

# Analysis of Covid-19 Lockdown Measures Impact on the Air Quality in Rome Region: Key indications for future air quality management

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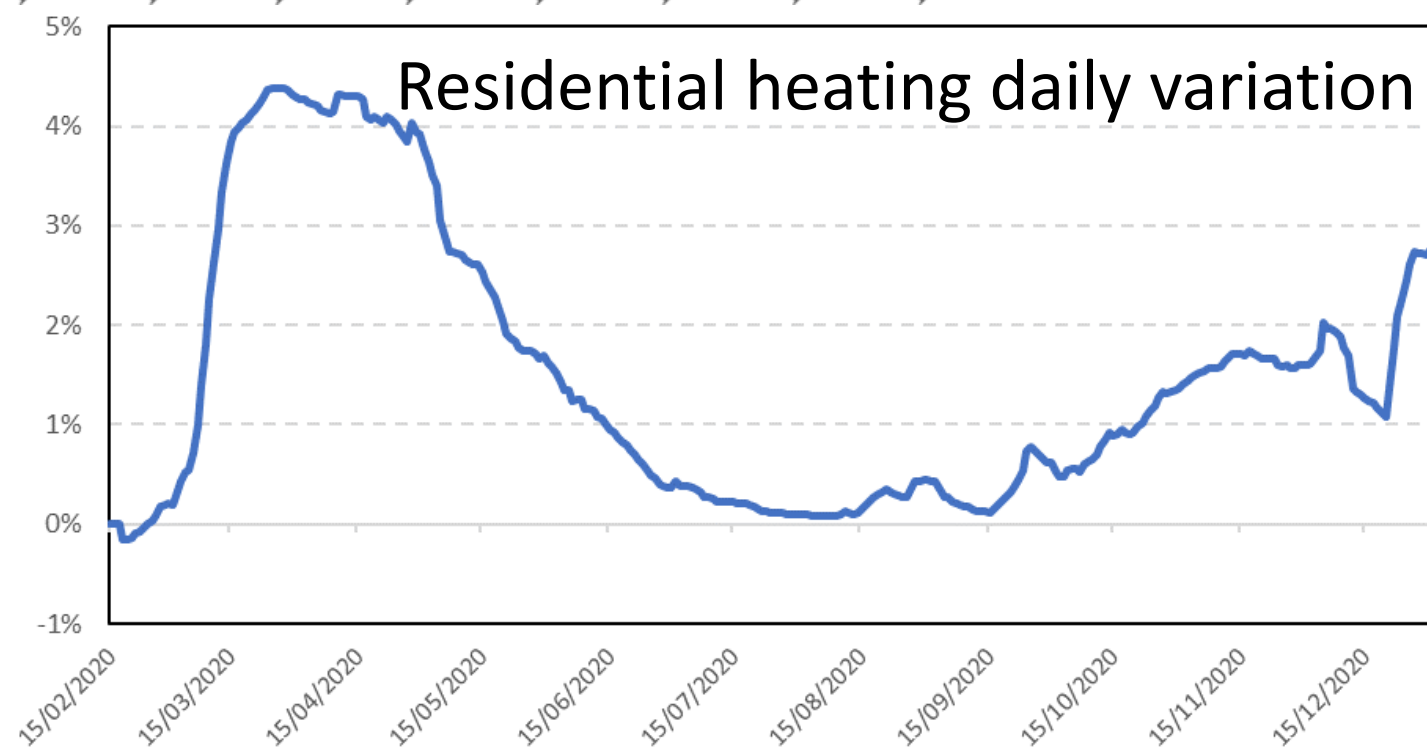
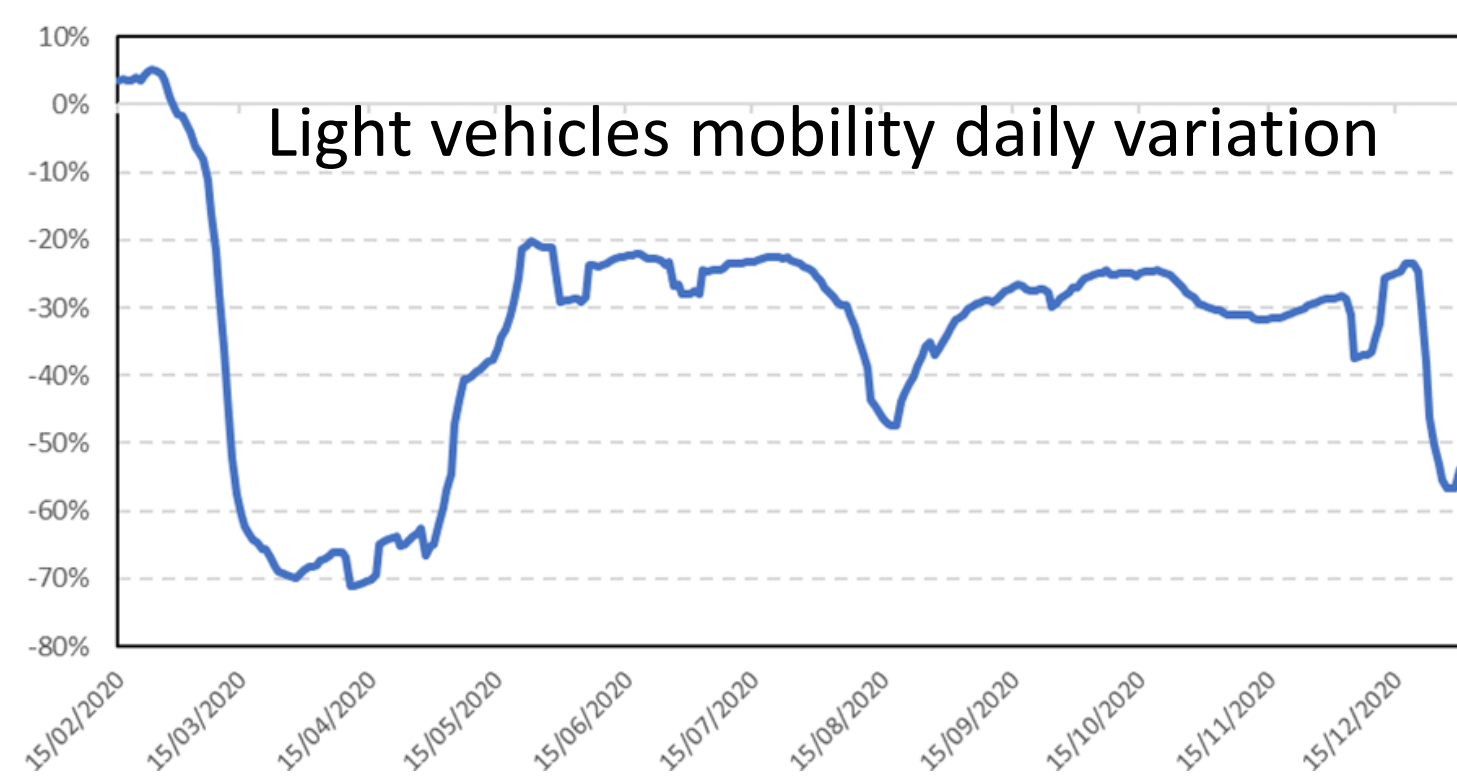


