

AIR QUALITY MODELLING ON TEL AVIV

Improving AQ forecast with downscaling
approach : CHIMERE-SIRANE-PMSS

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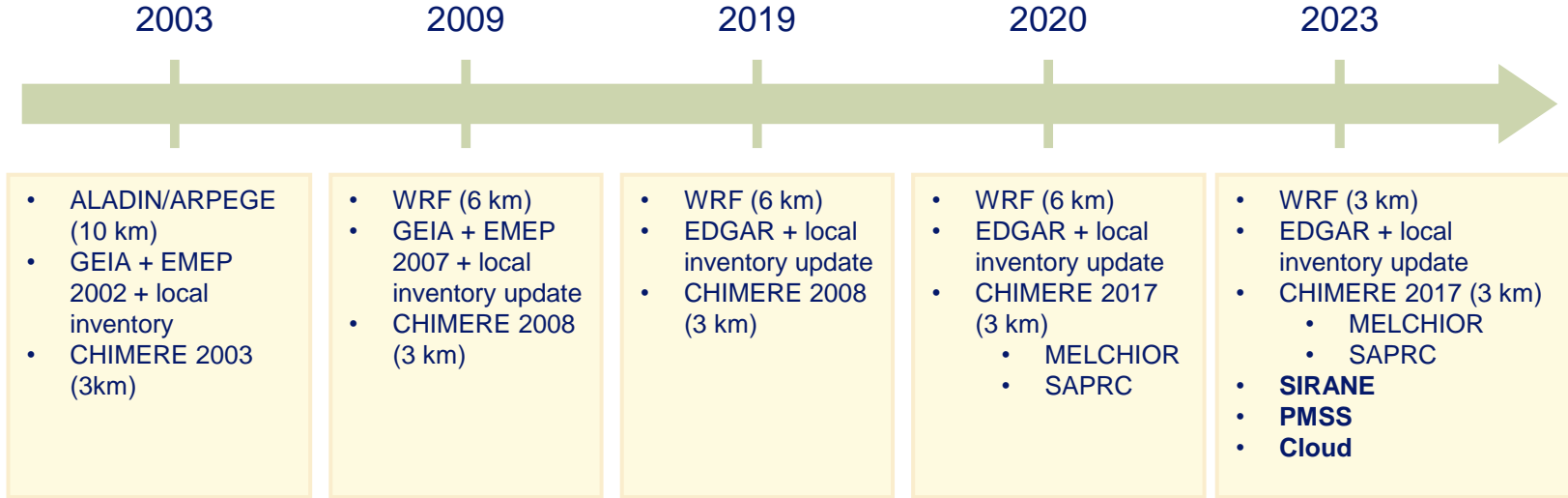
Osnat Yossef,

from Ministry of
Environment Protection of
Israel



Ministry of Environmental Protection

Air Quality modeling chain on Israel - Evolution over time



Forecast system developed for and with Israel Ministry of Environment

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SIRANE
PMSS

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1

LOCAL SCALE APPROACHES

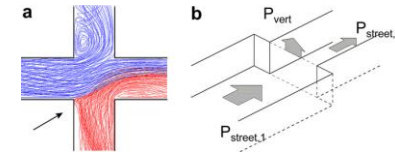
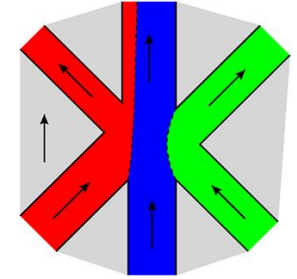
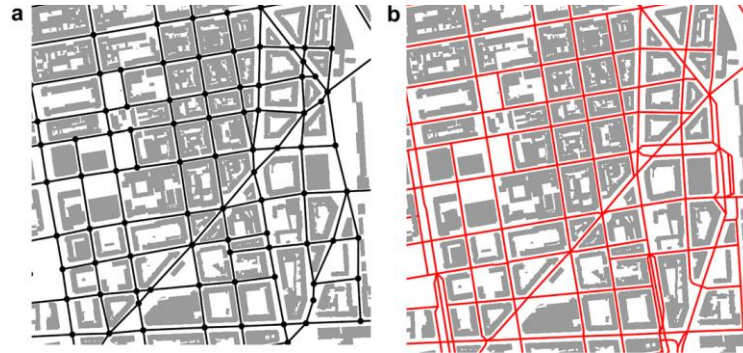
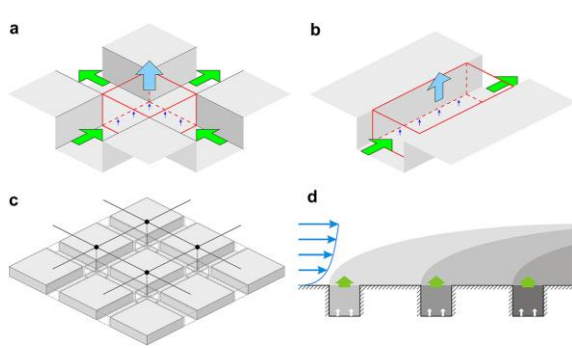


