

CT8 #1

Spatial Representativeness of monitoring stations

Preliminary results in Emilia-Romagna

Arpae

Roberta Amorati, Giulia Giovannini, Michele Stortini, Giorgio Veratti

FAIRMODE CT8 #1 applied criteria

- **Annual averaged** ground level concentrations
- A deviation from the modelled concentration at the monitoring stations is allowed within a threshold or **tolerance level of 20%**.
- **Variable tolerance** is examined
- An absolute **minimum $2\mu\text{g}/\text{m}^3$**
- A **non-contiguous** approach is used to outline the SR area and comparison with **contiguous** approach
- Boundaries of the IPR **Air Quality Zones** as the maximal extent of the SR area

From

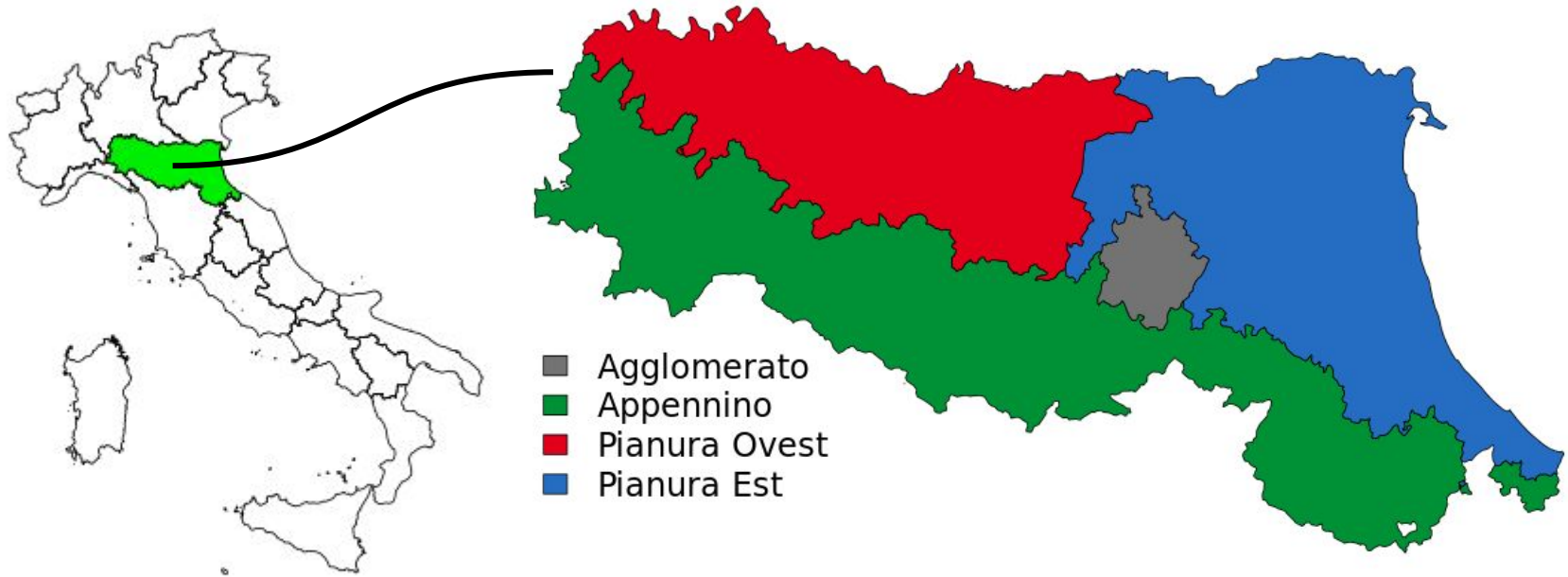
- **CTM: NINFA suite @ Arpae (CHIMERE + COSMO) 3x3 km²**
- **CTM and KED (Kriging CTM + Observations)**
- **PM10 PM2.5 NO2**
- **Background station locations**
- **Reference year 2020**

To

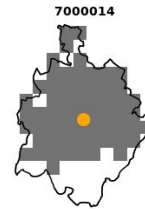
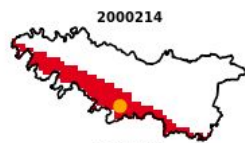
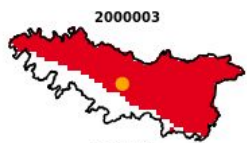
For every station location:

- **a SR map**
- **a plot of the SR area, calculated varying the tolerance from 10% to 20% by step of 1%**

Emilia-Romagna Air Quality Zones



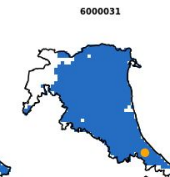
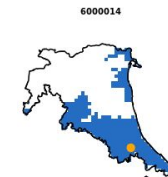
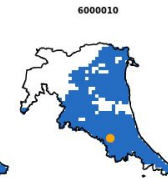
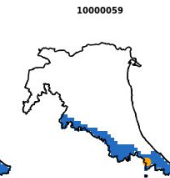
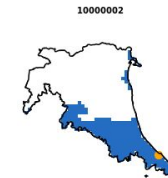
PM10 CTM