## Covid-19 lockdown measures

The measures taken by the Italian government to curtail the spread of the SARS-CoV-2 virus pandemic caused rapid reduction of air pollutant emissions since the end of February 2020. Full lockdown conditions have been established at national level from March 16<sup>th</sup> to May 3<sup>rd</sup>.

### Emission reduction estimates

The recent WMO-GAW observational study estimated for this period a reduction of people mobility of 83% for the city of Rome, while independent estimates, provided by the PULVIRUS national project, evaluated an average **decline of 67% of passenger road transport emissions** over the same time period. Air traffic emissions decreased by 89%, office heating by 62%, while **residential heating emissions increased by 4%** due to the extended time periods spent at homeplaces. These reductions of pollutant emissions per macro-sector on a daily basis have been applied to the business-as-usual daily emissions, prepared from the latest available Lazio Region emission inventory.

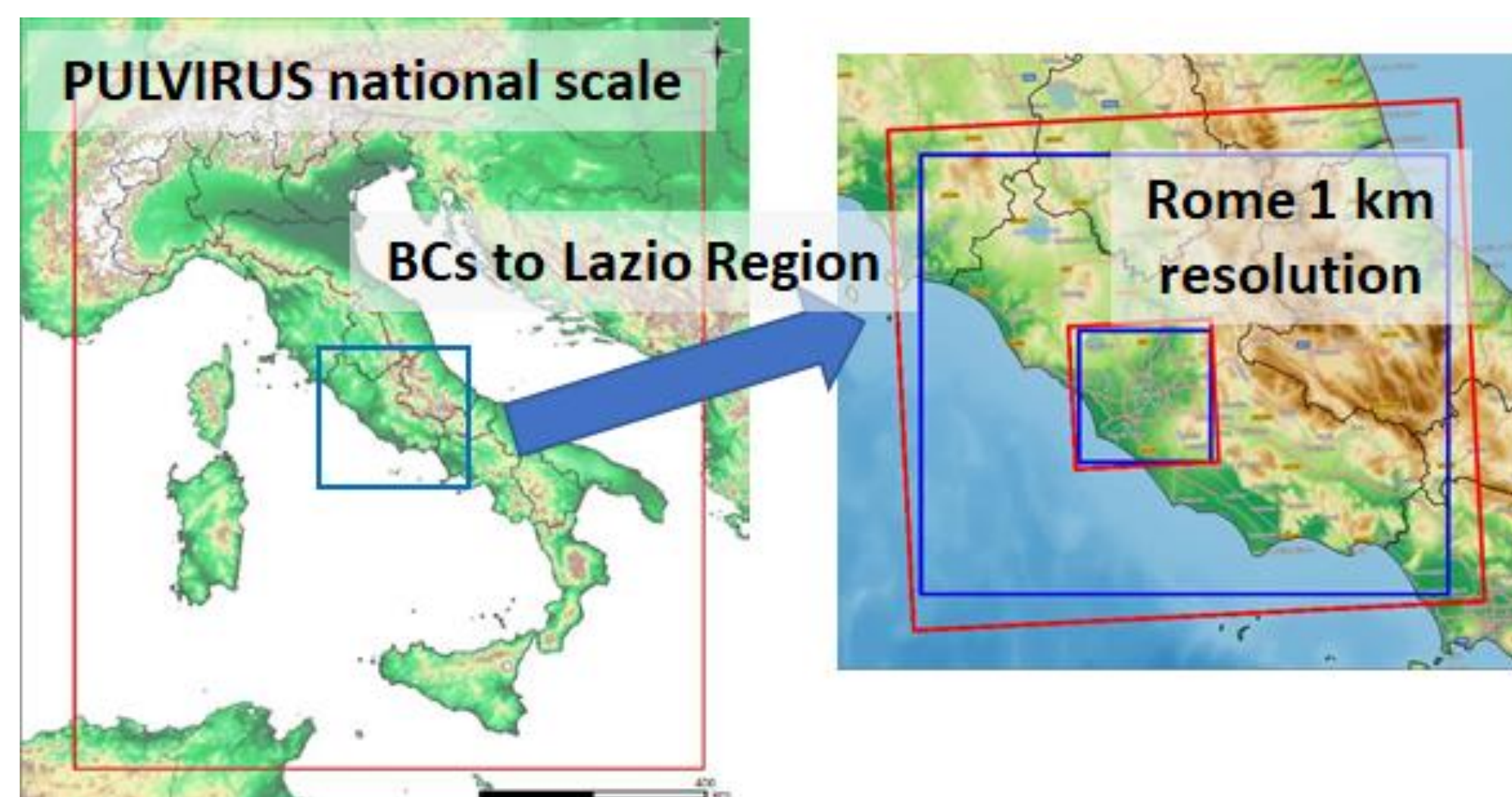


### Concentration change WMO-GAW observational study

Following the WMO-GAW observational study, the mean air pollutant concentration variation with respect to the previous five years has been estimated for Rome to reach: **-55% NO<sub>x</sub>, -3% PM<sub>2.5</sub>, -11% PM<sub>10</sub>; -0.3% O<sub>3</sub> at urban background concentrations and -30% O<sub>3</sub> at rural background concentrations.**

