

# LIFE-REMY project: source apportionment results of the diagnostic analysis in regional modelling

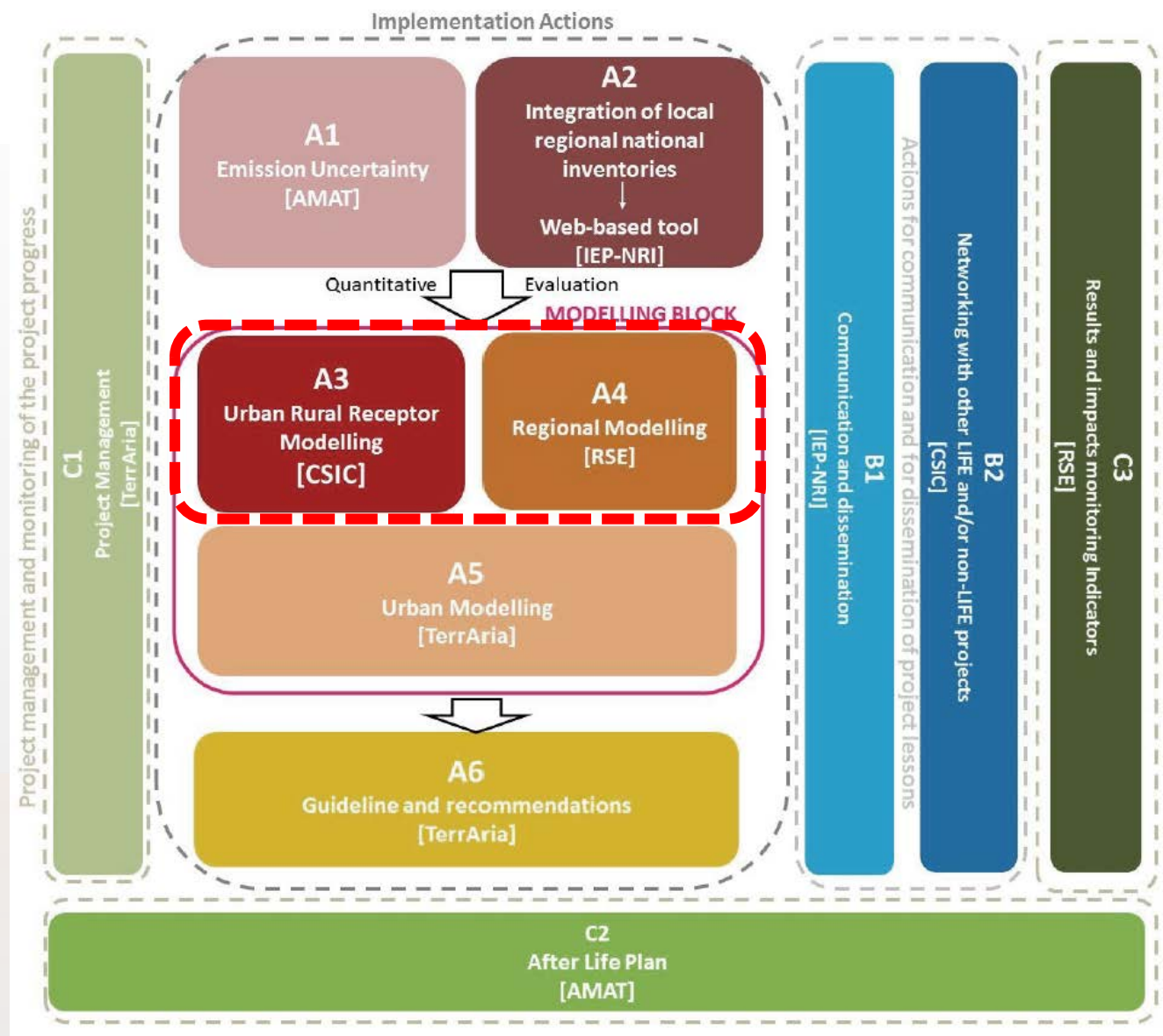
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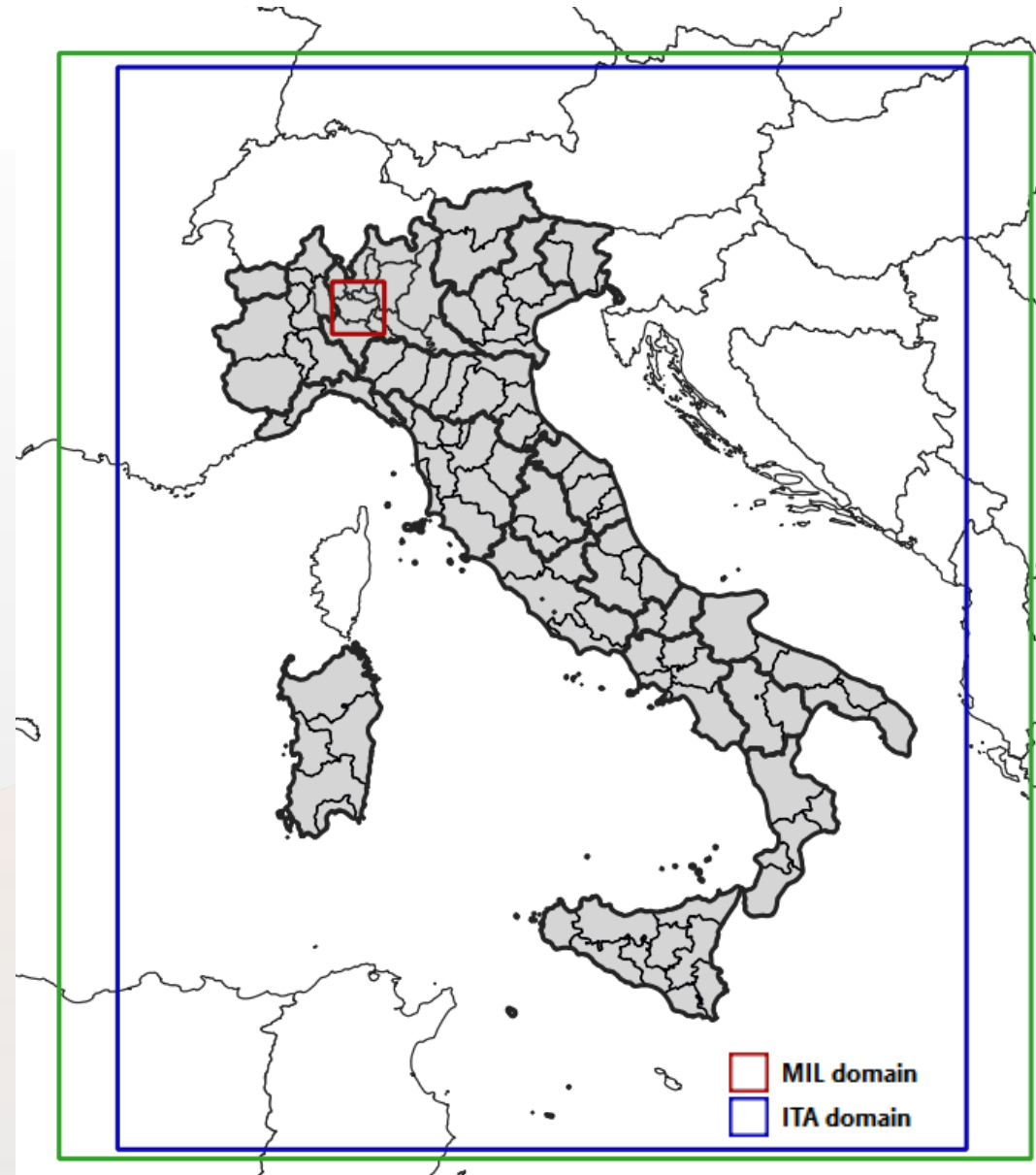
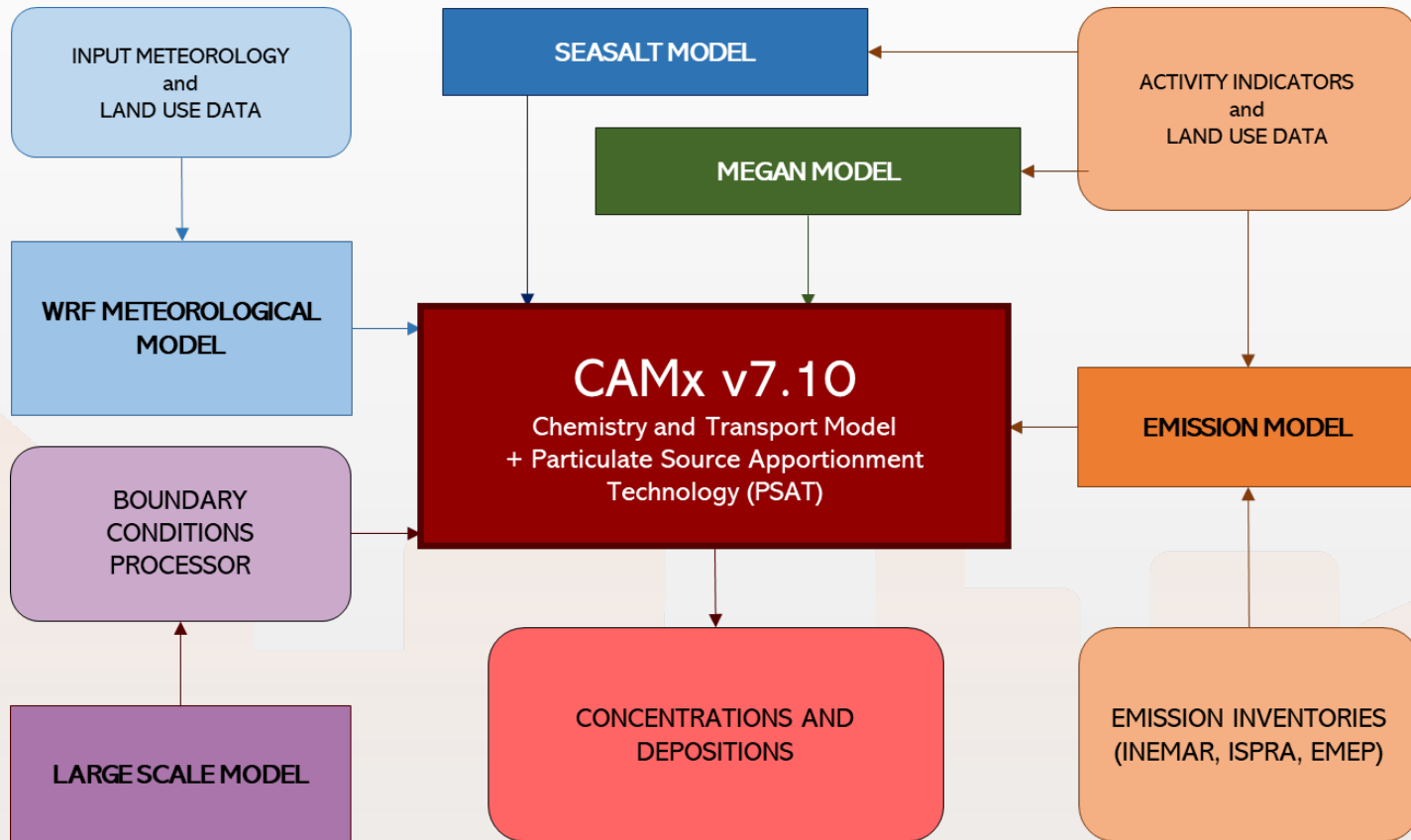
# REMY project

