TFMM annual meeting, Warsaw, Poland, 6-7 May 2024

LIFE20 PRE/IT/000004

Organic aerosol modelling at regional scale in the LIFE-REMY project: obtained results and lesson learnt

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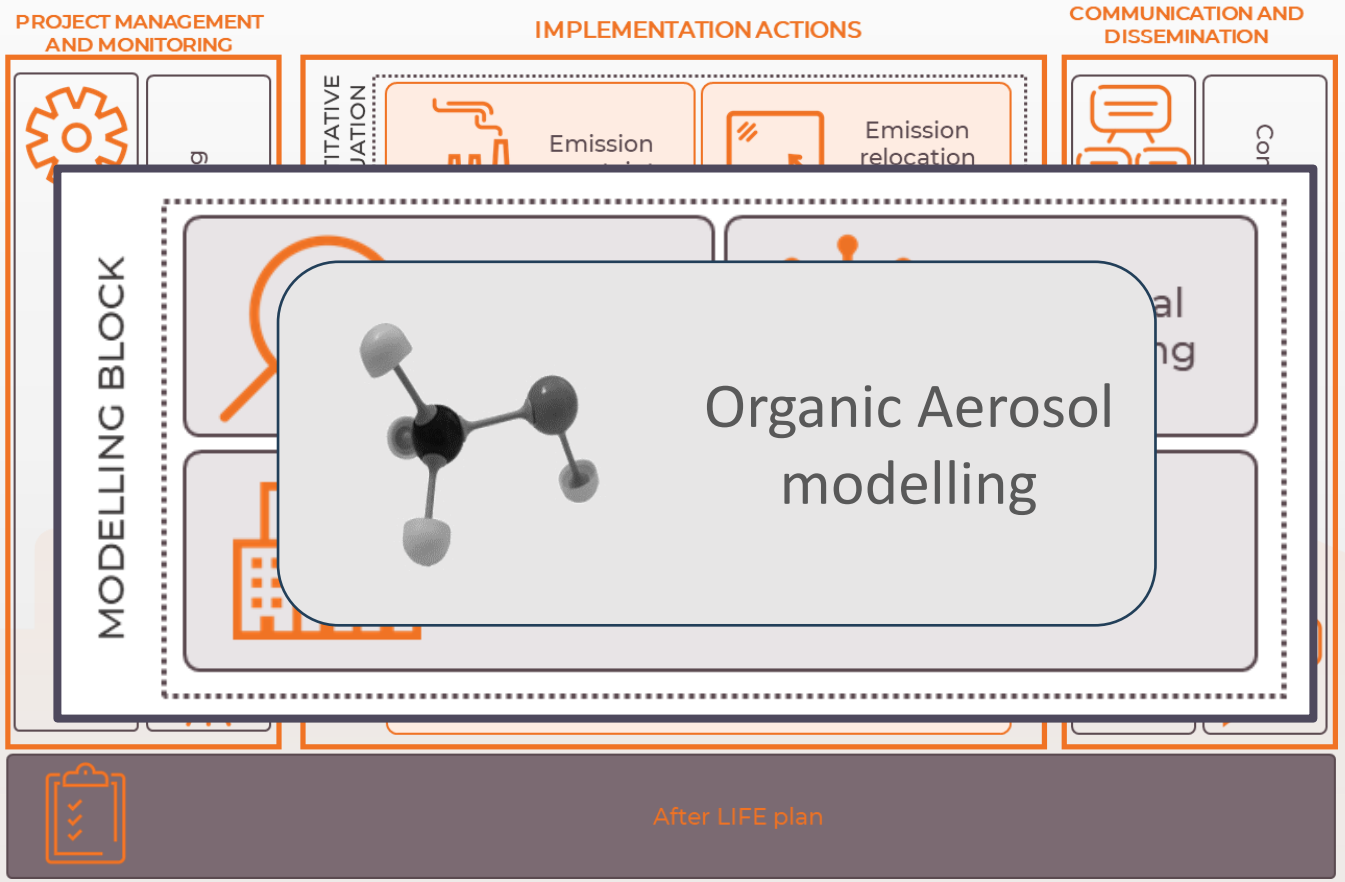
LIFE REMY Project

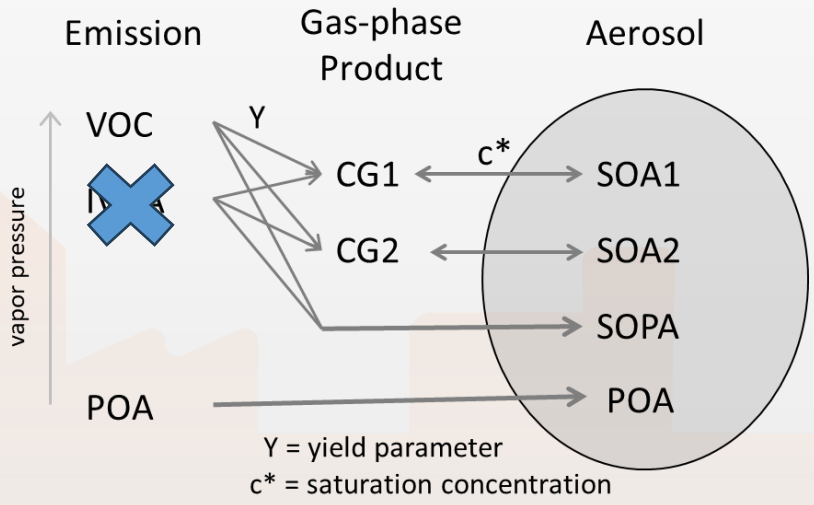
REMY: Reducing Emission Modelling uncertaintY

The final goal of the project is to provide recommendations and guidelines for the compilation of emission inventory with the specific aim to improve air quality model performances for assessment, source apportionment and planning.