SIRANE

Street network approach + gaussian dispersion

Developped by ECL-LMFA

Buildings database used to compute height and width of canyon streets



Pictures from ECL-LMFA

PMSS

Developed by ARIA,ARIANET,CEA-DAM

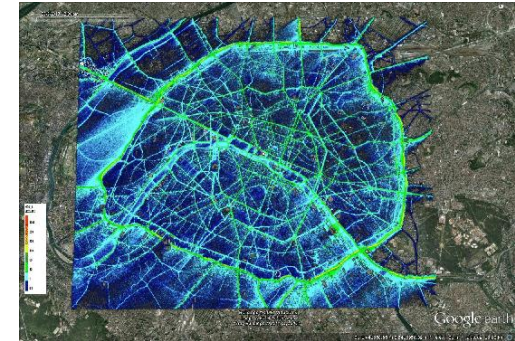
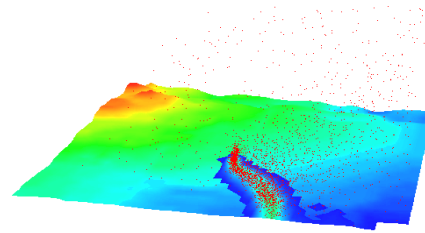
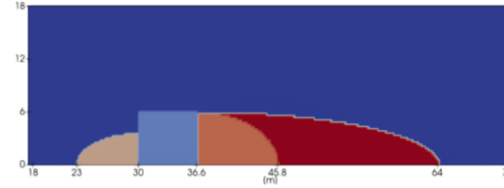
PSWIFT

Mass consistent diagnostic meteo model
Rockle type model for 3D buildings effects

PSPRAY

Lagrangian particles dispersion model
Spatial and particles parallelization

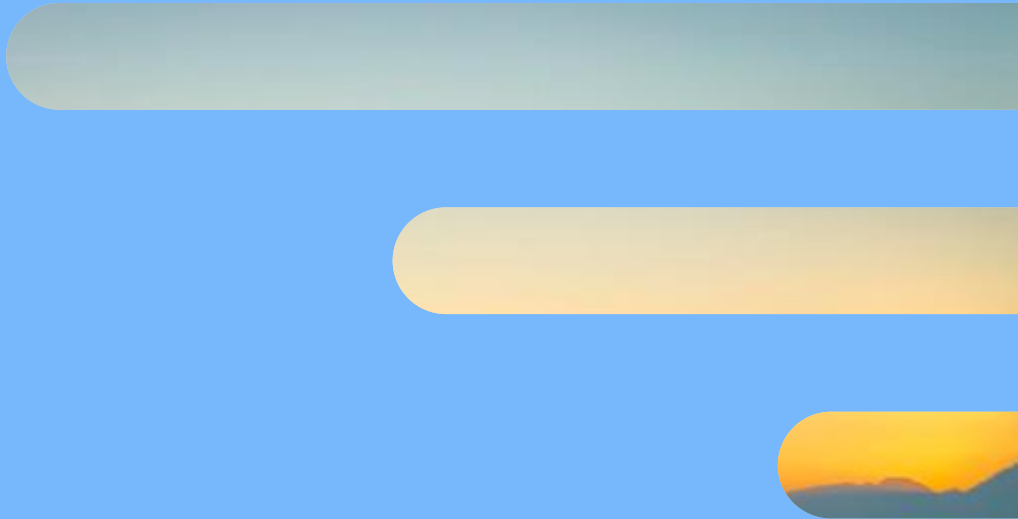
Faster than real time: forecast
A whole city is affordable with a large machine



Aircity project - Paris

2.