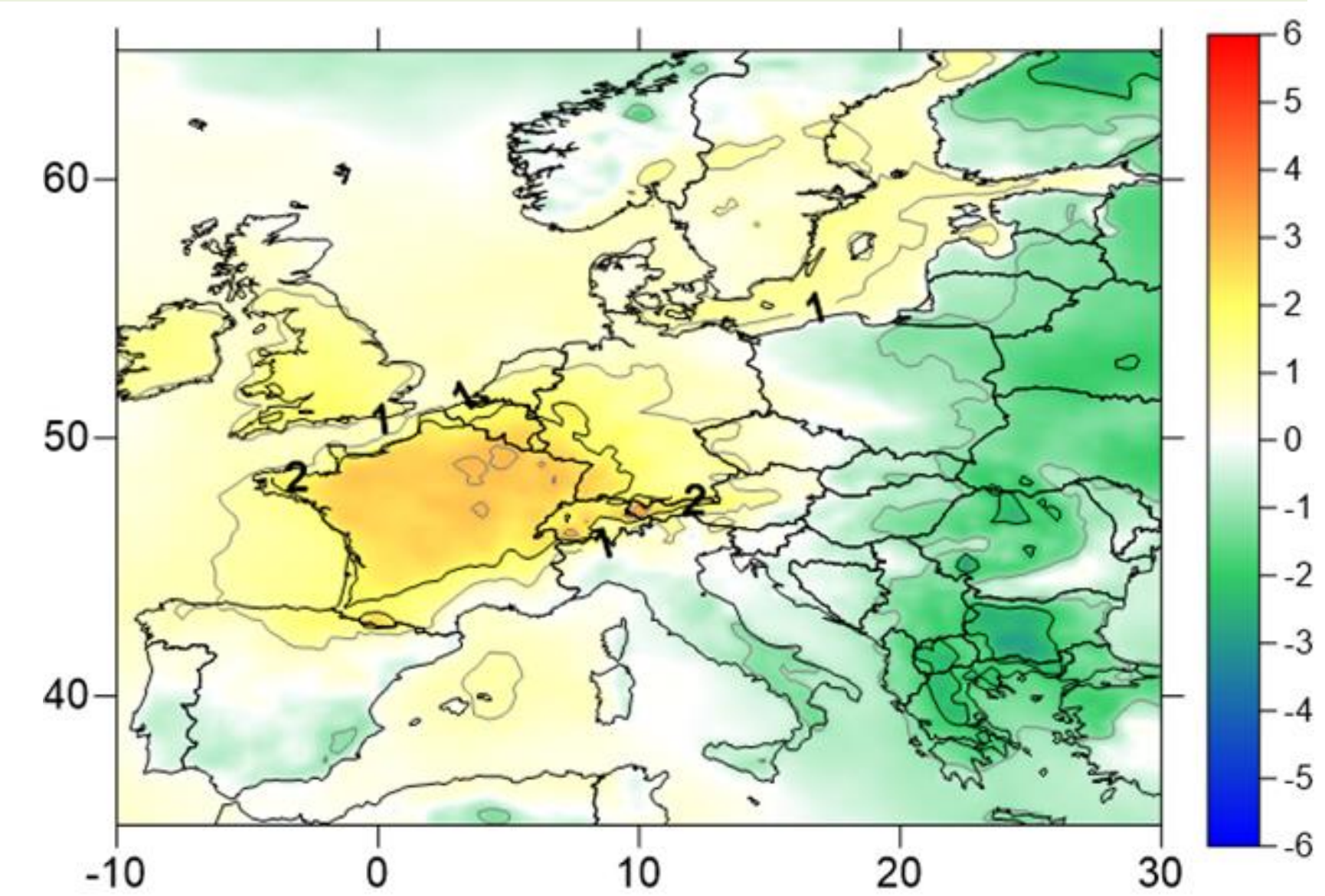
### Air Quality model simulations

Model simulation with FARM CTM have been performed with BAU and reduced emission scenarios, to be able to estimate air pollutant concentration reductions, compare them against reductions estimated from multi-year monitoring data and check the consistency of anthropogenic emission reduction estimates. Predicted concentrations with 2020 reduced emissions have been compared with observations to verify the model capability to reproduce observed concentrations inside and around Rome.

