródenas, F. Alacreu, M. Vázquez, E. Clemente, R. Porrás, A. Muñoz, A. Stein..(2013). *Experimental data on SOA formation from mixtures of anthropogenic and biogenic organic compounds. Atmósfera* 26 (1), **59-73**.
- Vivanco, M.G., Santiago, M., A. Martínez-Tarifa, E. Borrás, M. Ródenas, C. García-Diego, and M. Sánchez (7/1) (2011): *SOA formation in a photoreactor from a mixture of organic gases and HONO for different experimental conditions. Atmospheric Environment.* 45 (3), 708-715.



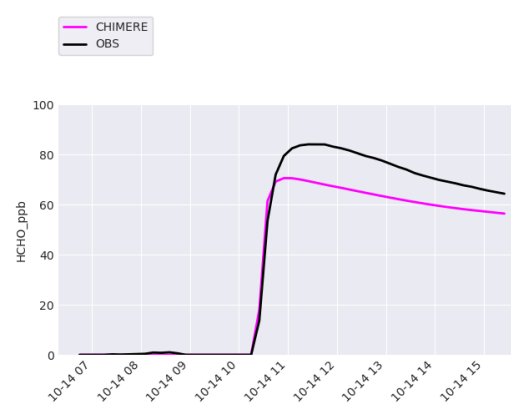
MIX OF ISOPRENE,
LIMINENE AND A-
PINEN

HCHO

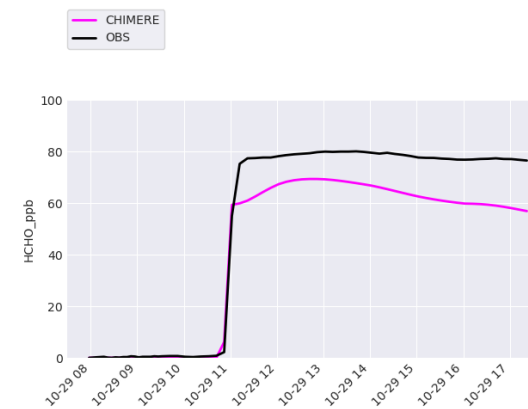
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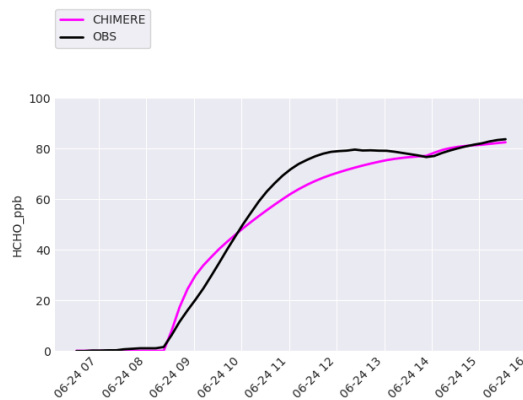


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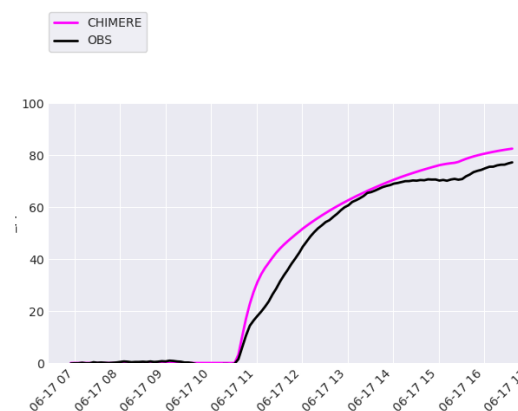


