



Agenzia nazionale per le nuove tecnologie,
l'energia e lo sviluppo economico sostenibile



FAIRMODE CT4: MICRO-SCALE AQ MODELLING

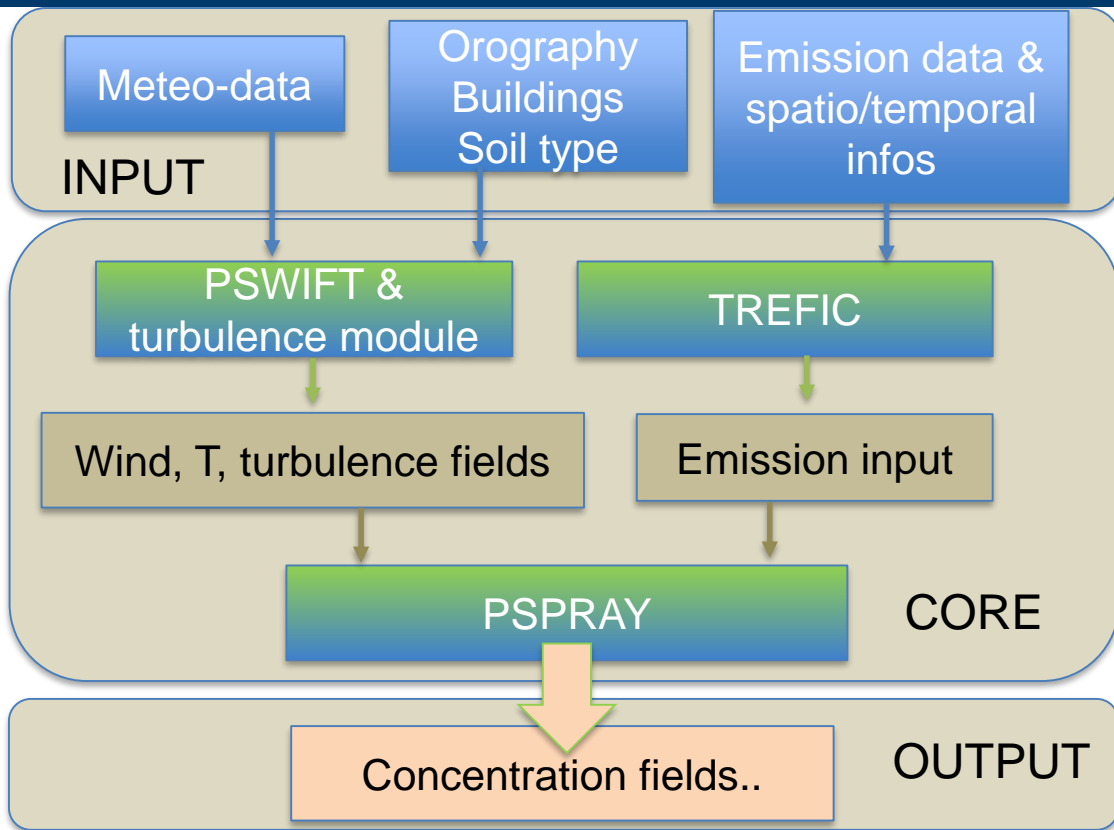
AAQ Annual Indicators: an Approach based on PMSS (Parallel MicroSWIFT- MicroSPRAY)

ENEA, Laboratory of Air Pollution & ARIANET s.r.l.

FAIRMODE Technical Meeting, 30th September- 2nd October, 2020



PMSS description



System CORE

- > TREFIC:
Emission Manager
- > PSWIFT: mass
consistent interpolator
- > PSPRAY:
Lagrangian model:
 - Steady
 - (chemistry)

BEEP, an yearly simulation with PMSS

Set-up:

Domain: Simulation: whole year 2015

City of Rome, 12x12 km² (36 «tiles»)

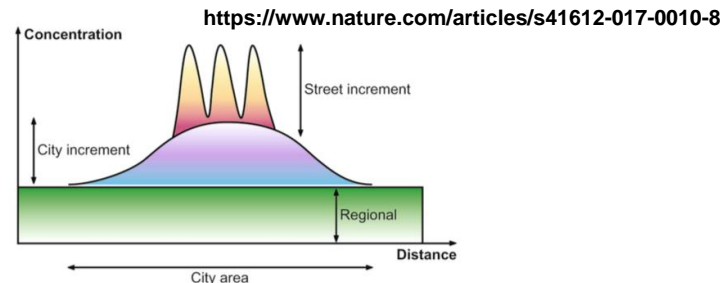
Chemistry: FARM CTM as background

Models chain: PMSS (4m) coupled with FARM CTM (1km)

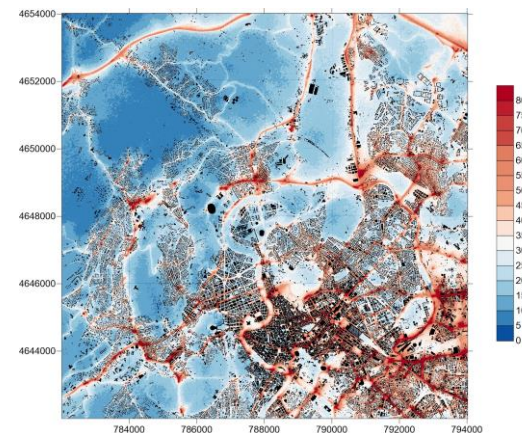
Input data:

- Meteorology WRF meteo fields (1km res)
- Emissions:
 - Traffic Fluxes data, Roma Mobilità (PMSS)
 - Emission inventory, ARPA Lazio (FARM-CTM)