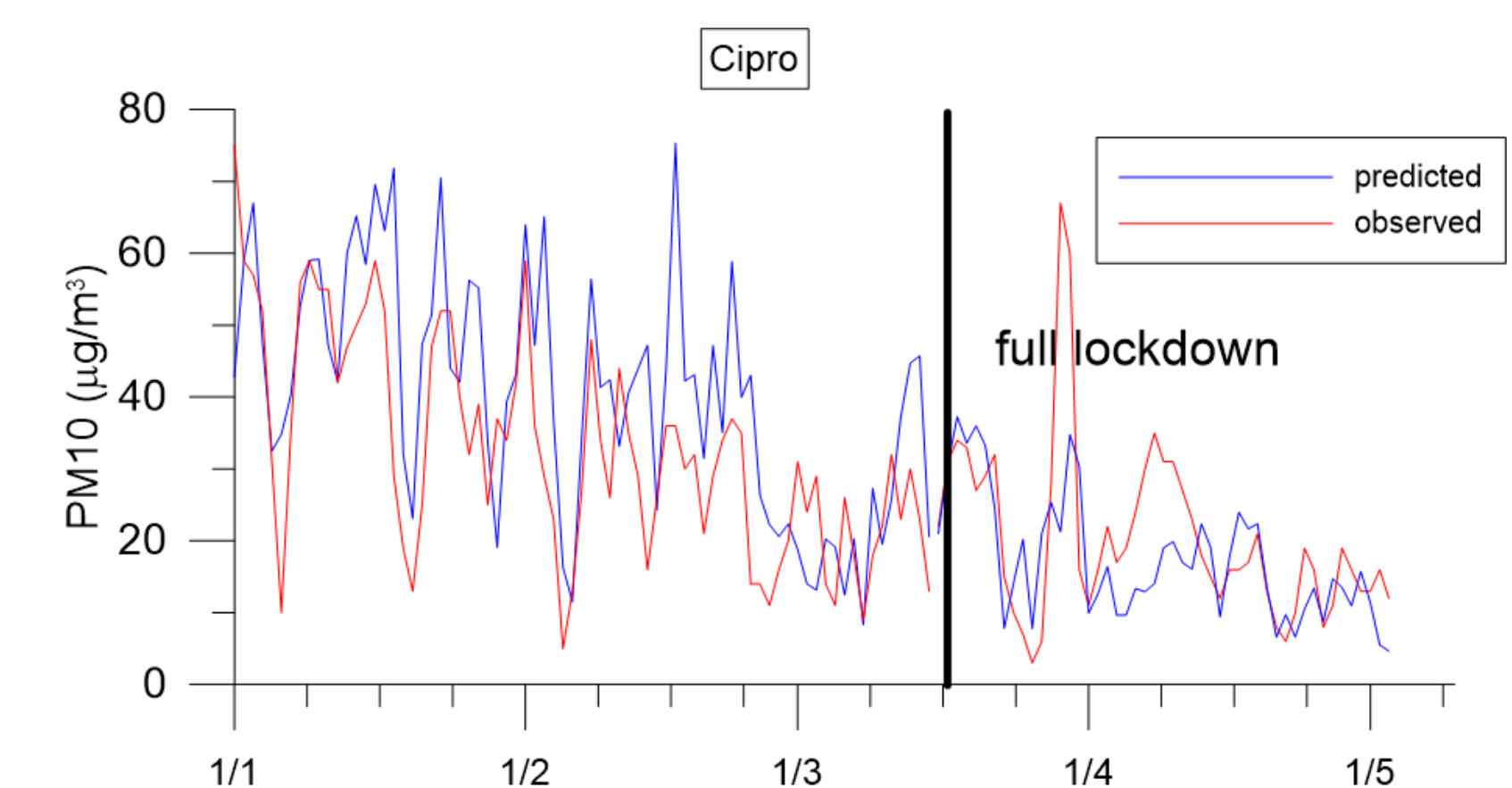


### 2020 meteorology influence

The possible influence of 2020 meteorology on the observed concentrations and on their reduction with respect to previous years has been analyzed studying 2020 meteorological anomalies with respect to the previous five years. Possible long range transport events impact on the observed concentrations have been identified using local observations and WMO SDS-WAS data.