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.



# Modelling system



# LIFE-REMY project: source apportionment results of the diagnostic analysis in regional modelling. Po Valley case study

1. Comparing source oriented (CAMx-PSAT) and receptor oriented (PMF) source apportionment methods
2. CAMx PSAT results of COVID19 lockdown scenario – effects of road transport emission reduction on source apportionment analysis
3. SA for the assessment of an air quality modelling simulation

# Comparing source oriented (CAMx-PSAT) and receptor oriented (PMF) source apportionment methods

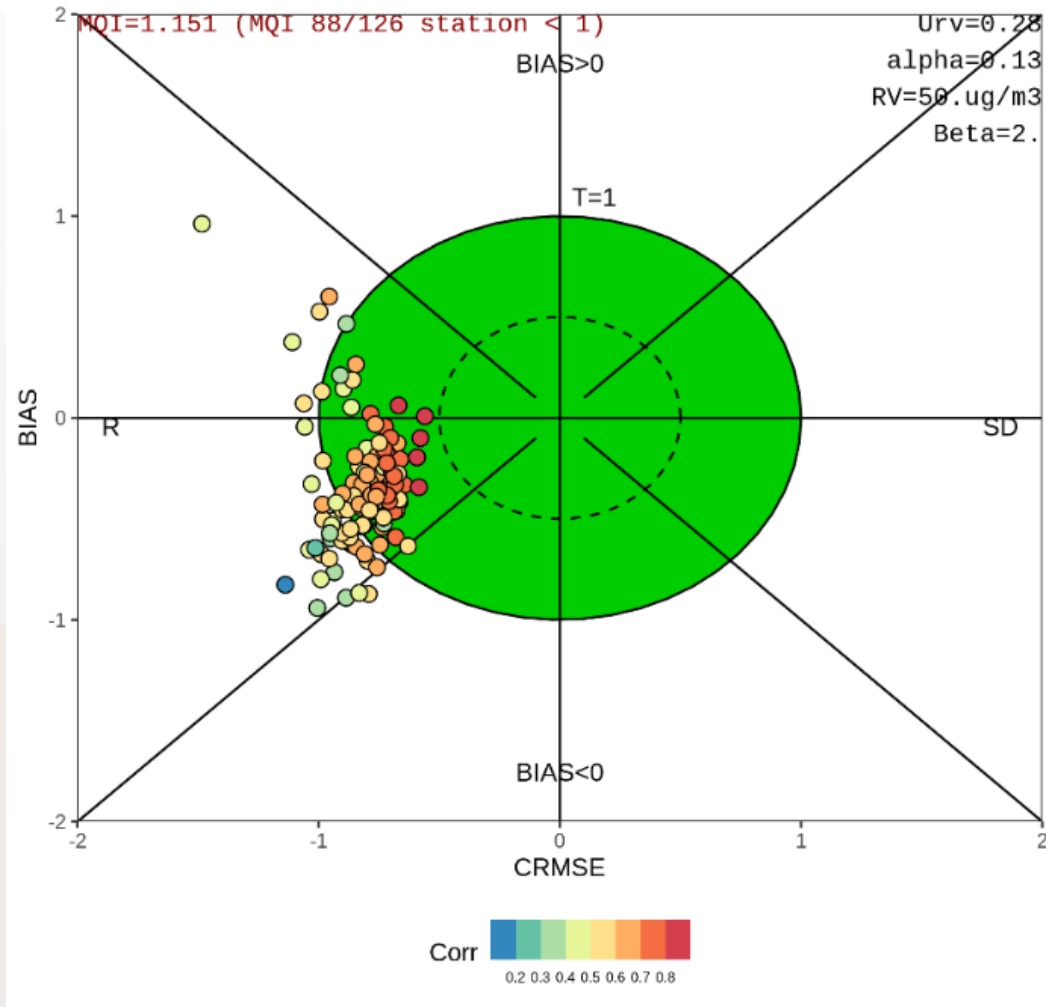
BASE CASE 2017

# BC2017: CAMx - PSAT emission

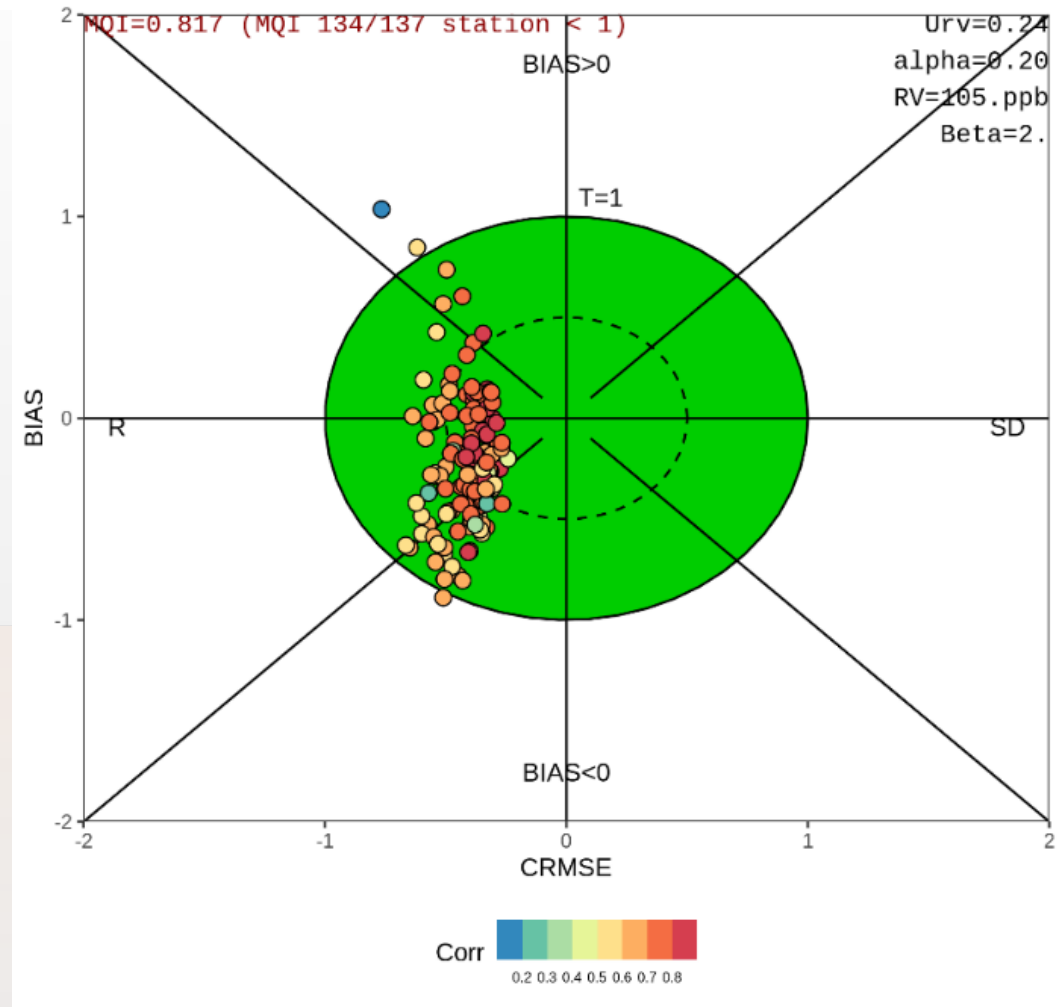


	Group	
<b>Road transport</b>	TRA_EX_HDV	Exhausted emission HDV
	TRA_D_LDV	Exhausted emission LDV and passenger cars (DIESEL)
	TRA_OTH_LDV	Exhausted emission LDV and passenger cars (other fuels)
	TRA_NOEX	Non exhausted emissions (including evaporative)
<b>Residential heating</b>	RES_BIOM	Residential heating biomass burning
	PIZZA	Commercial biomass burning (pizzeria)
	RES_MET	Residential heating natural gas
	RES_OTHER	Other residential heating (diesel fuel, lpg, other)
<b>Agriculture</b>	AGR_COMB	Open burning of agricultural waste