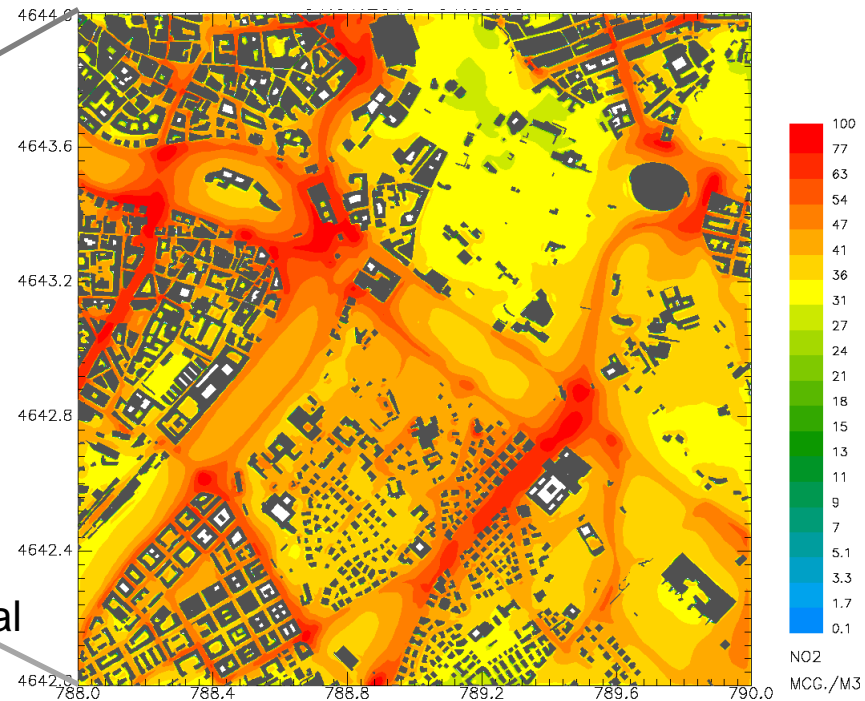
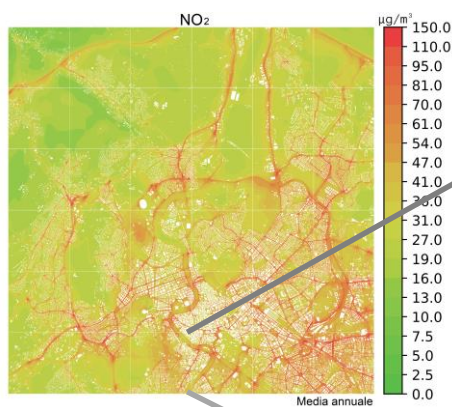
Run time for a day with PMSS: 4.5 h with 180 processors



NO₂: FARM + PMSS



NO₂ for 2015: a zoom in on a tile



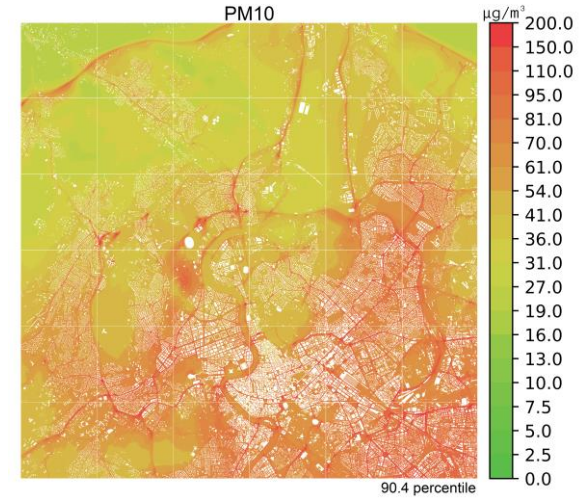
Advantages:

- One simulation for the whole year
- Insight over the whole urban area & retrieving information at a much higher spatial and temporal scale.

Procedure for retrieving annual indicators

Way to proceed:

- Annual simulation (indicators computed from yearly timeseries):
 - Average of all hourly/daily concentrations.
 - Percentiles.
- Shorter term simulations (not yet computed):
 - Daily simulations of statistically significant wind regimes (to be identified «manually» ->no fixed number of daily simulations)
 - + extrapolation on the year based on frequency of regimes



Example:
90.4 percentiles of
PM10 daily averages



Evaluation considering also other experiences with PMSS

Pollutant	Aim	Runtime	Data	References
NO ₂	Health effects of air pollution, noise and meteorological parameters	1 year	7-AQref	BEEP (Barbero et al., Annual simulation at microscale of the air quality over a large portion of a big european city, to be submitted) (ARIANET s.r.l)
NO _x (PM ₁₀)	Green infrastructure on hotspot in city	5 weeks	1-Aqref+ 1-CNR	Villani et al. submitted ATMENV-D-20-01136. (ENEA, CNR, Green City Solutions GmbH)
PM ₁₀	Steel plants	1 year	5-AQref	https://www.snpambiente.it/wp-content/uploads/2018/10/6_Pession.pdf (regional agencies: VdA + Umbria + Veneto)
PM ₁₀ BaP	Biomass residential burning in town hotspot	2 weeks	1-AQref	http://www.harmo.org/Conferences/Proceedings/_Bologna/publishedSections/H18-099-Intini.pdf (ARPA- Puglia, ARIANET s.r.l)

- Italian regional agencies or universities may have other studies at the microscale
- Accuracy of the methodology: depends on:
 - Representativeness of BG concentrations from AQ ref. stations
 - Accuracy of BG concentrations from CTM

Thank you



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