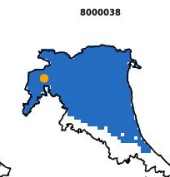
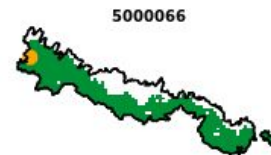
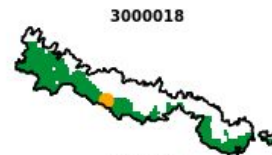
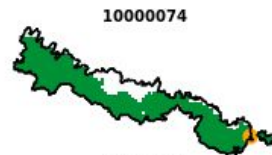
Agglomerato



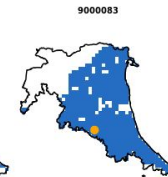
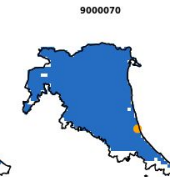
Pianura Est



Pianura Ovest



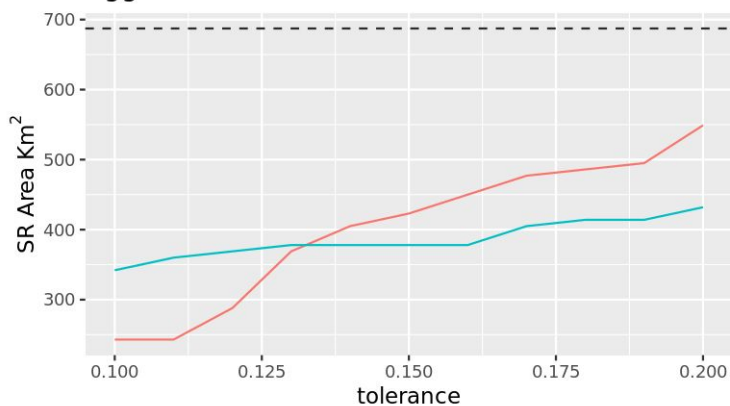
Appennino



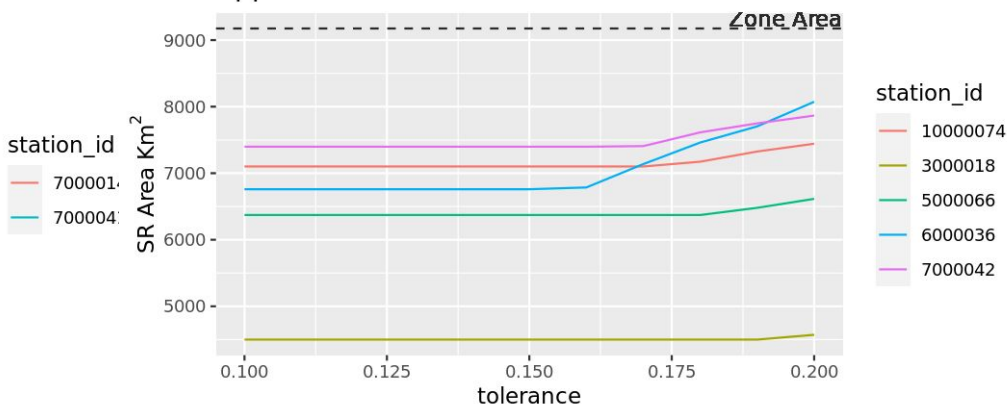
SR tolerance 20%
CT8 #1 Technical Meeting - October 6 - 8, 2021