MODELLING SETUP



DOMAINS

SIRANE

24 km x 24 km

Resolution : 20 m

Buildings database from MOE: canyons geometry

Local emissions inventory from MOE : points and line sources



PMSS

9.5 km x 9.3 km

Resolution : 5 m

20 vertical levels

70,7 millions cells

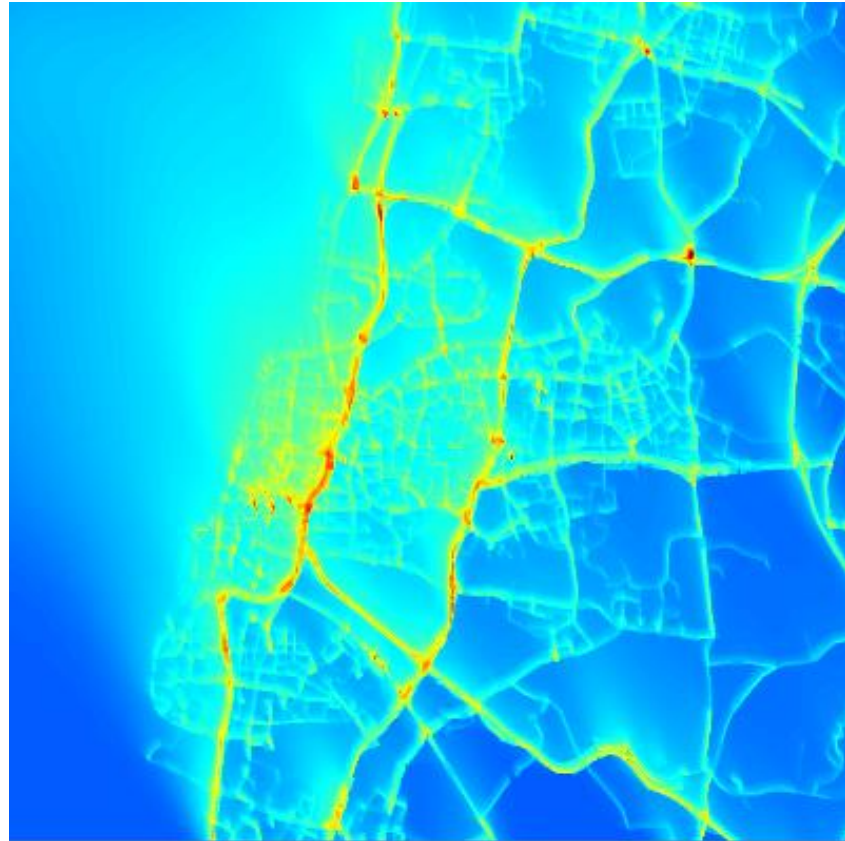
Buildings database from MOE

Road emissions inventory from MOE



SIRANE

Docker
Background from CHIMERE
Meteo from WRF



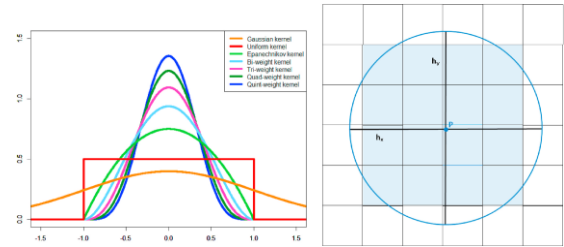
PMSS



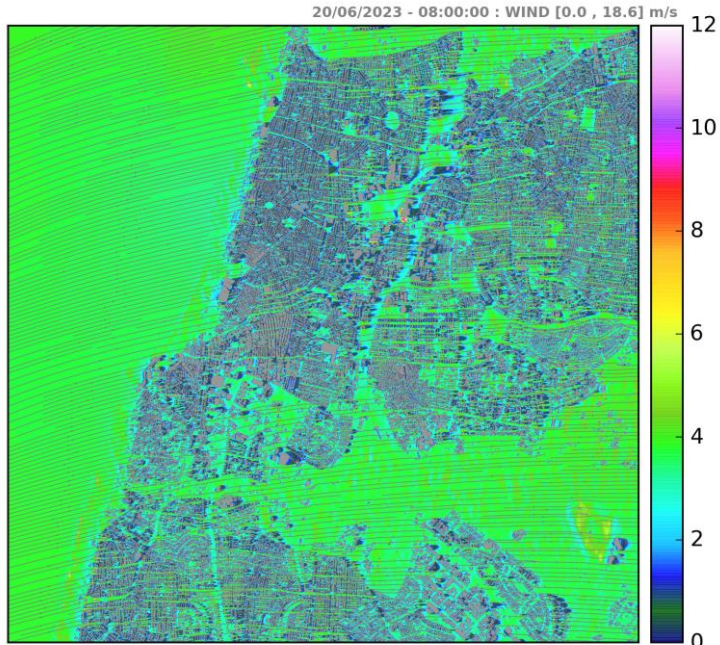
Docker
16 tiles
Kernel method
3D Meteo from WRF as input