	AGR_OTHER	Other emissions in agriculture
<b>Industry</b>	IND1	Processes in iron and steel industries
	IND2	Processes in non-ferrous metal industries
	IND_CEM	Extraction of minerals and quarrying
	IND_OTHER	Other industry
<b>Other</b>	WASTE	Waste incineration and waste open burning
	ELETTR	Combustion in energy and transformation industries
	BIOG	Biogenic emissions
	OTHER	Other

# Model quality assessment



PM10



NO2

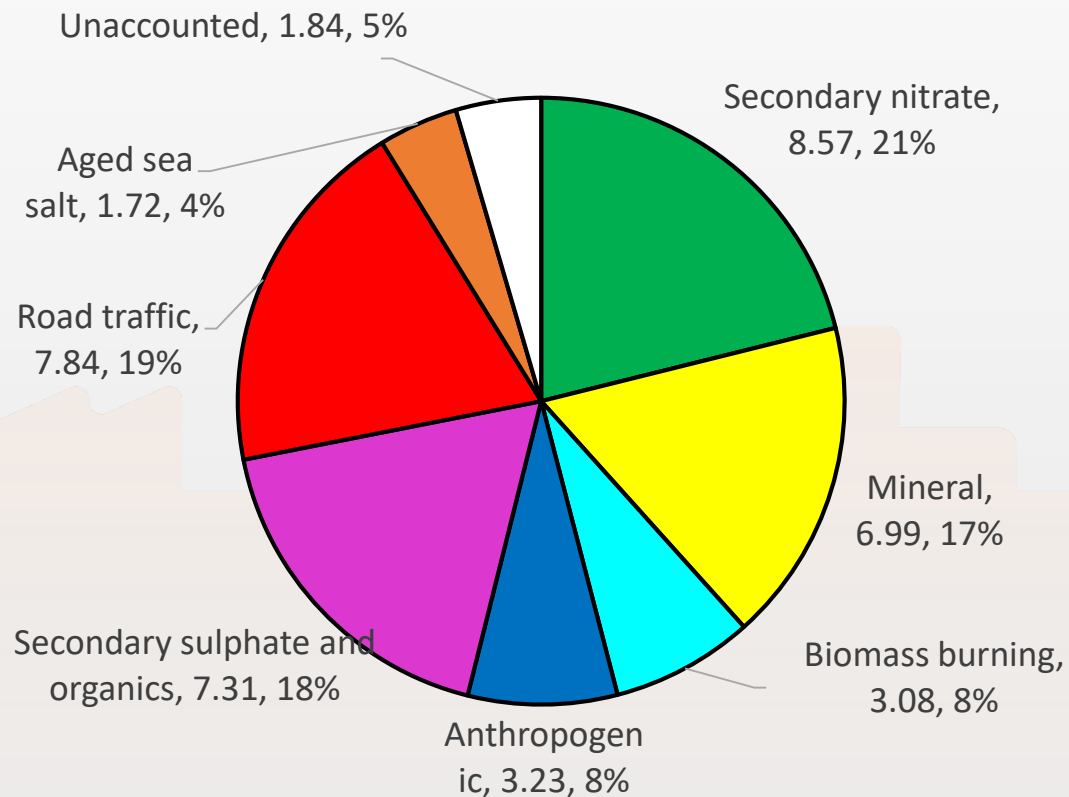
# COMPARISON CAMx-PSAT AND PMF

		PMF categories								
		Road Traffic	Mineral	Anthropogenic	Biomass Burning	Aged Sea Salt / Road Salt	Secondary Nitrate	Secondary Sulphate and Organics		
CAMx PSAT categories	ELETTR						NO3,NH4	SO4,NH4		
	IND_OTHER			PPM			NO3,NH4	SO4,NH4		
	IND1									
	IND2									
	OTHER						NO3,NH4	SO4,NH4		
	WASTE				PPM		NO3,NH4	SO4,NH4		
	AGR_COMB									
	PIZZA									
	RES_BIOM									
	RES_MET						NO3,NH4	SO4,NH4		
	RES_OTHER									
	TRA_D_LDV	PPM, SOA						NO3,NH4	SO4,NH4	
	TRA_EX_HDV									
	TRA_NOEX									
	TRA_OTH_LDV									
NATURAL						PPM	NO3,NH4	SO4,NH4,SOA		
IND_CEM		PPM						SO4,NH4		
AGR_OTHER		PPM,NO3								
BOUNDARY		Fine and coarse crustal and «other» PM				NO3,NH4				