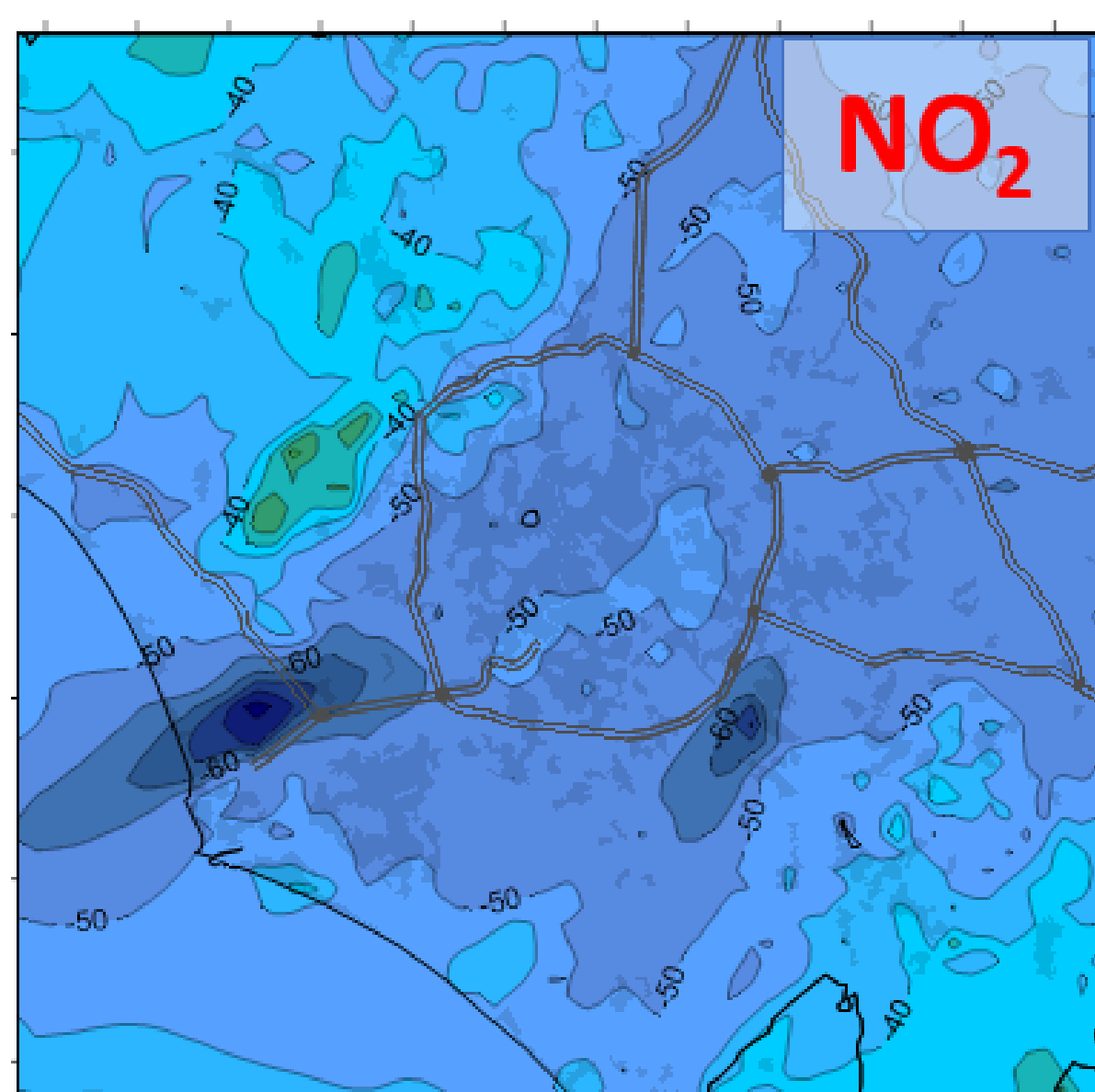


### Predicted vs computed PM<sub>10</sub>



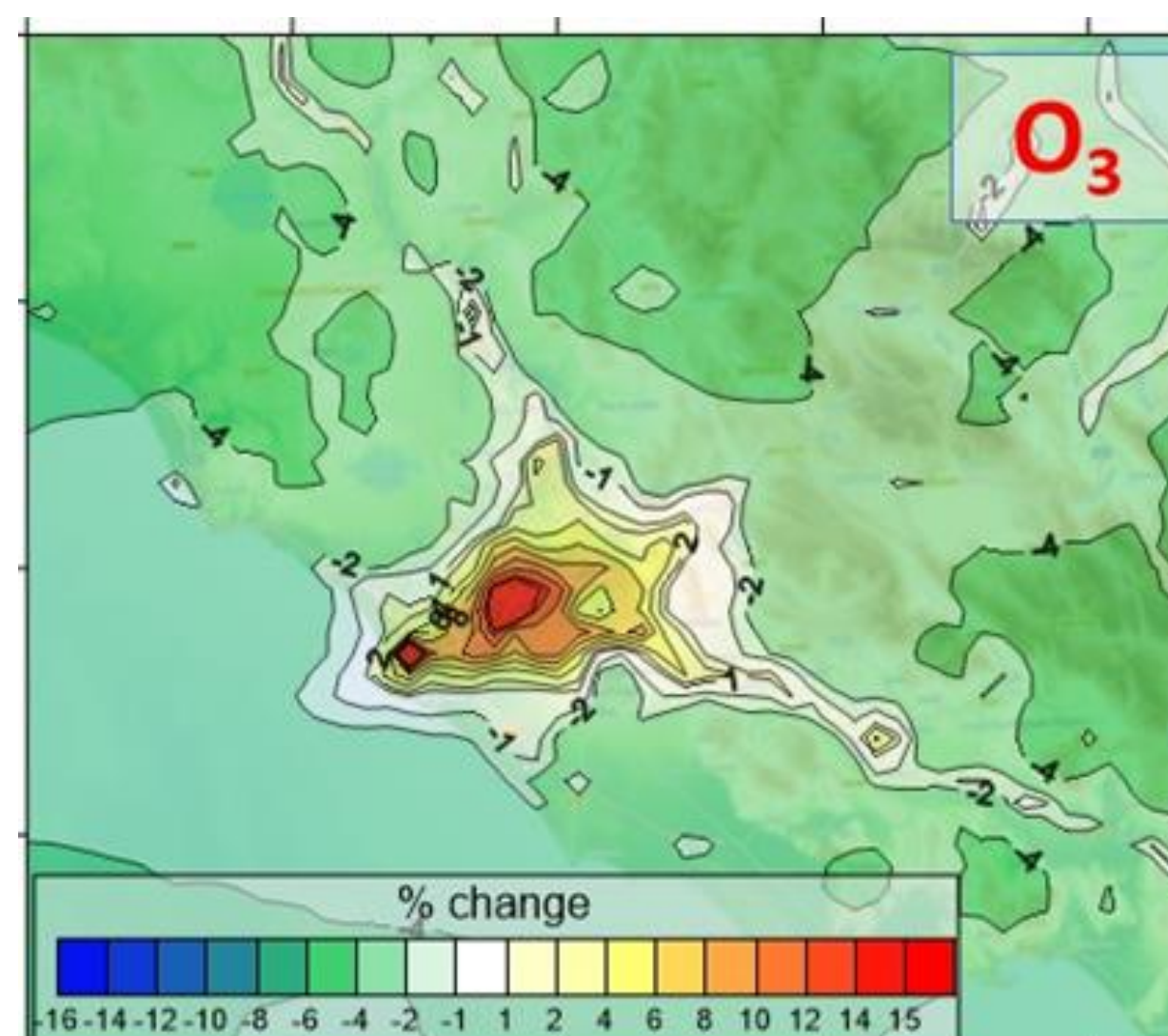
### NO<sub>2</sub> concentration change

Mean predicted NO<sub>2</sub> reduction for April 2020 ranged between 40 and 55% in the central part of Rome city, and from 50 to 65% in the outer part of the conurbation, comparing with an average 45% decrease estimated from local observations in the city centre and 60% decrease in the outskirts.