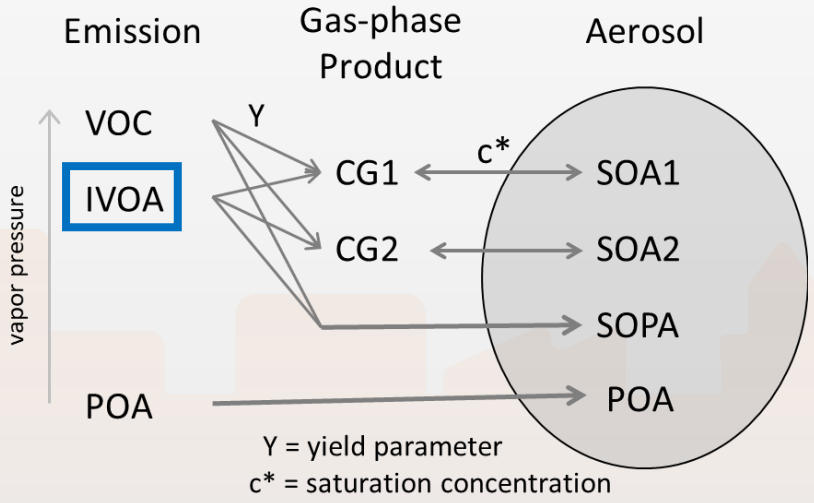


CAMx – OA modelling

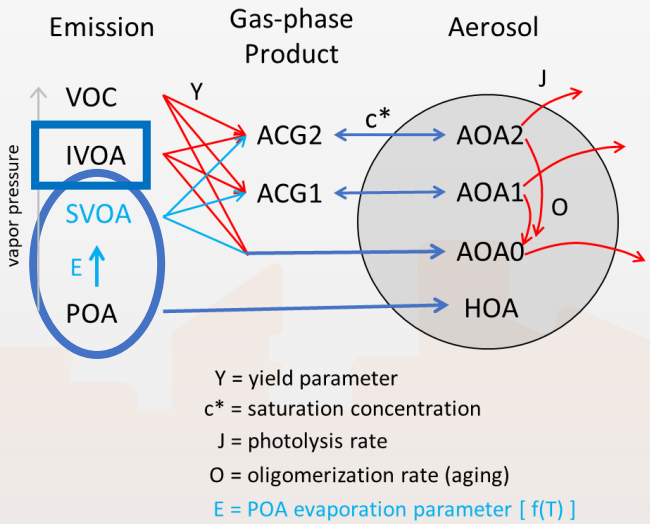
SOAP2 (Basecase)



SOAP2 + IVOC



SOAP3



Case studies

Catalonia and Barcelona:

- CAMx (SOAP2, SOAP3)

Po Valley and Milan

CAMx (SOAP2, IVOC, SOAP3)

CAMx Modelling setup

Domain	POV-MIL
CTM	CAMx v7.2
Baseline year	2017

Time period	2017
Meteo	WRF 2017
Boundary conditions	CHIMERE PREV'AIR
Gas Chemical mechanism	CB06r5
Inorganic Aerosol chemistry	ISORROPIA/RADM
OA mechanisms	**SOAP2.2; SOAP3**
Domains	2 nested domains: POV 4x4 km, MIL 1x1 km, 14 vertical levels
Emissions	INEMAR2017 ISPRA2015 EMEP
Biogenic emissions	MEGAN

IVOC and SVOC estimation

IVOC emission estimation according to Giani et al 2019

- Road transport

$$IVOC = \alpha \cdot NMHC$$

$$IVOC = \frac{\alpha \cdot 0.954}{1 - (\alpha \cdot 0.954)} \cdot VOC$$

- Biomass burning and other sectors

$$IVOC = \beta \cdot POA$$

Parametrization from two studies from Zhao et al (2015 and 2016)

Fuel	α
Gasoline	0.04
Diesel	0.6

Biomass burning IVOC estimation from Ciarelli et al 2017

source	β
Biomass burning	4.75
Other sources	1.5

Emission group	IVOC	VOC	IVOC/(VOC+IVOC)
Biomass burning	184902	126321	59%
Diesel	13610	10167	57%
Gasoline	2971	74896	4%
Other sources	5146	305001	2%
Total	206630	516385	29%

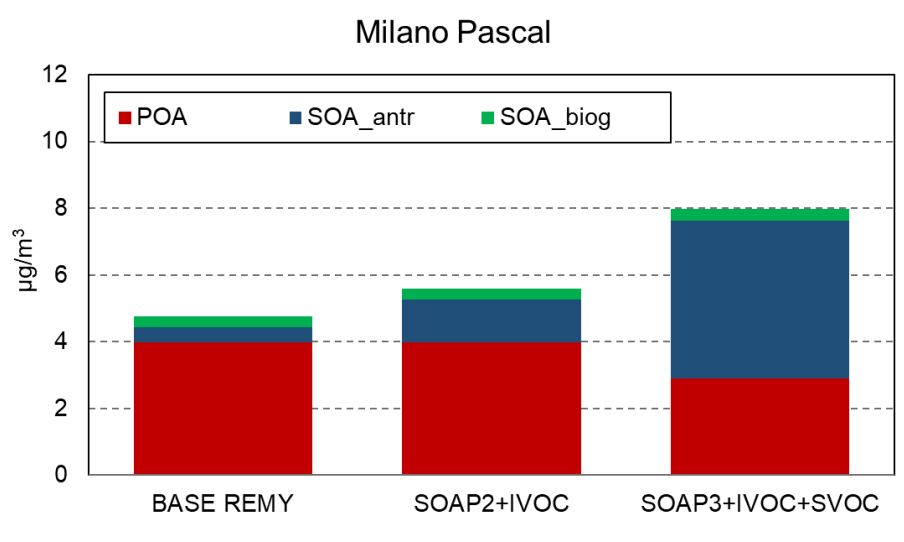
$$POA + SVOC_{vehicles} = \frac{\mathrm{IVOC_{diesel}}}{R_{diesel}} + \frac{\mathrm{IVOC_{gasoline}}}{R_{gasoline}}$$