SR Area vs Tolerance PM10 CTM

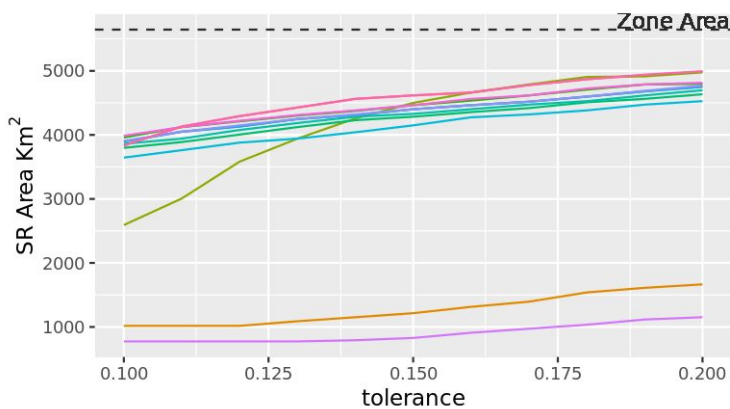
Agglomerato PM10 CTM



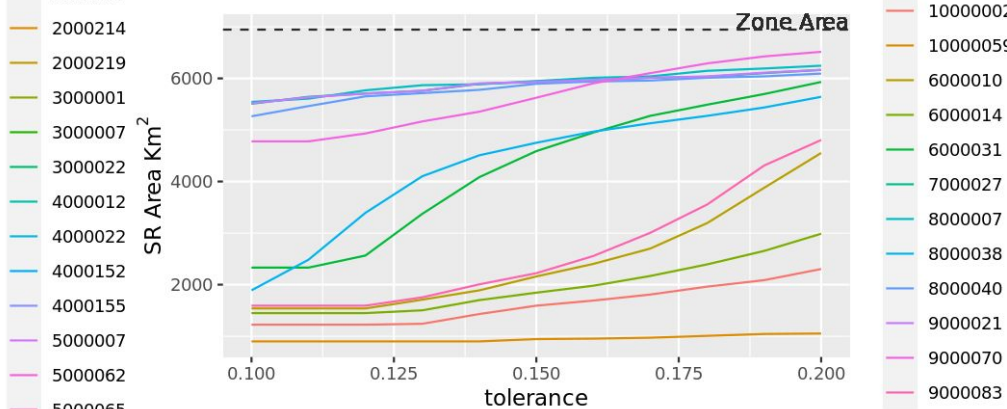
Appennini PM10 CTM

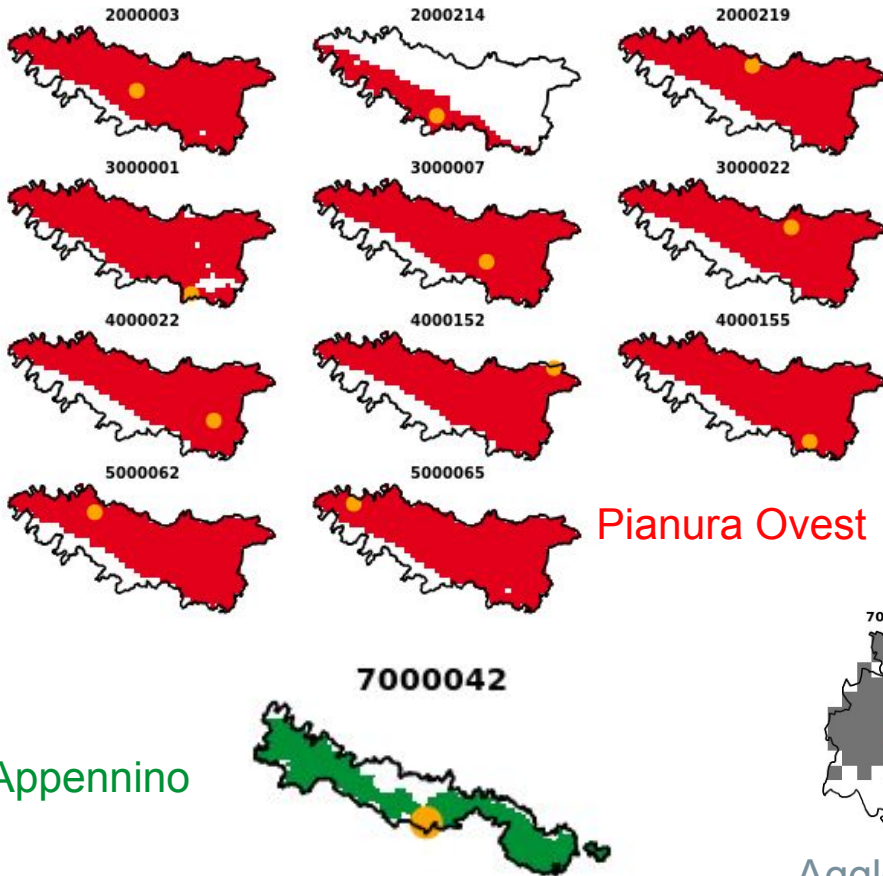


Pianura Ovest PM10 CTM

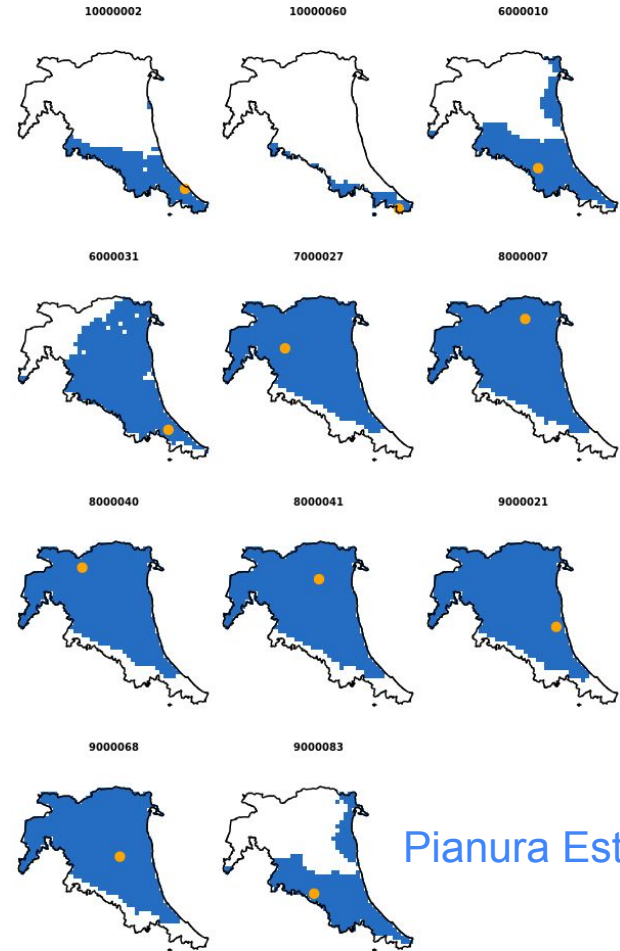


Pianura Est PM10 CTM





PM2.5 CTM

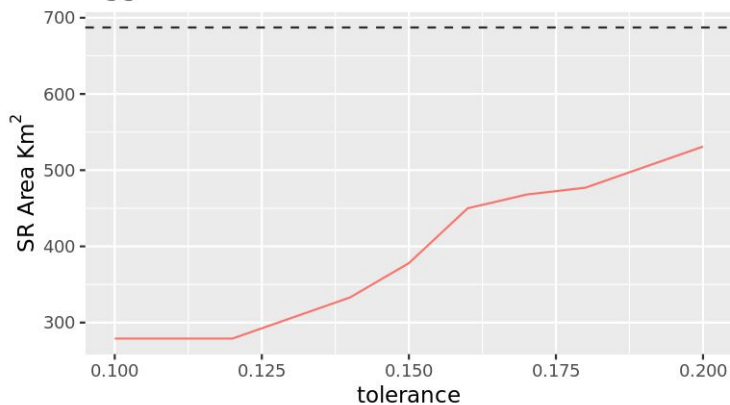