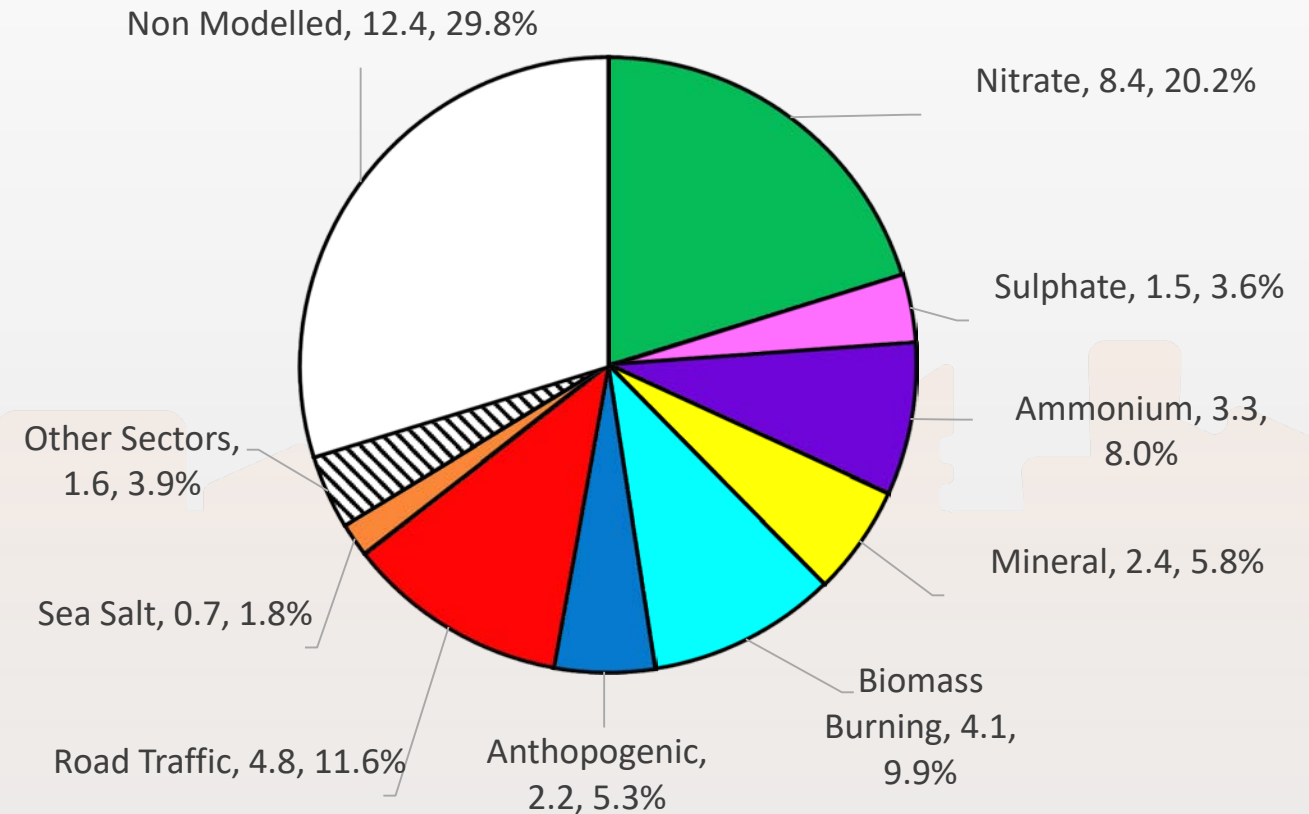


# Comparison between receptor oriented and source oriented models results - MILANO PASCAL 2017

## PMF



## CAMx-PSAT



# Biomass burning

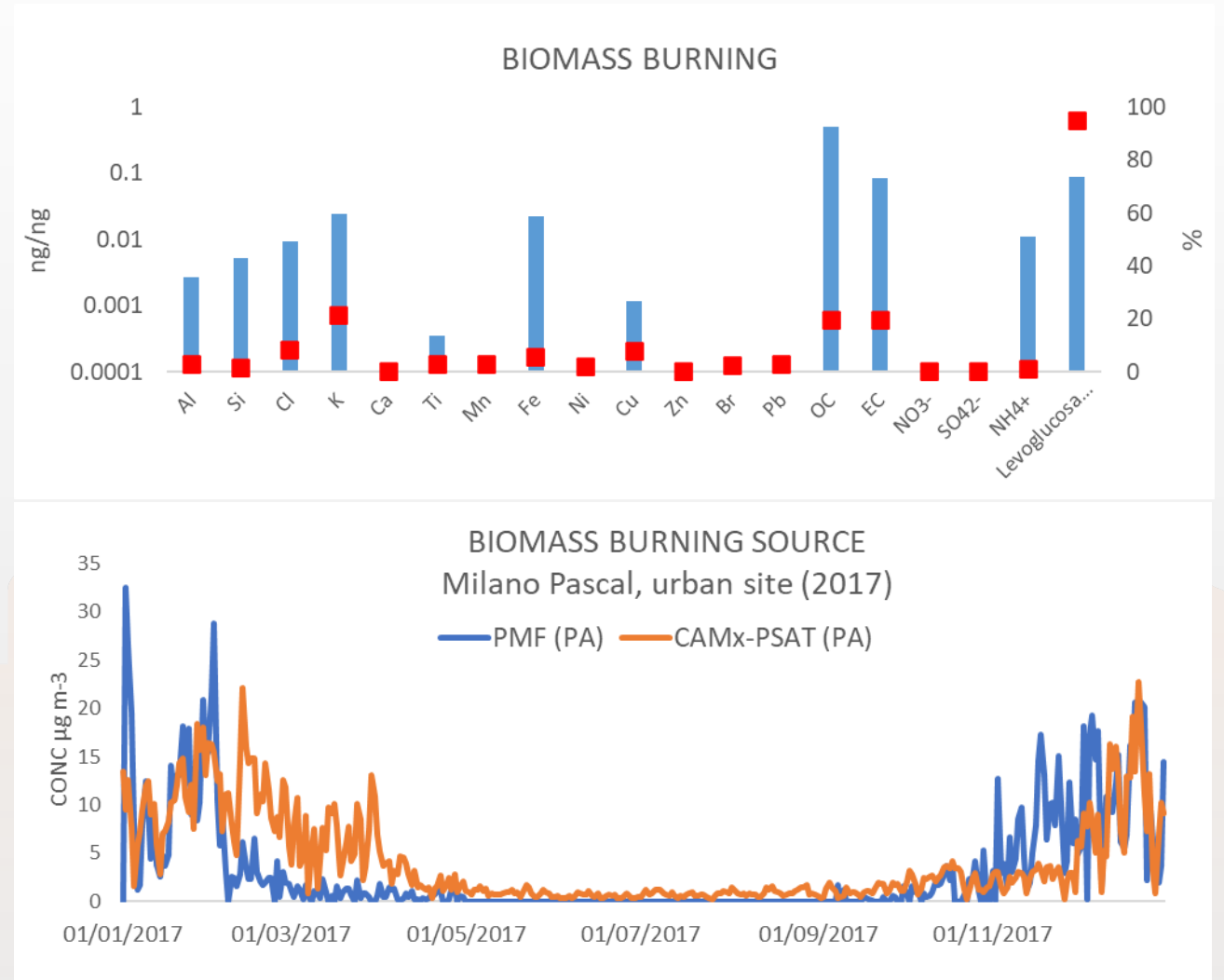
Name	CONC [ $\mu\text{g}/\text{m}^3$ ]	PERC
PMF	3.1	8%
CAMX-PSAT	4.1	10%

## CAMx/PSAT emission categories:

- residential heating biomass burning (RES\_BIOM);
- commercial biomass burning (PIZZA);
- open burning of agricultural waste and stubble/straws on field burning (AGR\_COMB);
- waste incineration and waste open burning (WASTE).