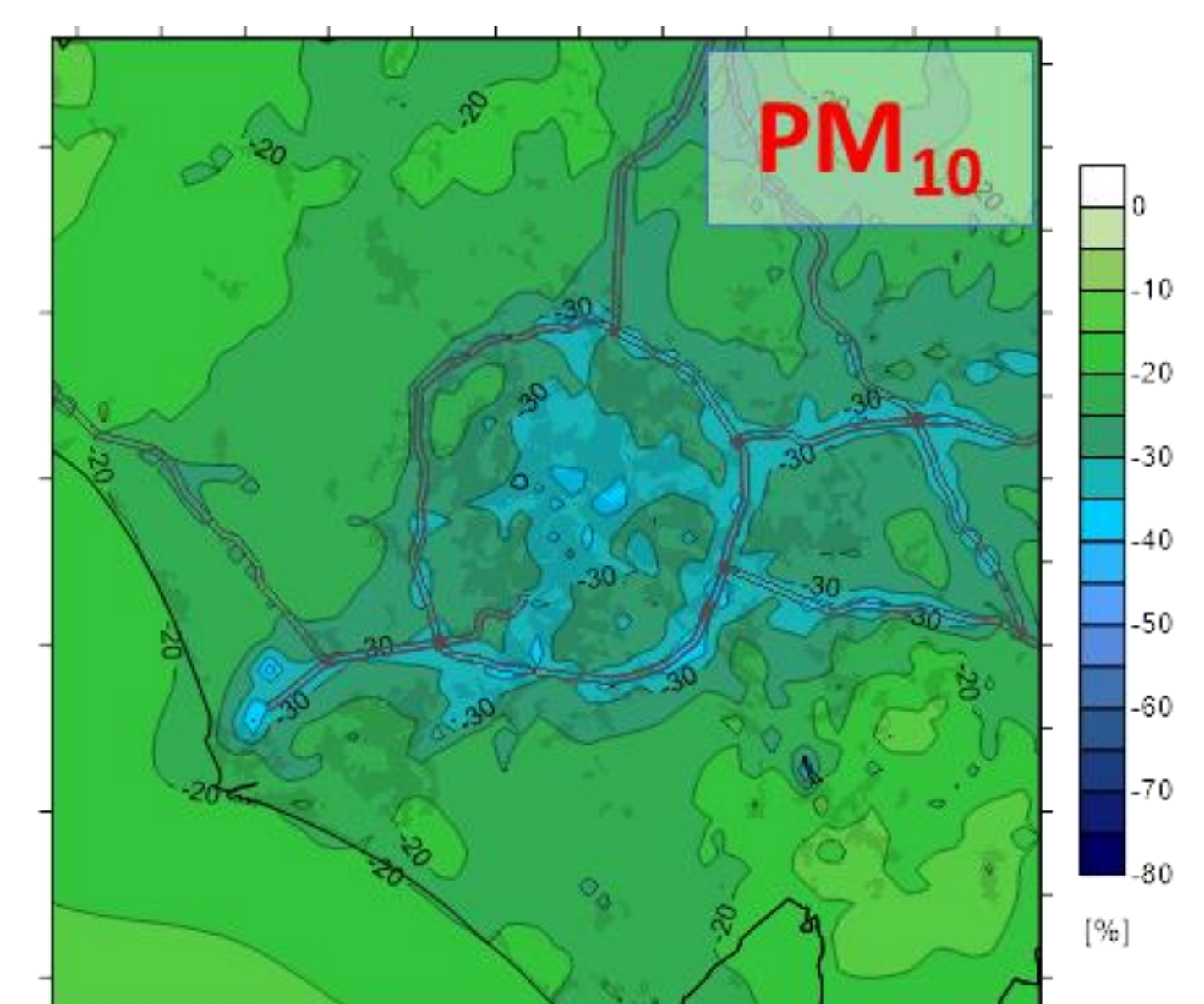
### O<sub>3</sub> concentration change

Mean predicted O<sub>3</sub> concentration for April 2020 increases inside the conurbation and near the major roads, while it decreases at rural background locations



### PM concentration change

Mean predicted PM<sub>10</sub> concentration reduction for April 2020 reached 30-35% in the city centre and nearby the major roads, and a 20-30% decrease in the peripheral areas. Observation based analysis indicated a 27% average decrease in the city centre and a 13% decrease in the outskirts.



## Indications for Air Quality Management

Preliminary results confirm the predictable effectiveness of mobility measures to reduce the urban population exposure to NO<sub>2</sub> concentration and foster the strengthening of public transport, as well the implementation of electric and green mobility. Otherwise, the reduced impact on PM<sub>10</sub> and PM<sub>2.5</sub> of the emission changes related to covid-19 lockdown highlights the need to target other emission sectors than mobility (e.g. biomass burning for house heating, agriculture,...) and the need of policies at regional/continental level. A wide diffusion of electric mobility cannot be expected to be the key solution to PM pollution even due to non-exhaust emission contribution persistence.