16 tiles



Kernel method - from Barbero at al 2021



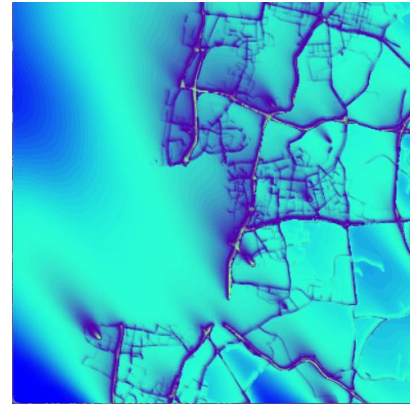
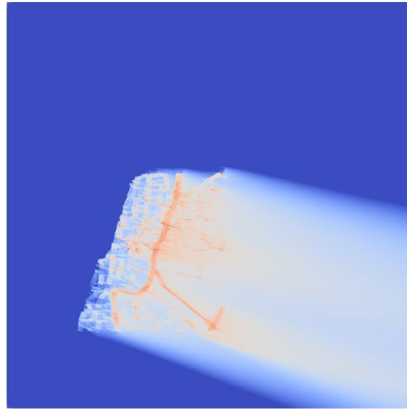
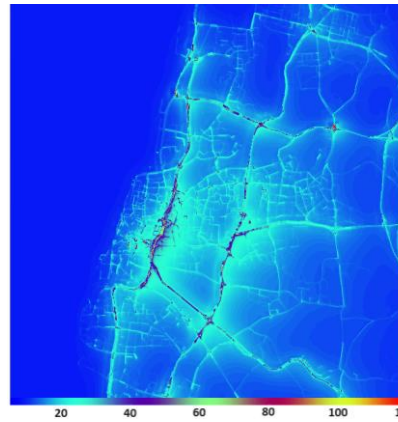
COUPLING SIRANE & PMSS

2 groups of sources in the SIRANE setup

- In PMSS domain
- Out PMSS domain + point sources

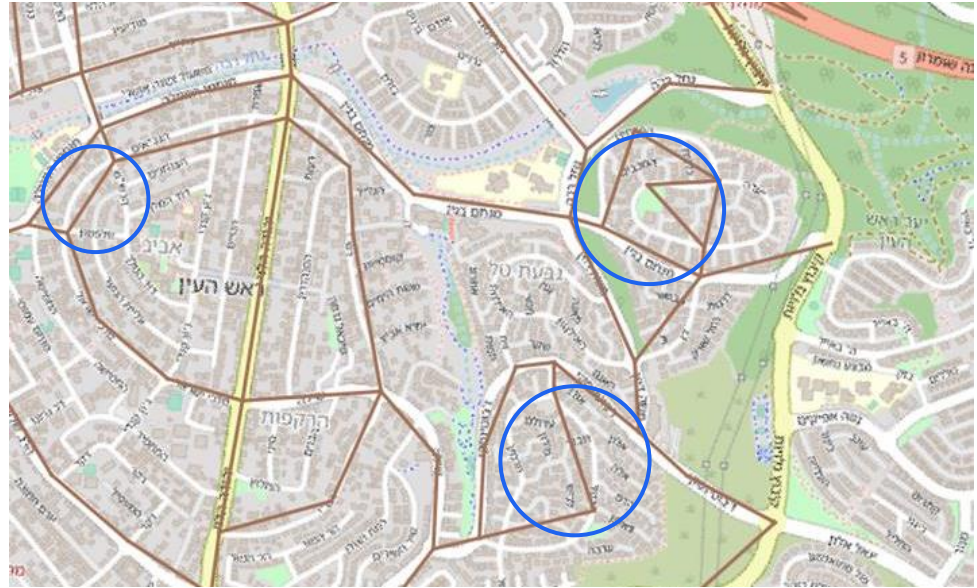
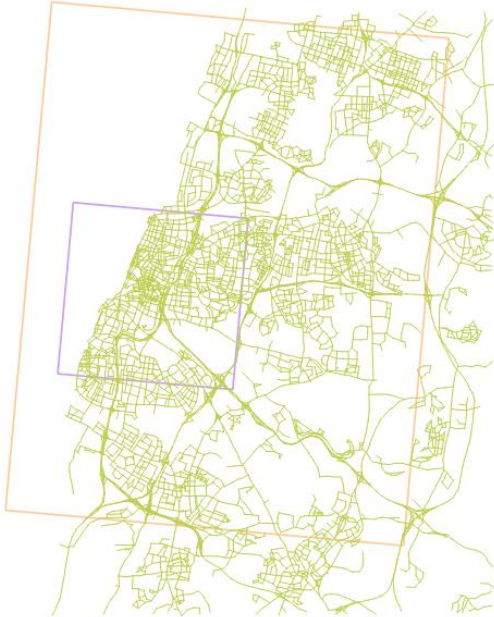
Sum of PMSS concentration + SIRANE OutPMSS