R_{diesel} = 2.54 and $R_{gasoline}$ = 4.62

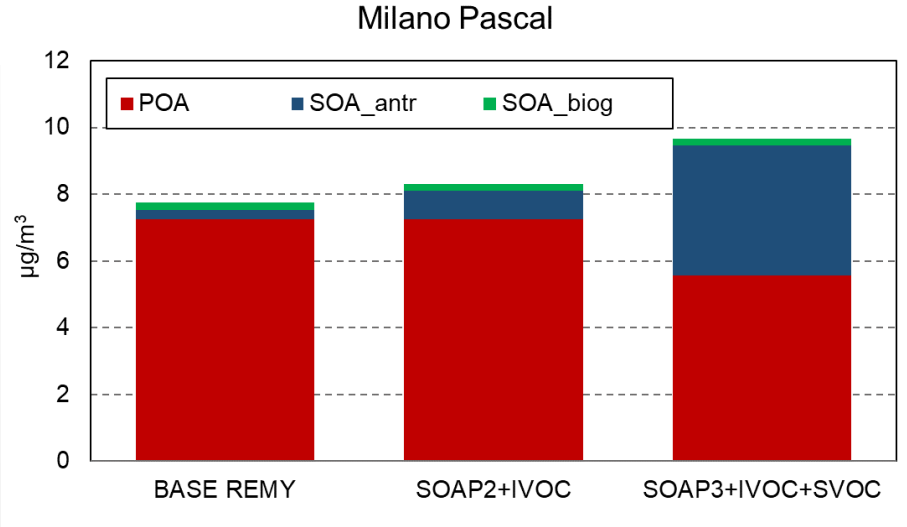
$$POA + SVOC_{Biomass} = 1.39\ POA\ \ (CAMS)$$

CAMx results - Milano Pascal (UB site)