SR tolerance 20%

CT8 #1 Technical Meeting - October 6 - 8, 2021

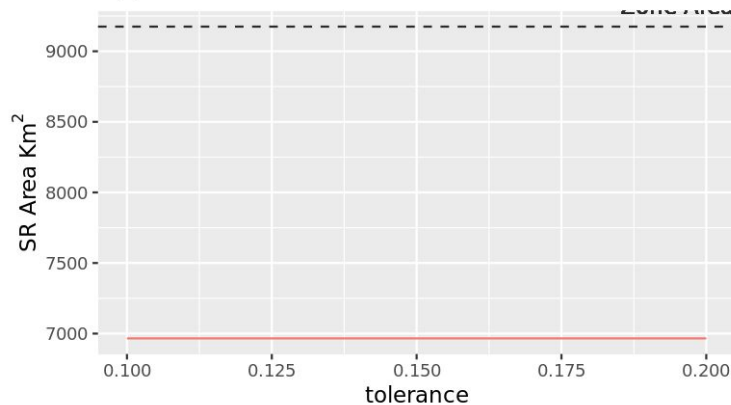
SR Area vs Tolerance PM2.5 CTM

Agglomerato PM25 CTM



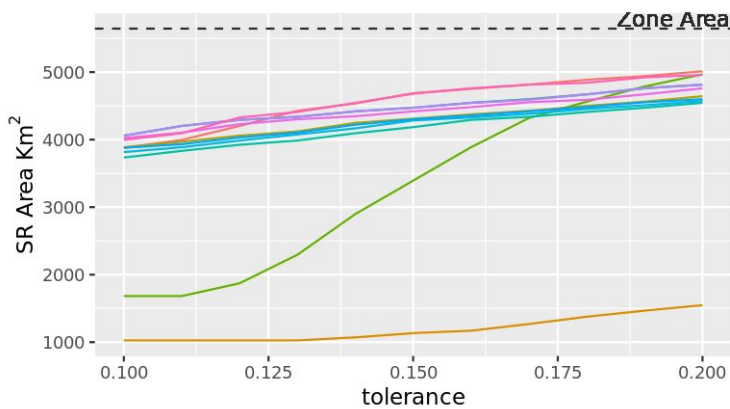
station_id
7000014

Appennini PM25 CTM



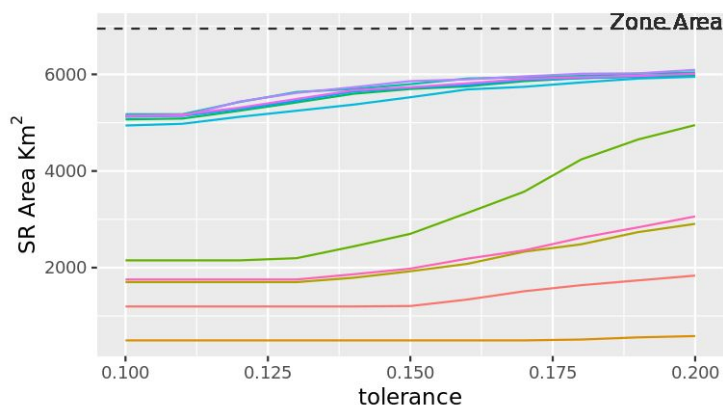
station_id
7000042

Pianura Ovest PM25 CTM