## Differences between PMF and CAMX-PSAT results can be attributed to:

- Peaks not well captured, maybe due to meteorology
- Emission temporal modulation (i.e. meteorology dependent temporal profiles)
- Thermal instability of levoglucosan is probably responsible for the null contributions from PMF in summer



# Road transport

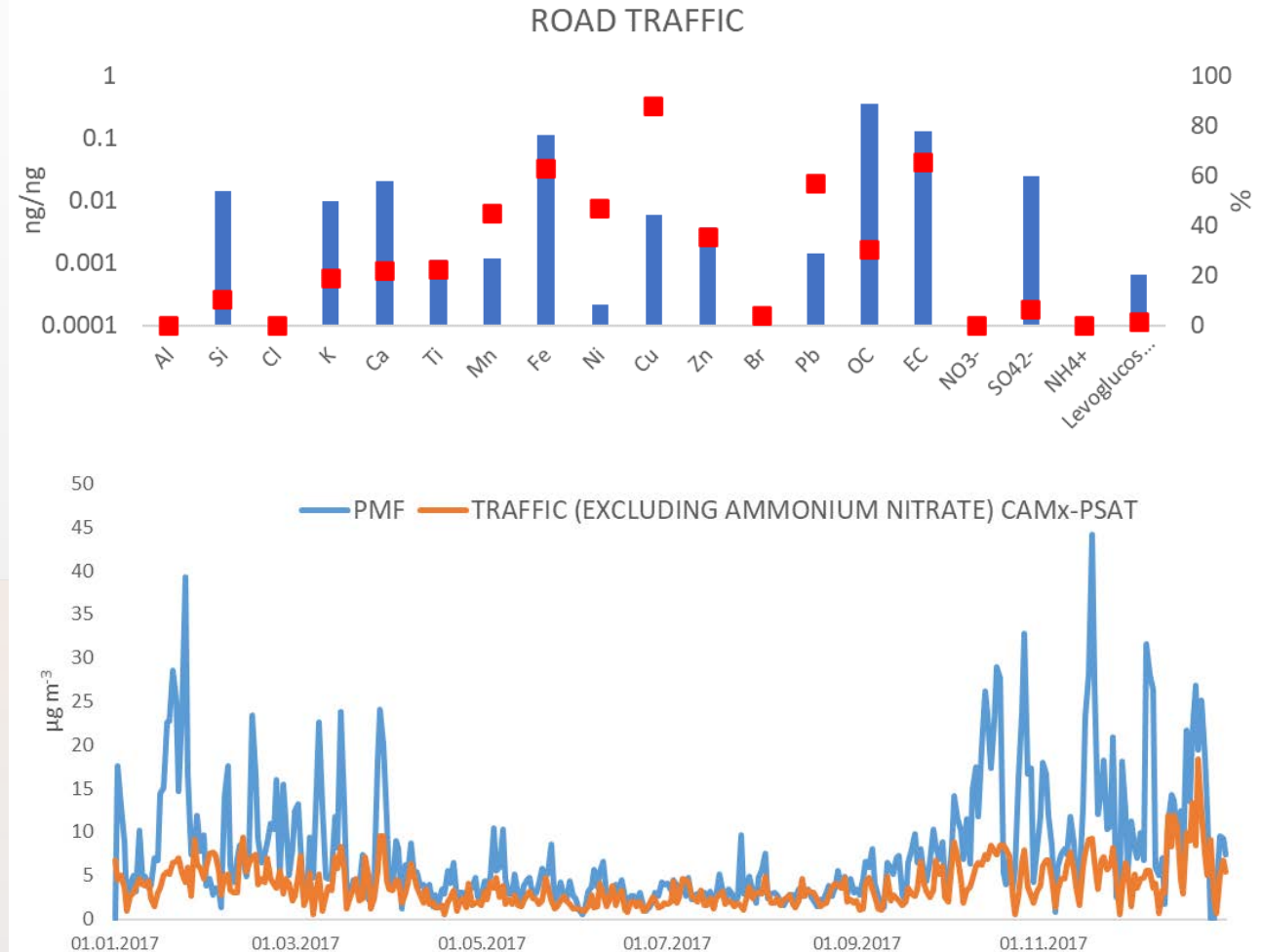
Name	CONC [ $\mu\text{g}/\text{m}^3$ ]	PERC
PMF	7.8	19%
CAMX-PSAT	4.8	9%

## CAMx/PSAT emission categories:

- Diesel Light Duty Vehicles (TRA\_D\_LVD);
- Heavy Duty Vehicles (TRA\_EX\_HVD);
- Non-exhaust emissions (all vehicles) (TRA\_NOEX);
- Other LDV (Gasoline, GPL and natural gas) including anthropogenic Secondary Organic Aerosols (SOA) (TRA\_OTHERS\_LVD);

## Differences between PMF and CAMX-PSAT results can be attributed to:

- emission factors underestimation used in the emission inventory;
- the lack of emissions due to resuspension of road dust in the emission inventory;
- uncertainty in the formation process of SOA;
- uncertainty in the Planetary Boundary Layer (PBL) height estimate.