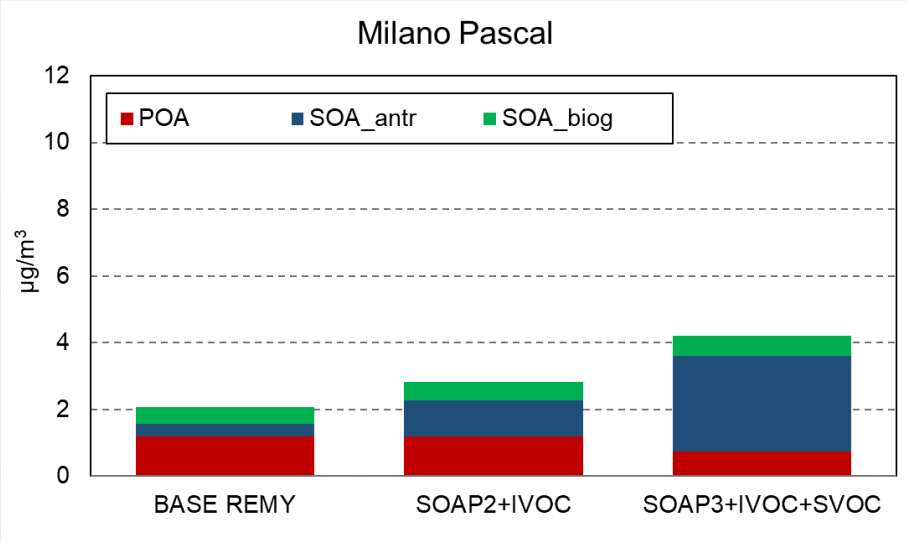
TOM2.5



YEAR

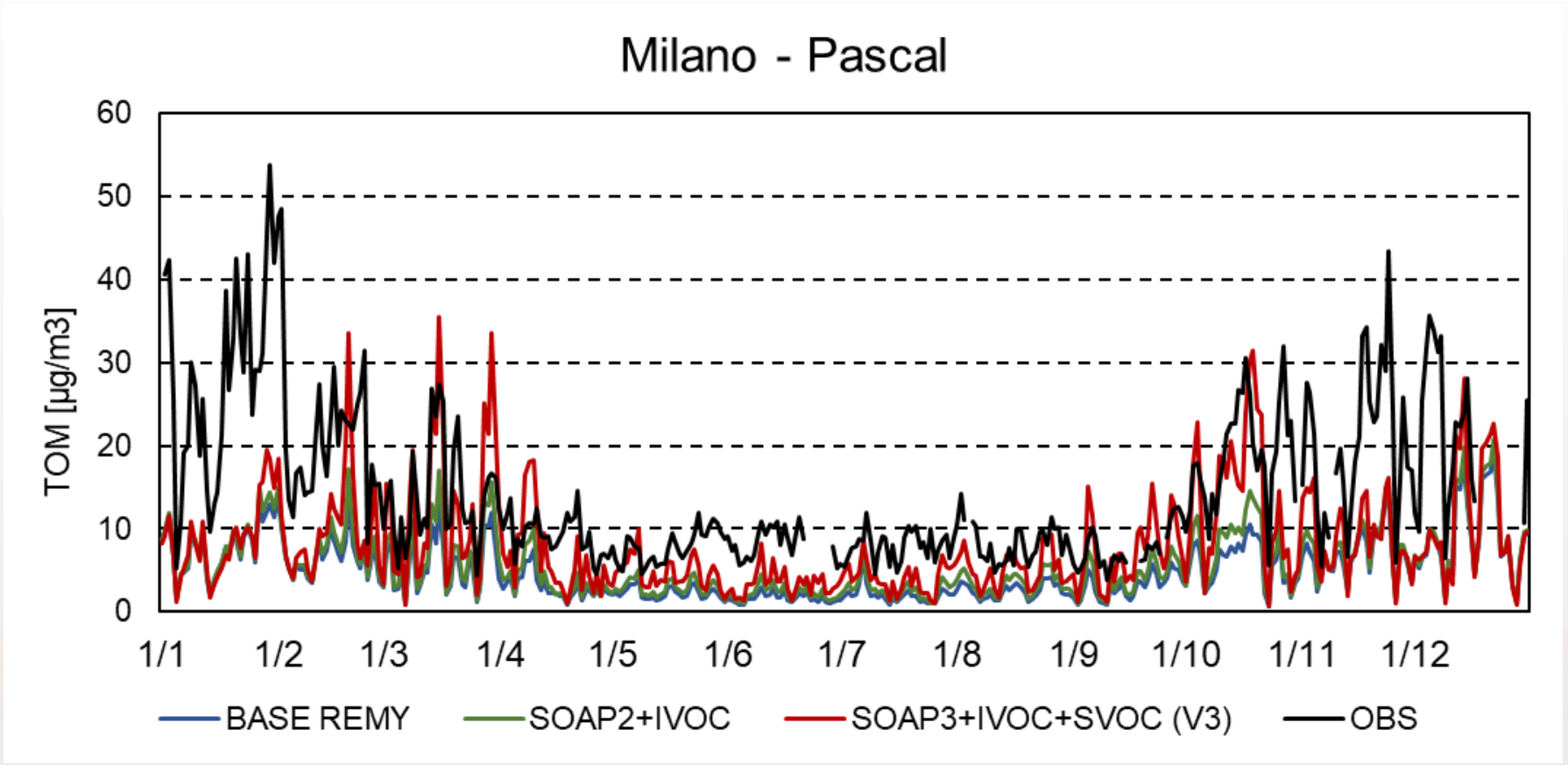


WINTER



SUMMER

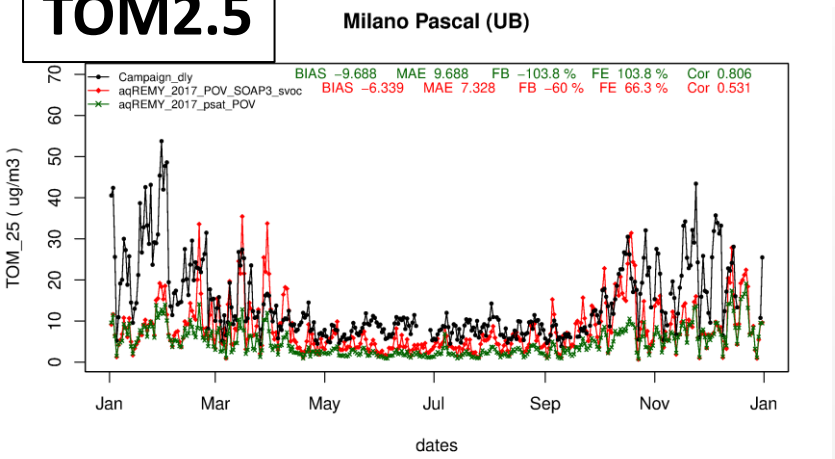
CAMx results - Milano Pascal (UB site)