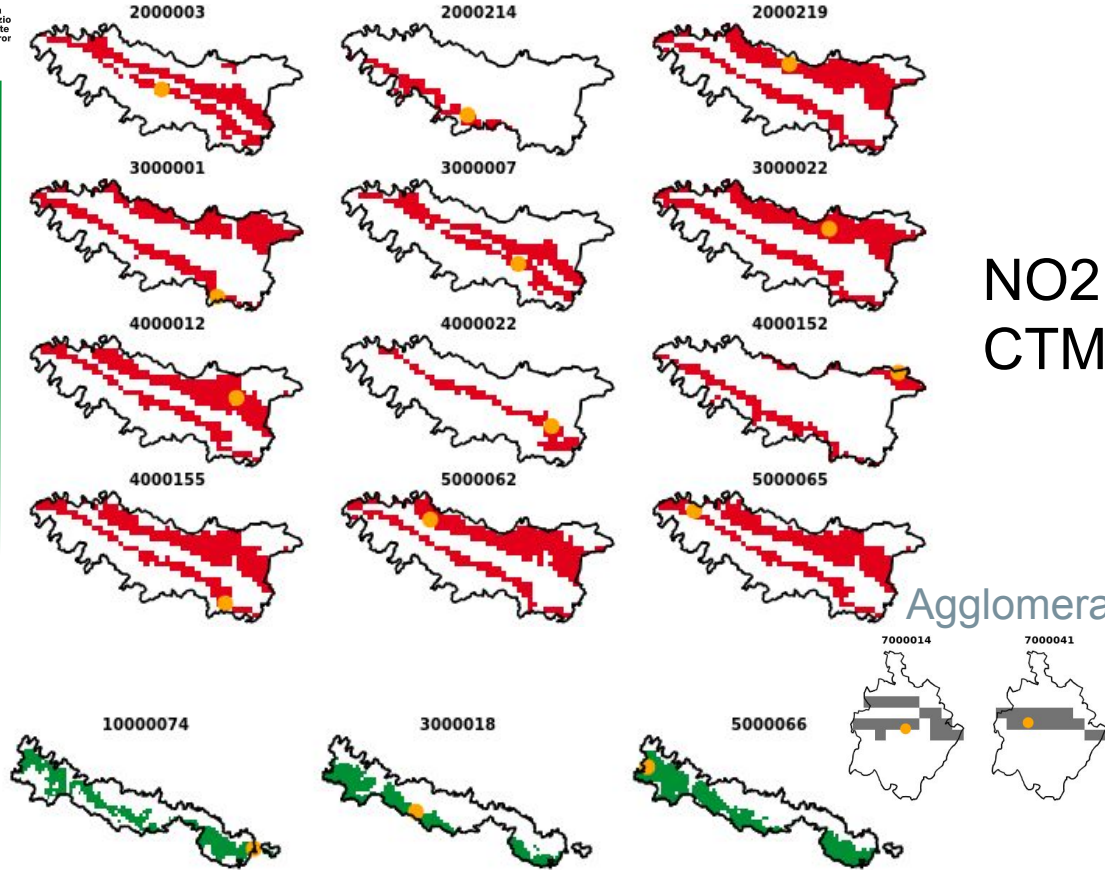
station_id
 2000003
 2000214
 2000219
 3000001
 3000007
 3000022
 4000022
 4000152
 4000155
 5000062
 5000065

Pianura Est PM25 CTM



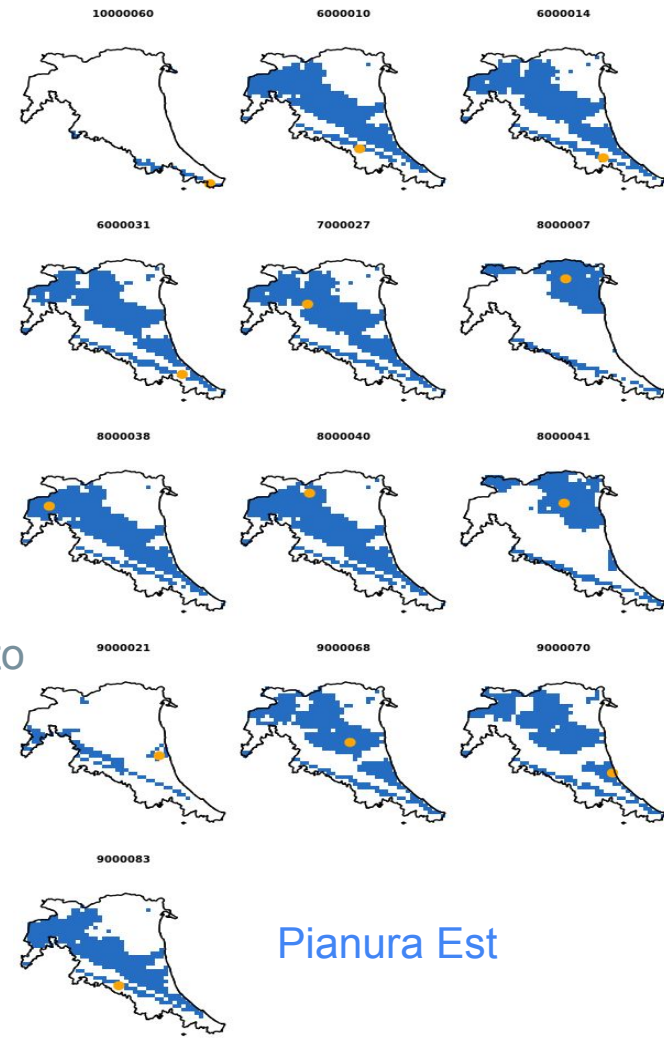
station_id
 10000002
 10000060
 6000010
 6000031
 7000027
 8000007
 8000040
 8000041
 9000021
 9000068
 9000083