No double counting of sources



CHALLENGES

Road network and buildings consistency



CHALLENGES

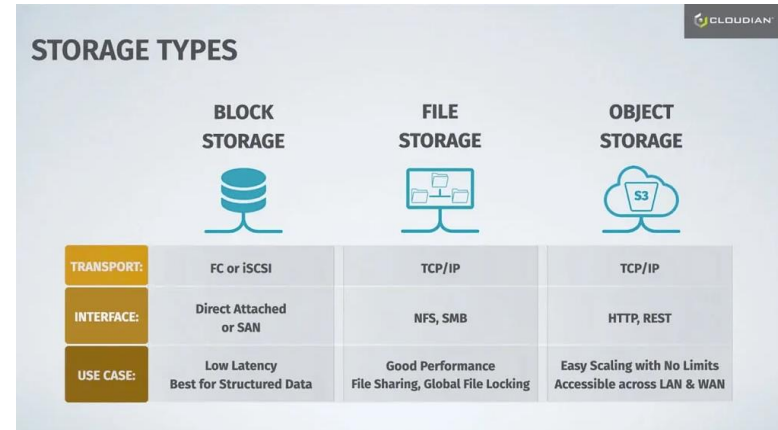


Docker and Cloud computing

Docker make the installation much simpler on a new server

Issues with Cloud machines

- File systems compatibility
- Hidden log files filling disc

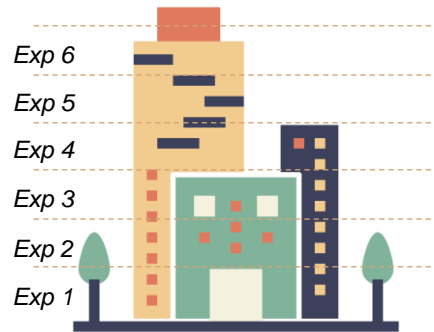
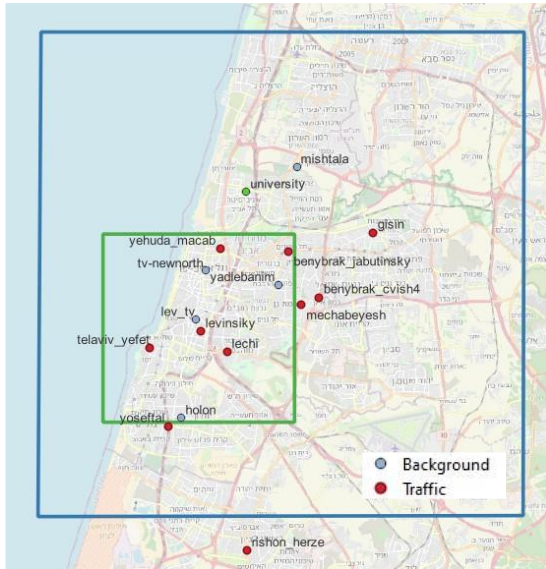


3.

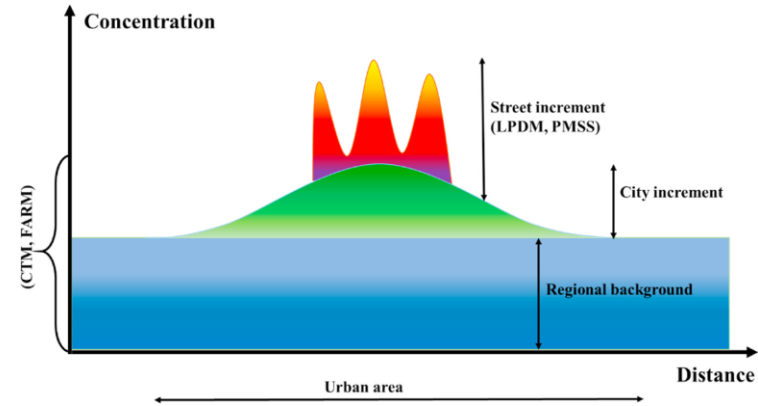
PERFORMANCES

RESULTS IMPROVEMENTS WITH LOCAL SCALE

Higher resolution models for street/city increment
AQ stations network (at ground level) : 15 ref stations
3D exposure