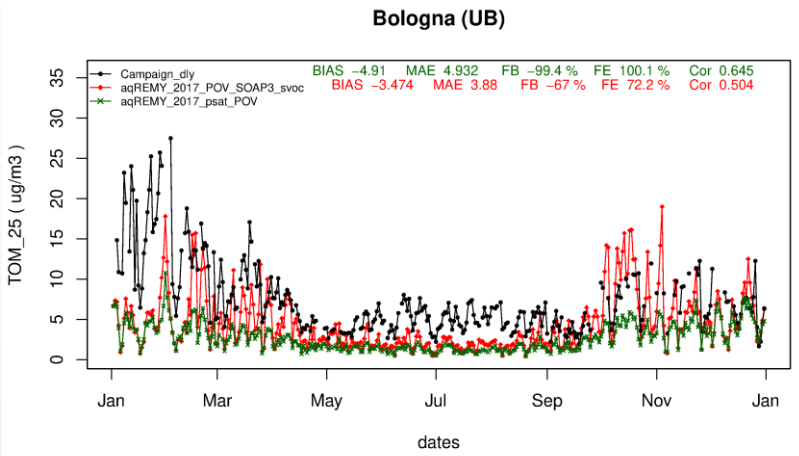


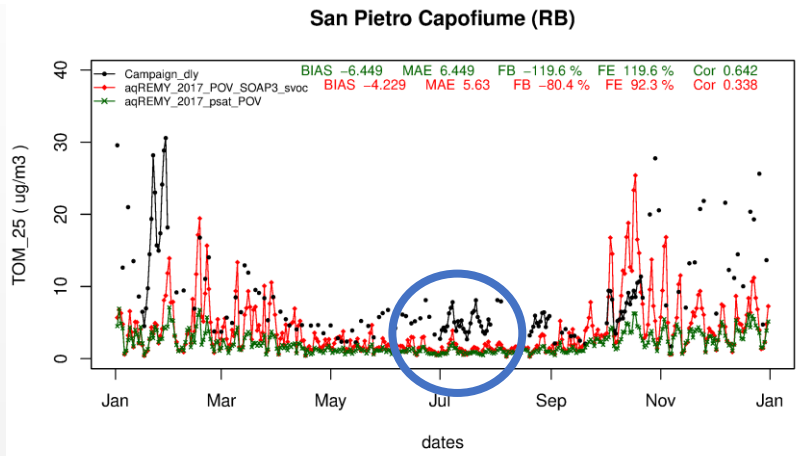
TOM2.5 - DAILY MEAN

CAMx results - Daily mean

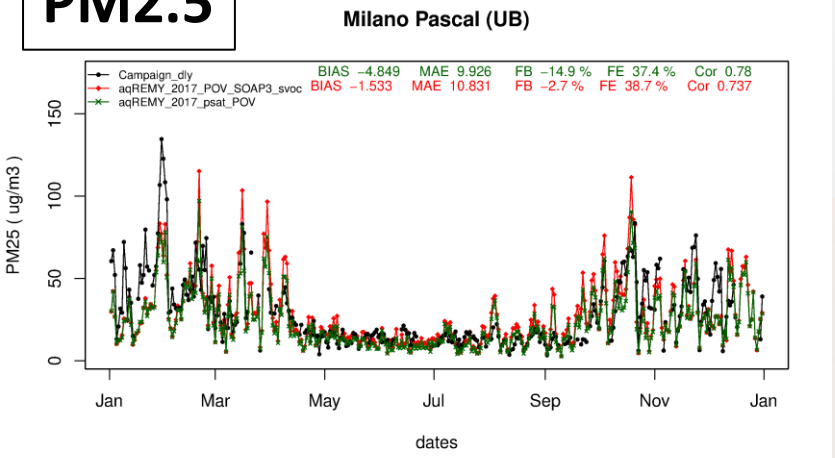
TOM2.5

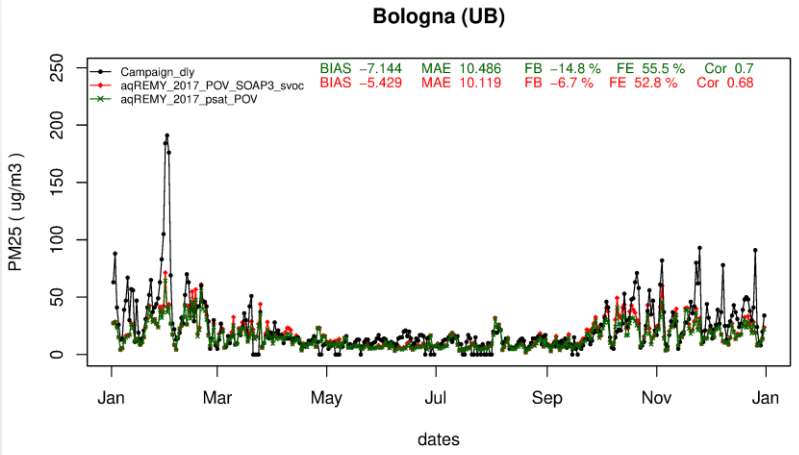


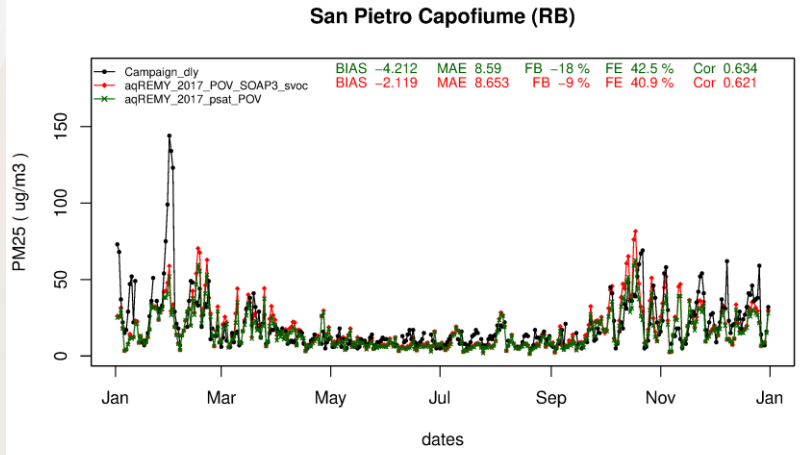


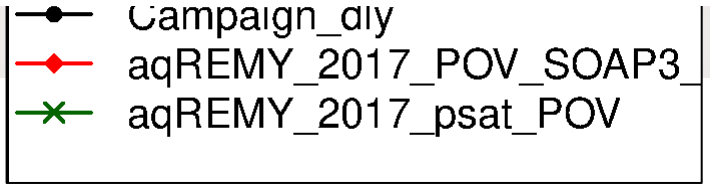


PM2.5

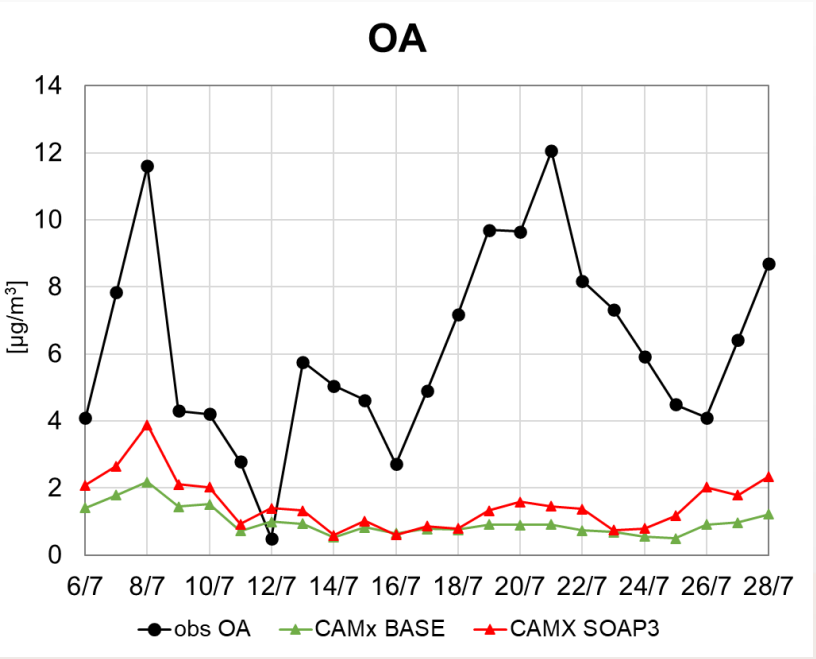


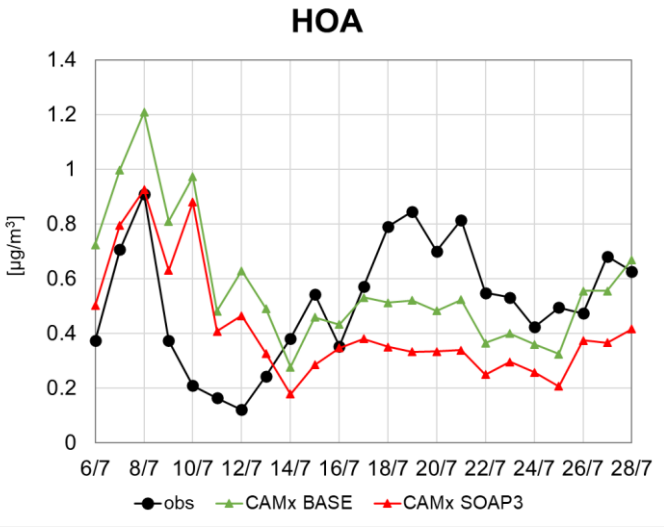