Pianura Ovest



NO2
CTM

Agglomerato



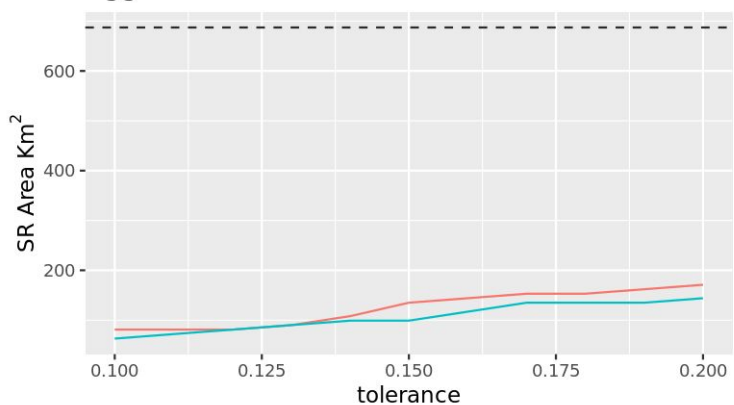
Pianura Est

SR tolerance 20%

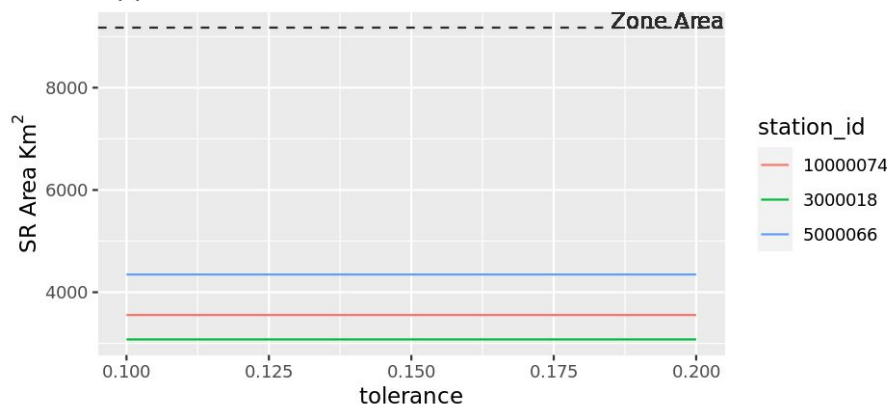
Appennino

SR Area vs Tolerance NO2 CTM

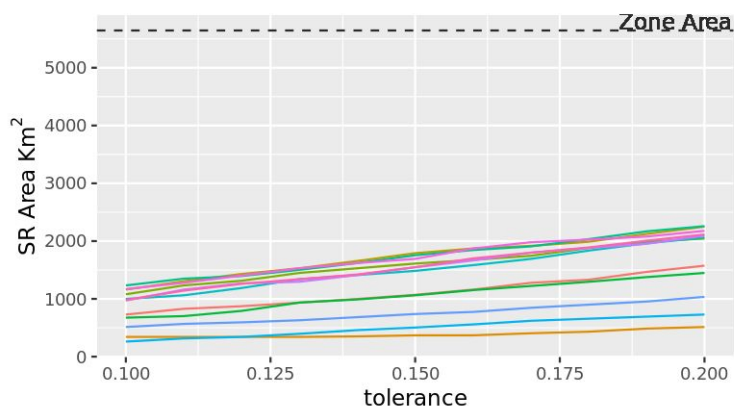
Agglomerato NO2 CTM



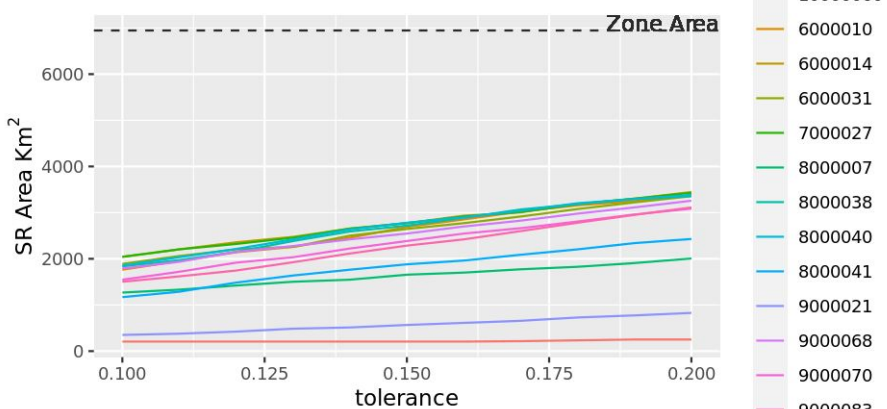
Appennini NO2 CTM



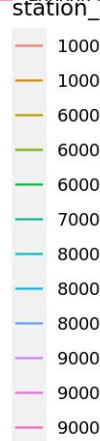
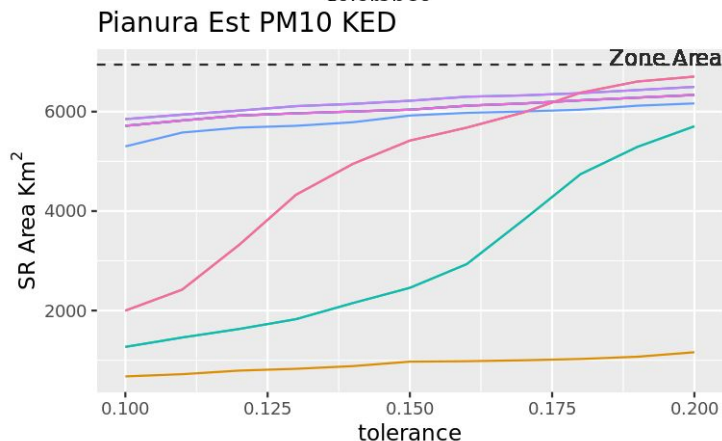