MIX OF TOLUENE,
TMB, OXYL, OCTANE

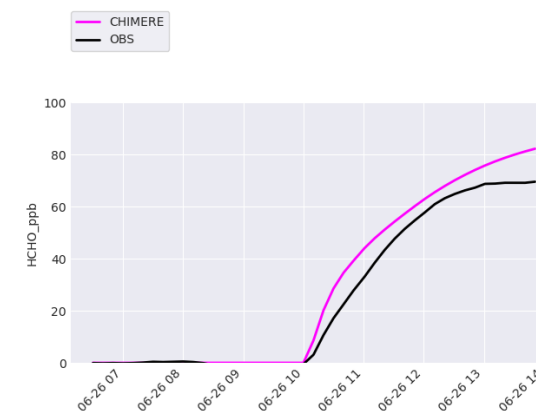
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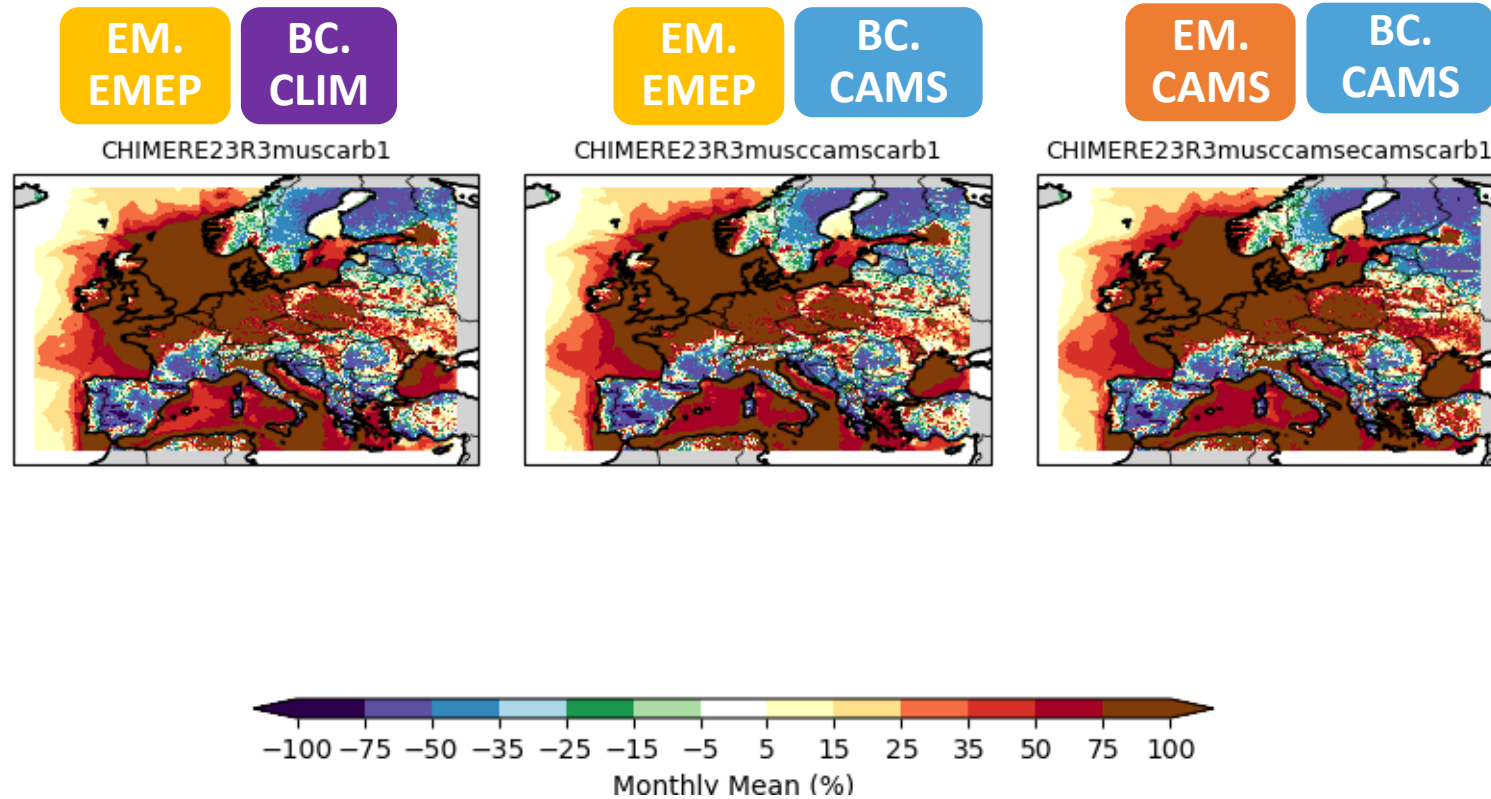


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Difference of Ant. And Biog. Impacts

TVOCs



Thank you!

- Project TED2021-132431B-I00 (TRANSAIRE: Transition to cleaner air in Spain) funded by MCIN/AEI/ 10.13039/501100011033 and by the European Union NextGenerationEU/PRTR



- We also thank the Ministry for the Ecological Transition and Demographic Challenge (MITERD)

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