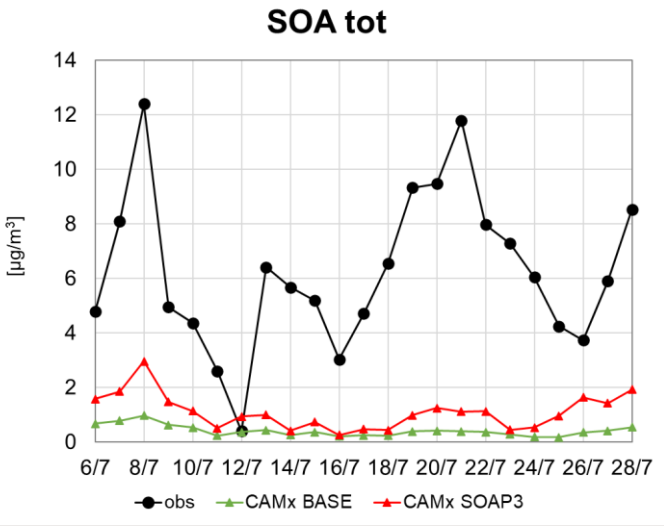


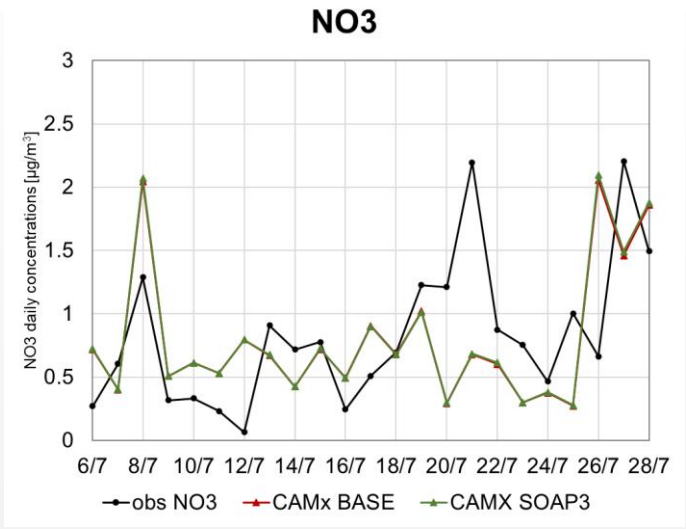


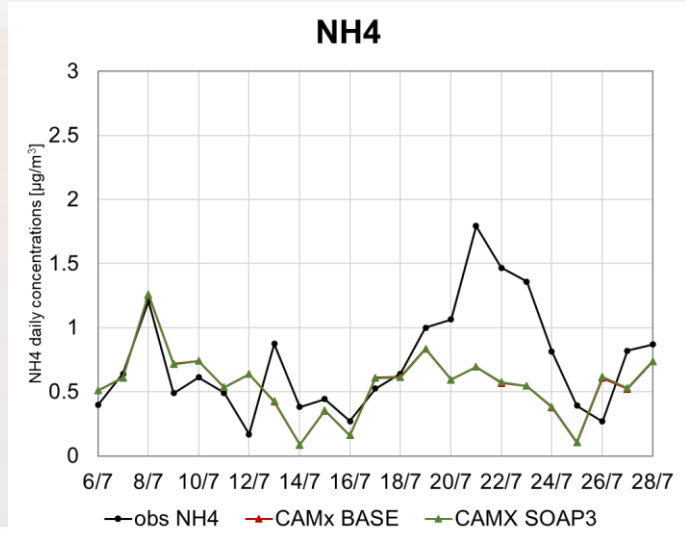
CAMx results - Comparison with ACSM





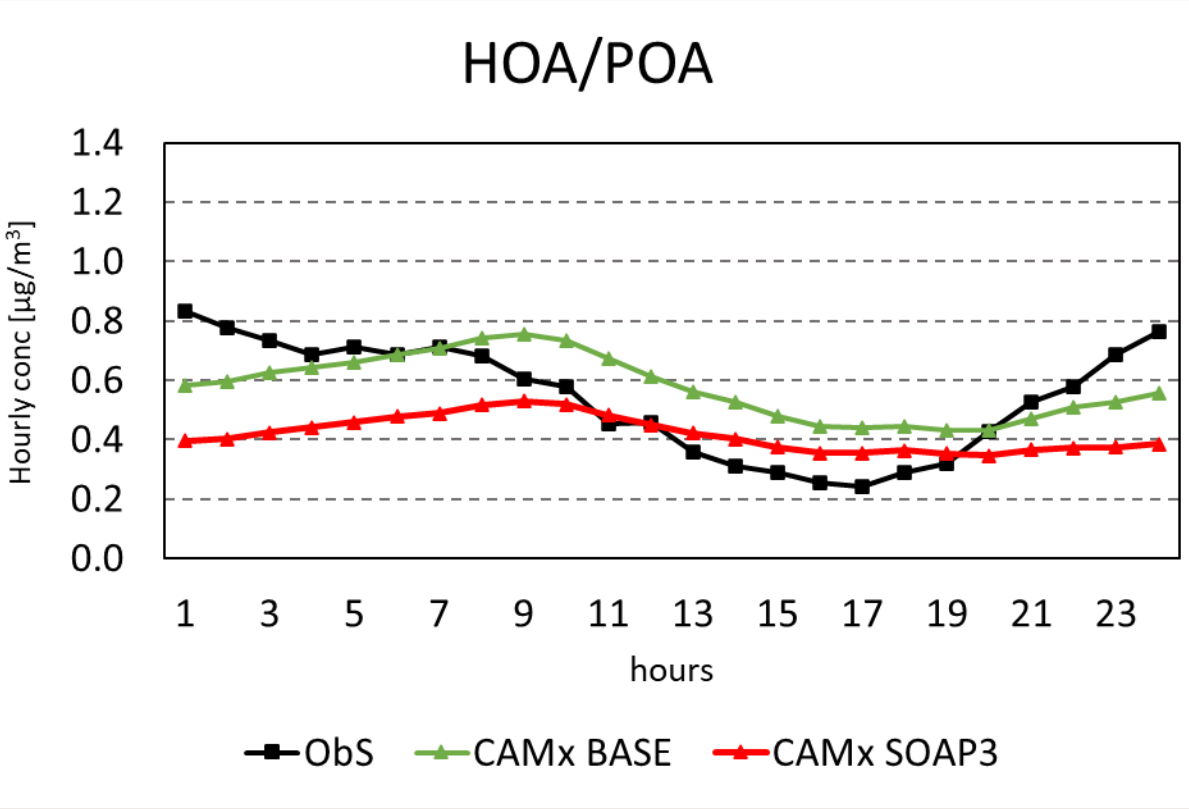


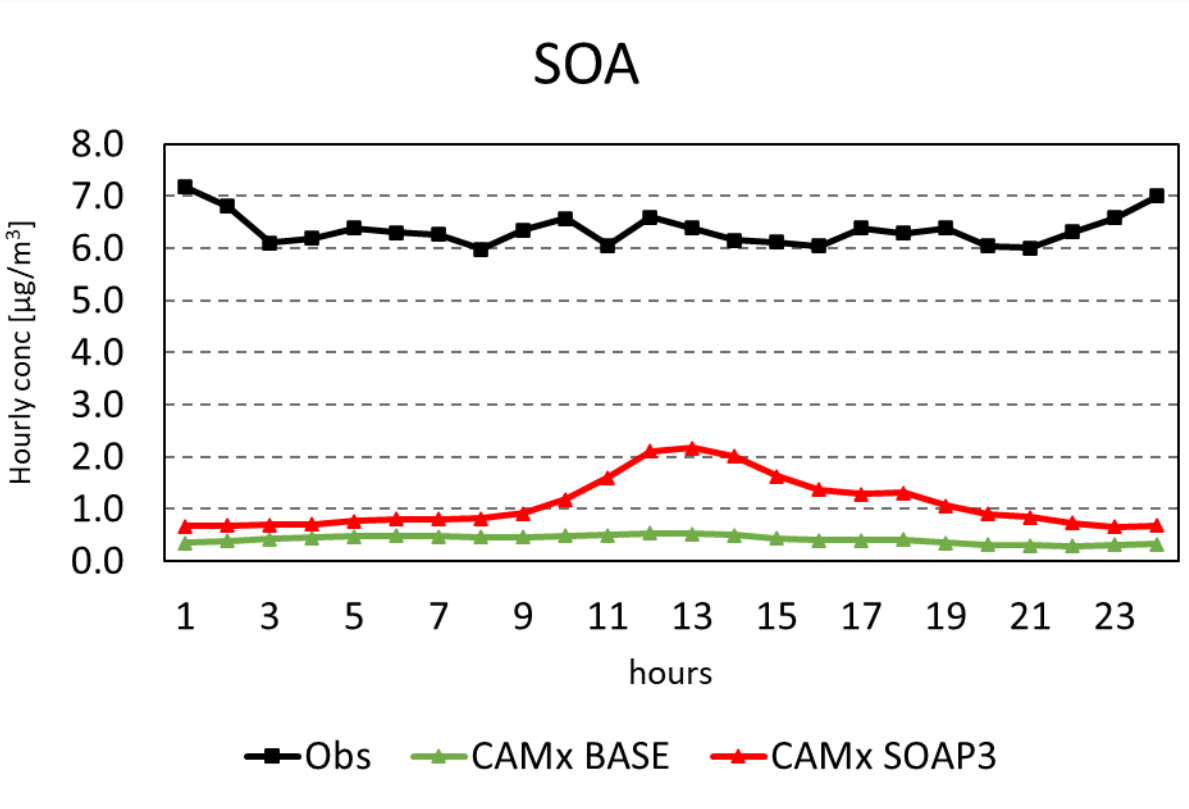




SAN PIETRO CAPOFIUME - DAILY MEAN

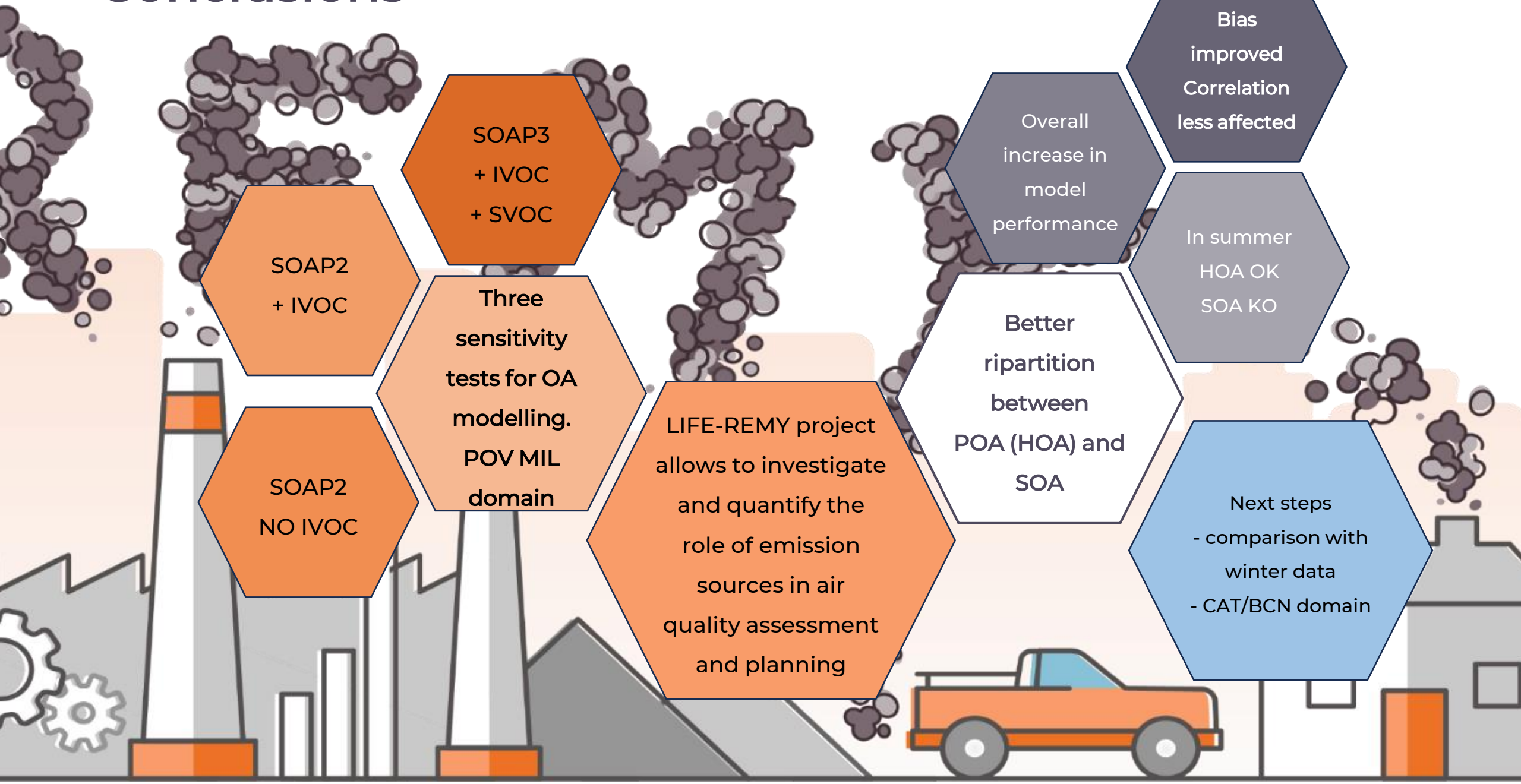
CAMx results - Comparison with ACSM





SAN PIETRO CAPOFIUME – MEAN DAY

Conclusions



SOAP3
+ IVOC
+ SVOC

SOAP2
+ IVOC

SOAP2
NO IVOC

Three sensitivity tests for OA modelling. POV MIL domain

LIFE-REMY project allows to investigate and quantify the role of emission sources in air quality assessment and planning

Overall increase in model performance

Bias improved Correlation less affected

In summer HOA OK SOA KO

Better ripartition between POA (HOA) and SOA

Next steps
- comparison with winter data
- CAT/BCN domain

LIFE REMY

LIFE20 PRE/IT/000004

Thank you for you attention!

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TerrAria s.r.l.

CSIC

idæa

AGENZIA MOBILITÀ AMBIENTE TERRITORIO

RSE Ricerca Sistema Energetico

IOŚ-PIB Institute of Environmental Protection National Research Institute

www.LifeREMY.eu

CAMx Modelling system