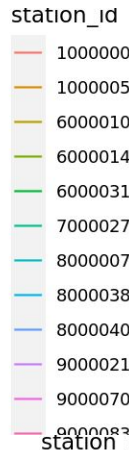
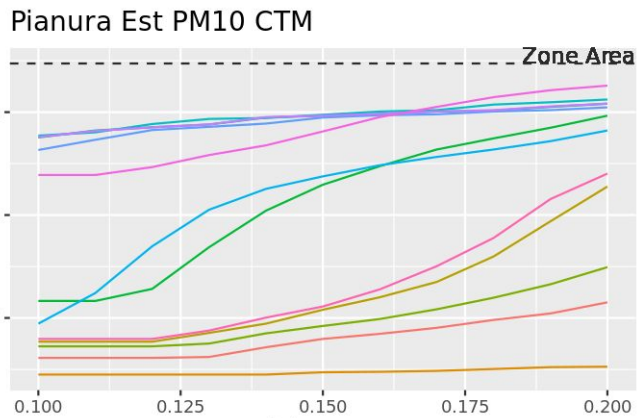
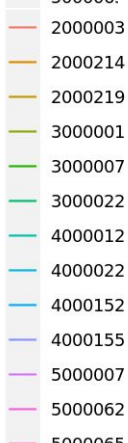
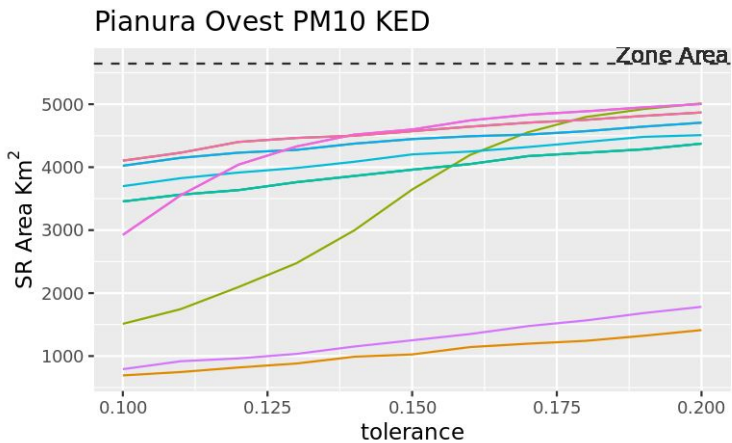
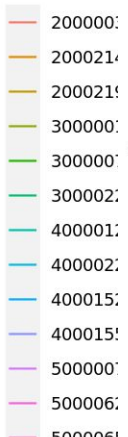
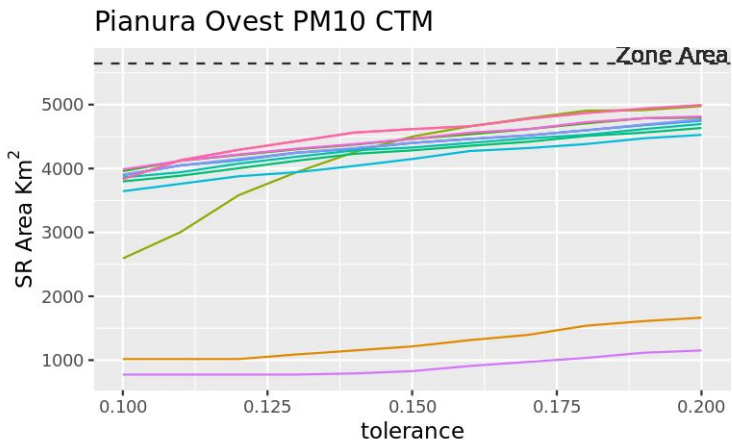
Pianura Ovest NO2 CTM



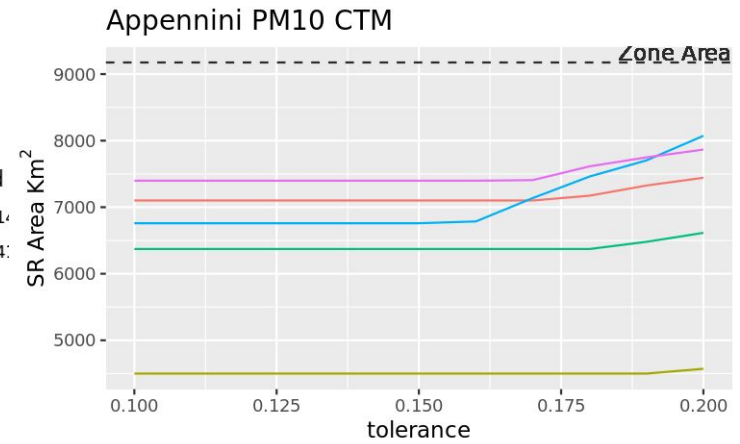
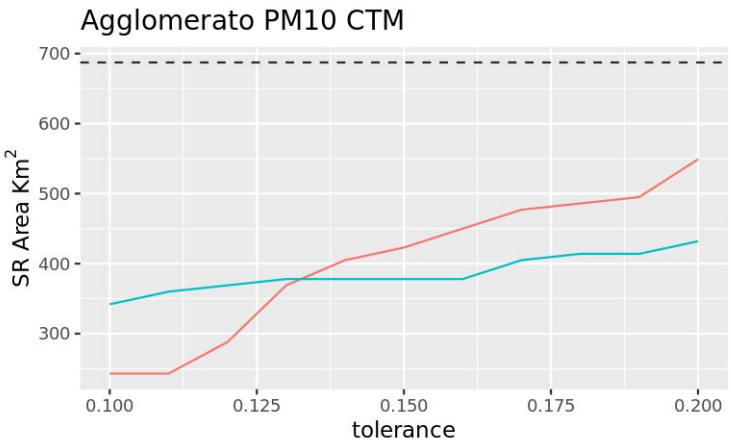
Pianura Est NO2 CTM