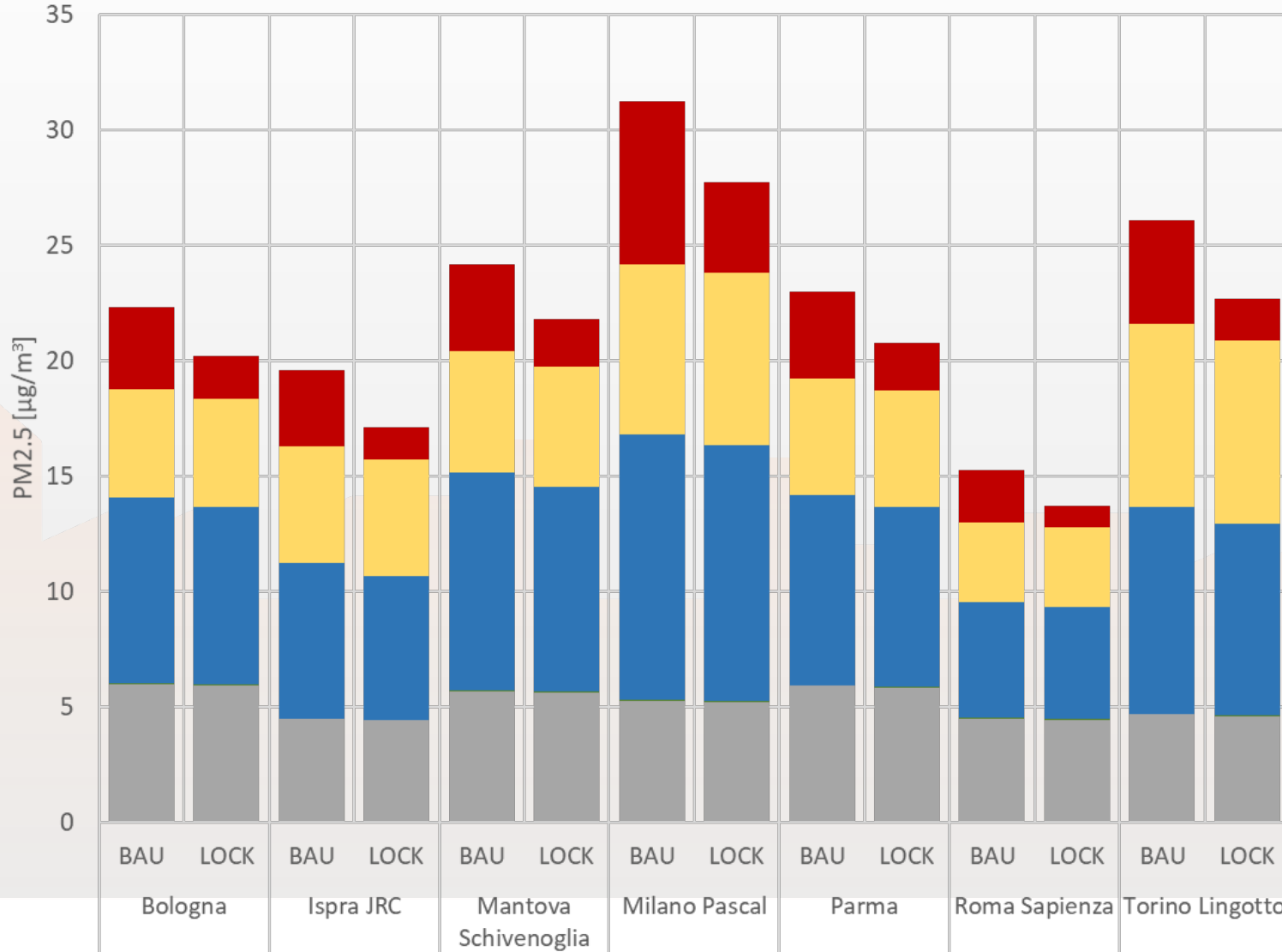
# CAMx PSAT results of COVID19 lockdown scenario

BAU-LOCK 2020

# PSAT results BAU vs LOCK 2020 – PM2.5

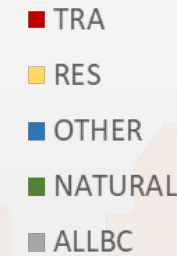


PSAT results 15/02/2020 - 30/04/2020



## PSAT categories:

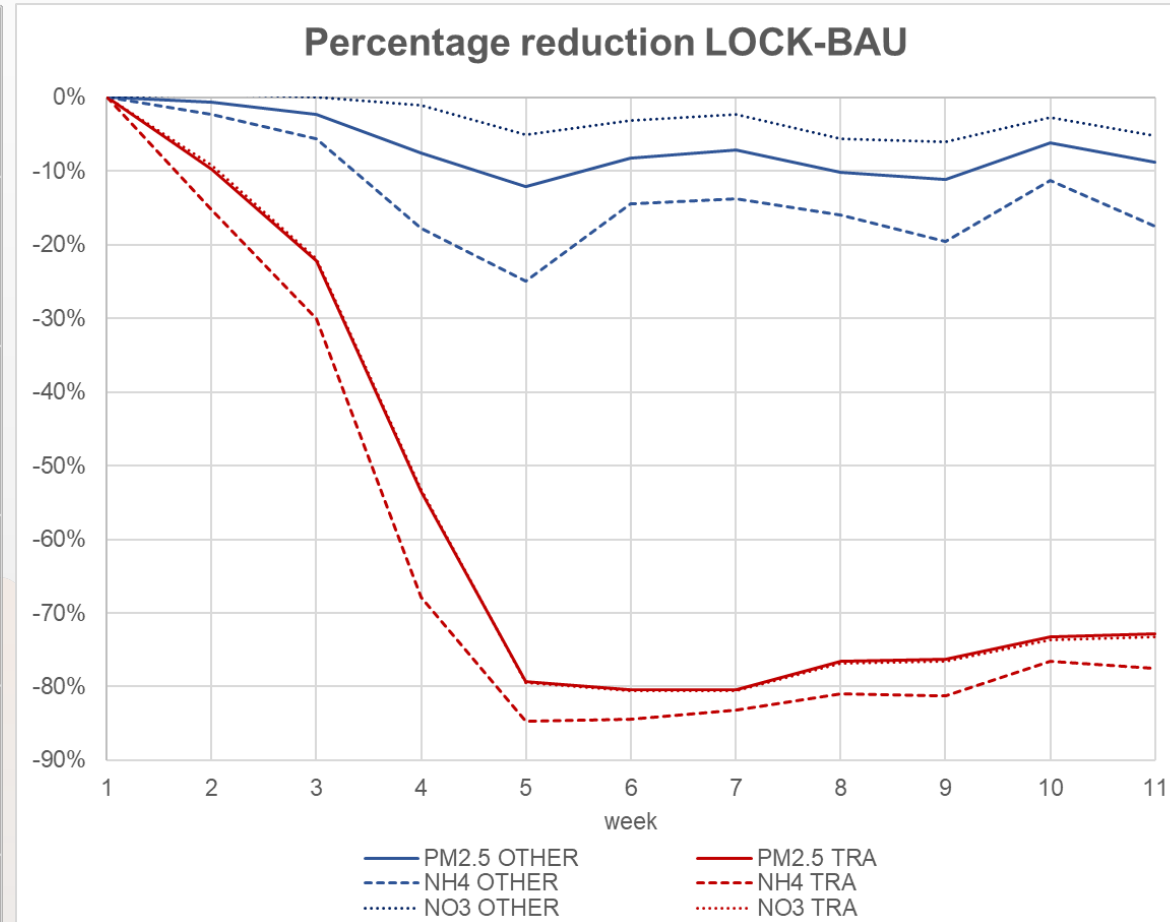
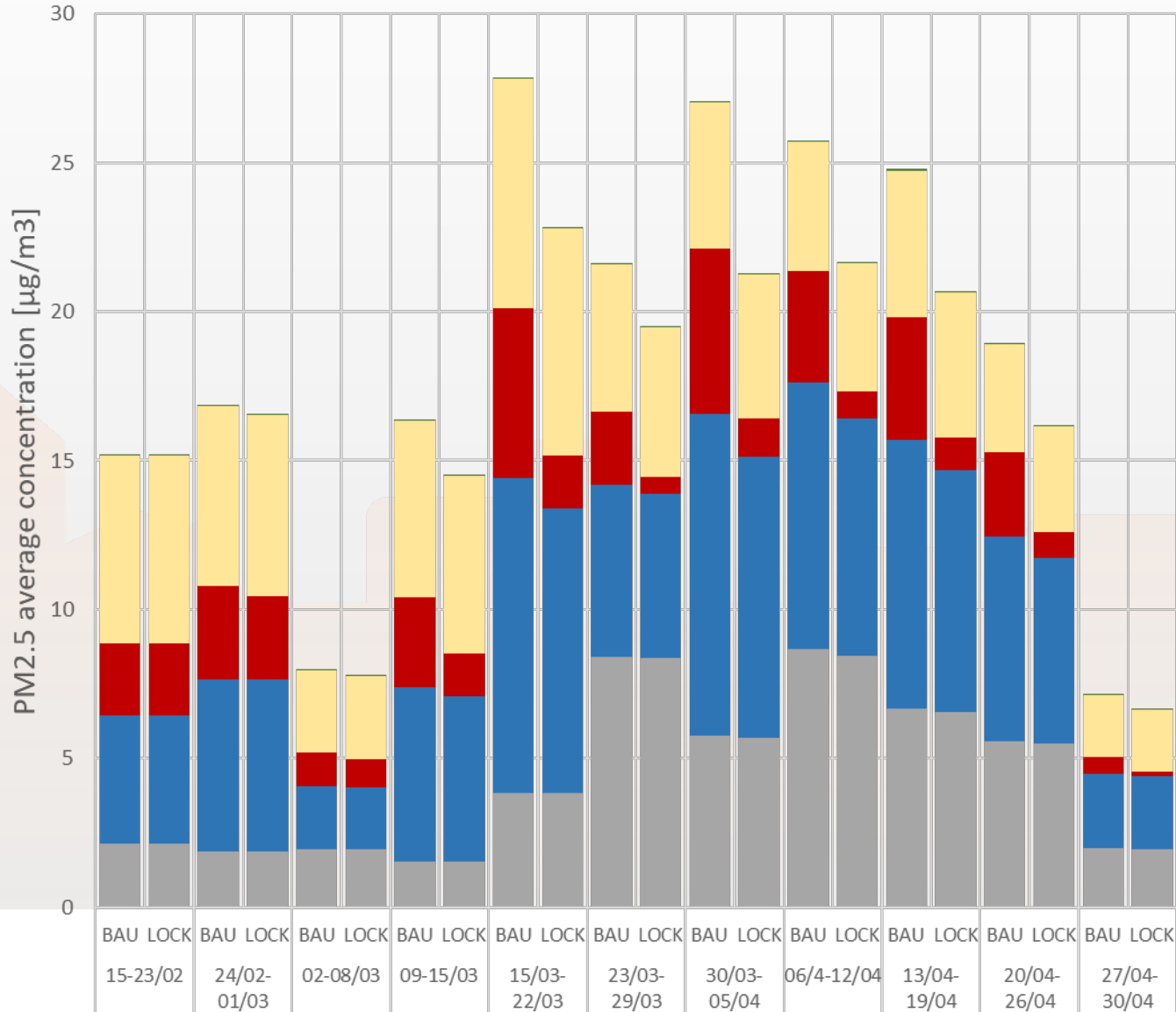
- **Road transport (15%-80%)**
- Residential heating
- Other (including solvent use, agriculture, industry...)
- Natural