Exposure per buildings and floors

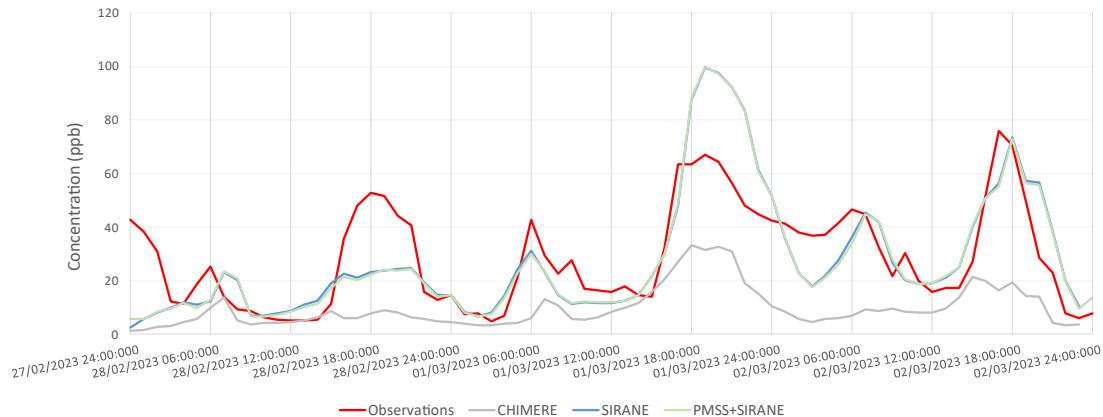


From Barbero at al 2021

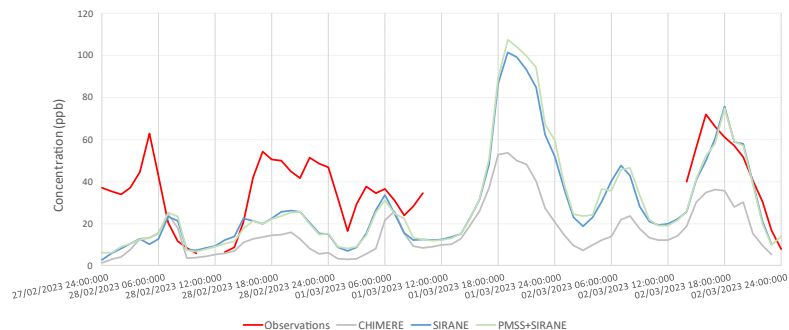
RESULTS IMPROVEMENTS WITH LOCAL SCALE

EPISODE March 2023 (NO₂)

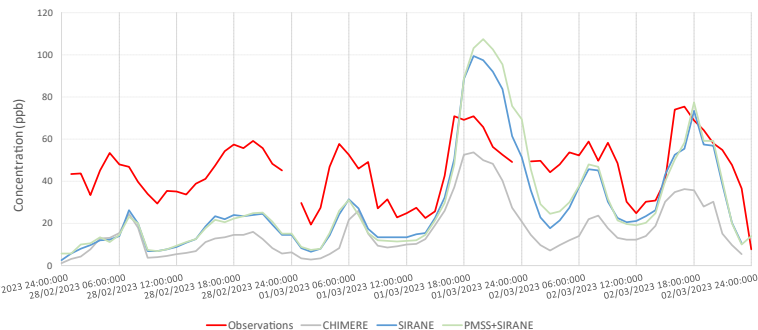
Comparison of observations and models - Holon site, NO₂, Episode of pollution of march 2023



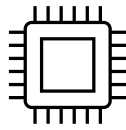
Comparison of observations and models - Lechi site, NO₂, Episode of pollution of march 2023



Comparison of observations and models - Levinsik site, NO₂, Episode of pollution of march 2023



CPU PERFORMANCES



40 logical cores machine

160 Gb RAM

File system : NFS versus object storage system

For 24h of forecast :

SIRANE

30 min

PSWIFT

1 hour

PSPRAY

1 hour 30 min

THANK YOU