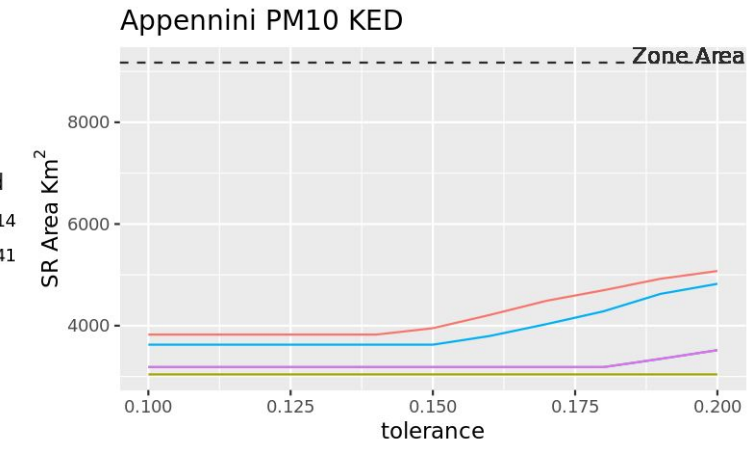
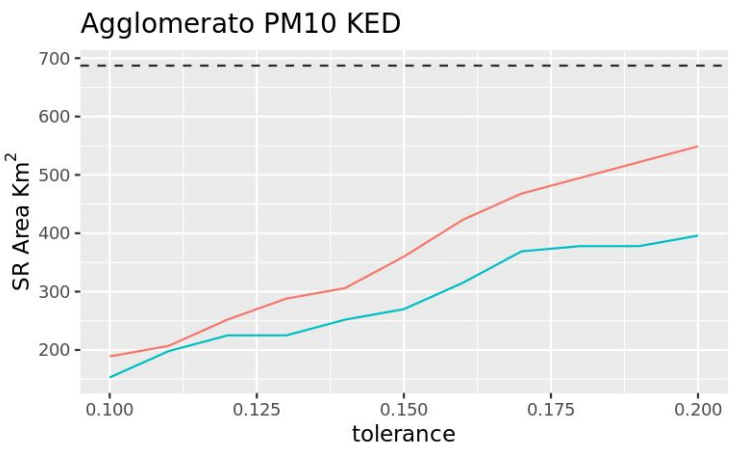
CTM vs KED Pianura Ovest Pianura Est



arpae CTM vs KED Agglomerato Appennino



- station_id
- 10000074
 - 3000018
 - 5000066
 - 6000036
 - 7000042



- station_id
- 10000074
 - 3000018
 - 5000066
 - 6000036
 - 7000042

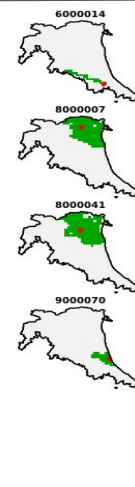
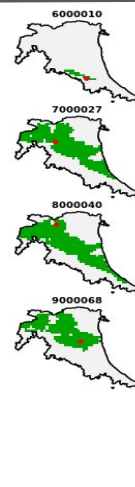
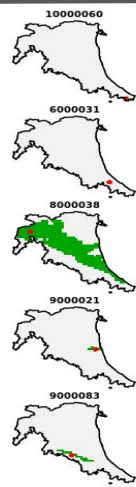
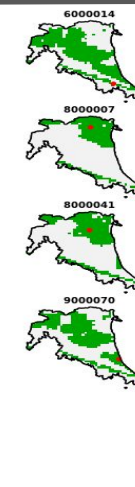
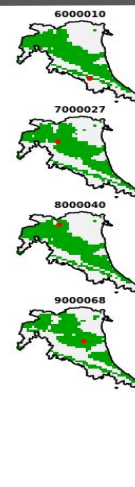
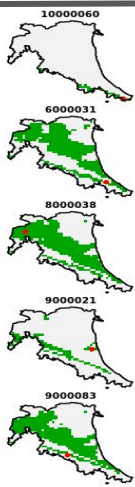
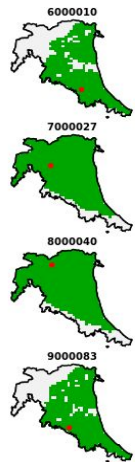
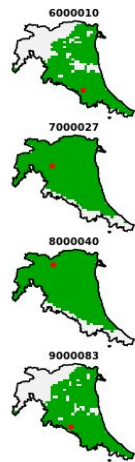
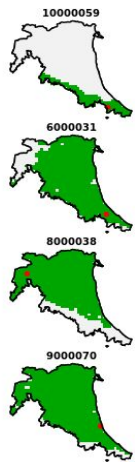
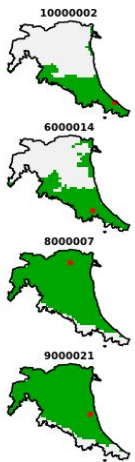
non contiguous area

contiguous area

PM10

NO2

CT8 #1 T



Outcome

- Most stations have a wide SR area in flat areas for PM
- For NO2 the SR areas are generally smaller
- For NO2 the contiguous/non-contiguous approach has an impact
- CTM or KED has little impact. More investigation required

Future Work

- Extend the analysis to more years
- Make the analysis also for O3
- ...

Thank you for your attention!

ramorati@arpae.it

Thanks to Giovanni Bonafè for providing useful scripts <https://github.com/jobonaf/spatial-representativeness>