# PM2.5 PSAT Mantova (rural background site)



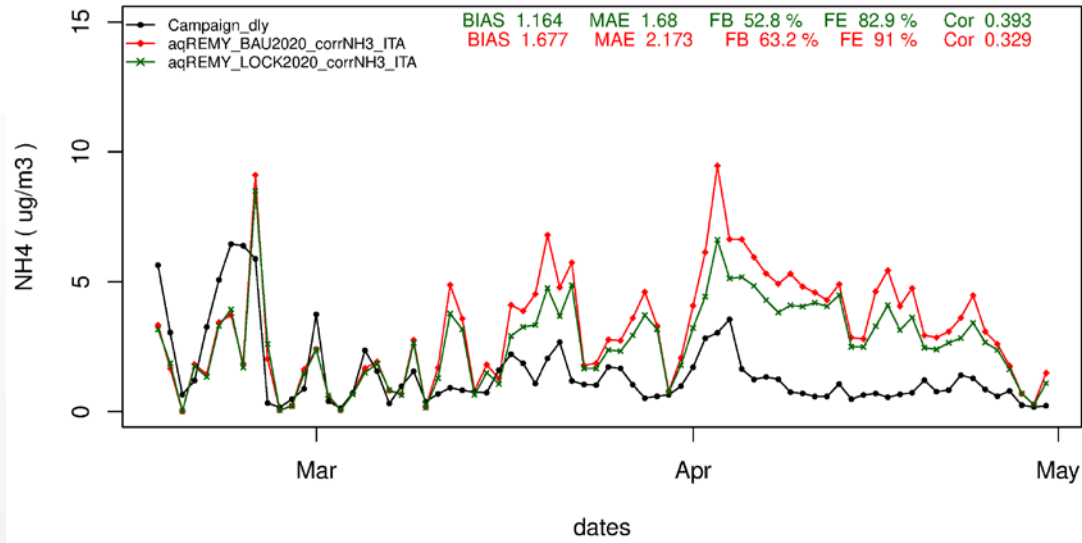
■ ALLBC ■ OTHER ■ TRA ■ RES ■ NATURAL



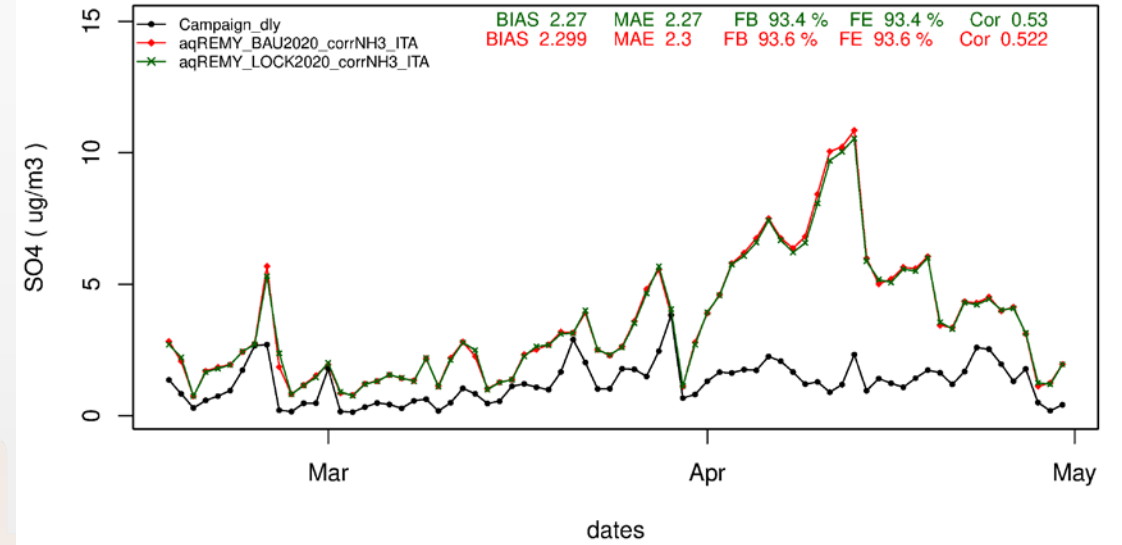
# SA for the assessment of an air quality modelling simulation

BAU-LOCK 2020

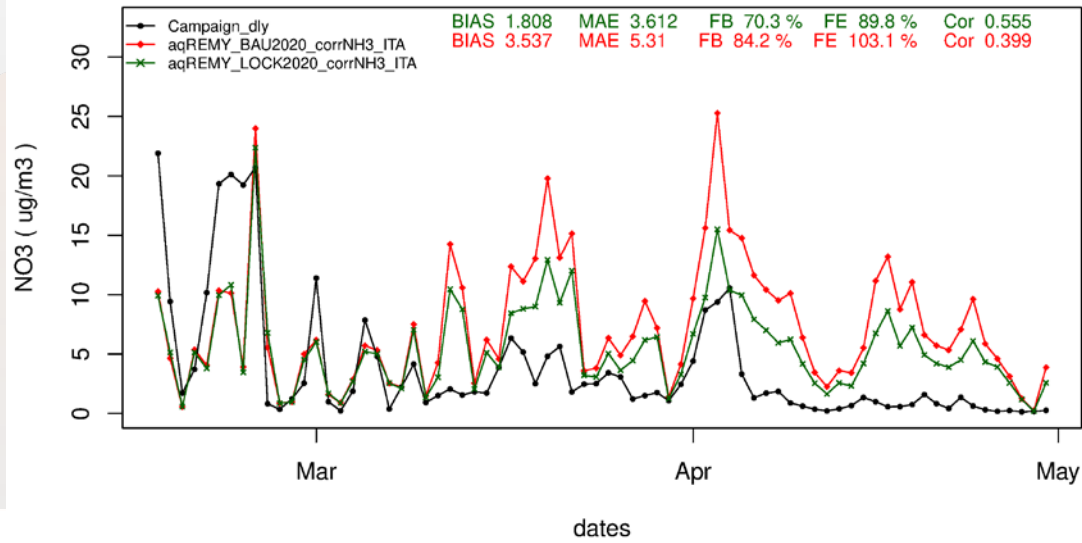
# NH4



# SO4

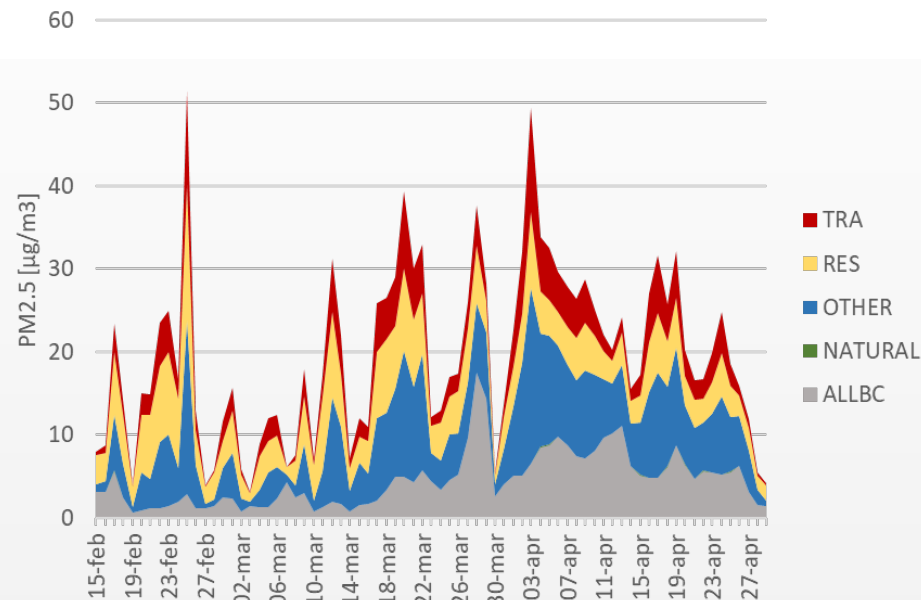
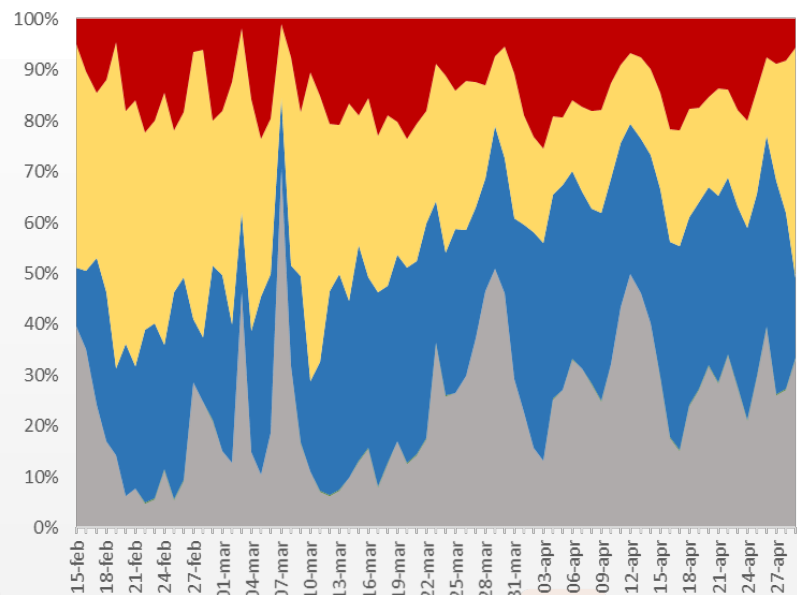


# NO3

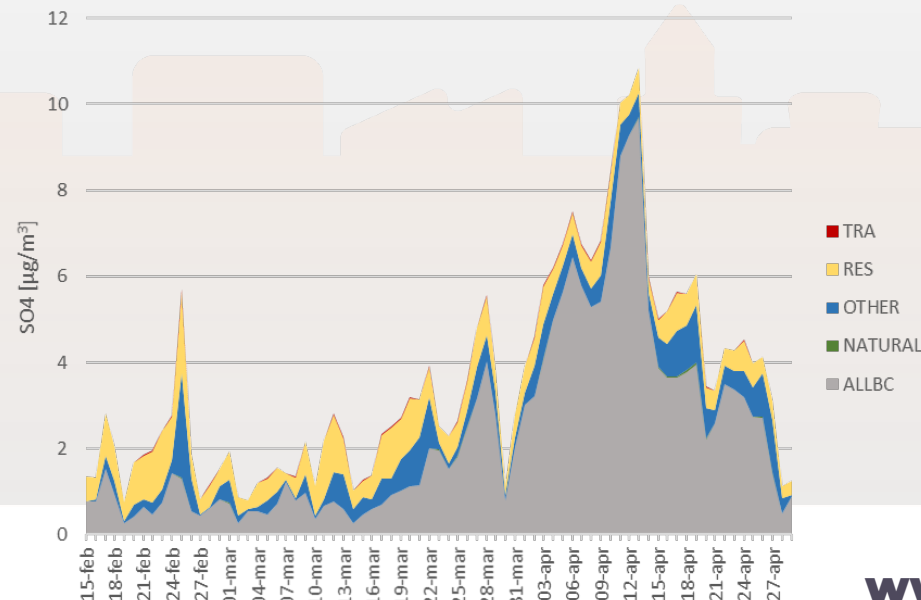
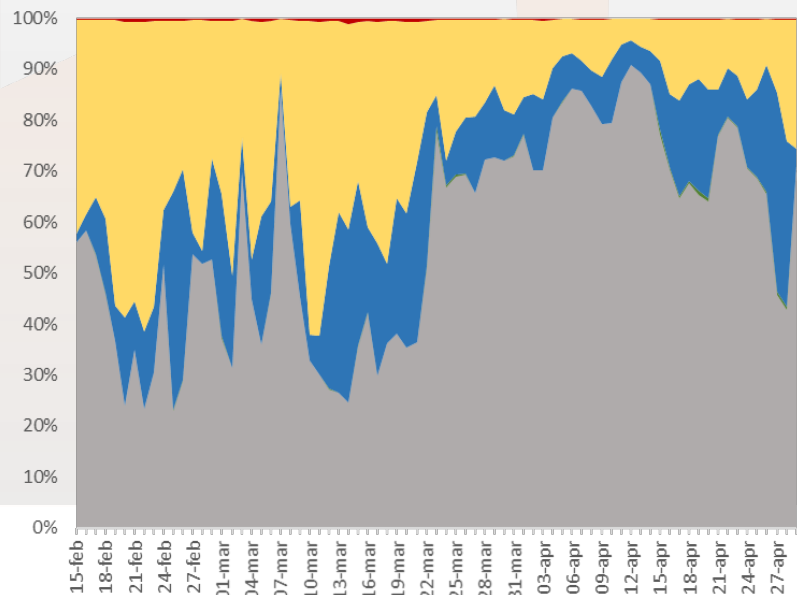




# Ispra (JRC) – BAU2020



PM2.5



SO4

Thank you!