Model and variable interpretation

spatial models level of disagreement it’s more constant over time

high levels of pm10 brings models with covariates to agree more, this was shown by looking both at the trend of pm10 and the trend of the ARI

Comments

The models from ppmsuite agree a lot.

Best agreement:

- gaussian and curve (expected since they are practically the same)

- sppm and gaussian, ecc)

- towards the end of the similarity there is drpm with all the other ones (makes sense, they were from different packages, and drpm was the only one including time)

The summer period is the most indecisive/dubious in terms of comparison/agreement.

Maybe this is because the trend in summer is very flat, so almost all stations behave in the same way and therefore there is no clear/distinct clustering definition.

Noticeably during this period drpm agrees only with sppm (they are the only one with space) and strongly disagrees with the others, this is because drpm considers time in it’s architecture and for this reason the construction of the clusters are correlated in time, unlike the others.

Also the models using covariates tend to disagree the most (with the others, while agreeing between them) during summer since they rely more on the contribution of covariates which may help the building of clusters

In winter, since the levels of pm10 are more spread out, the models tend to agree more globally, this is because the use of time, space or covariates is less important since the clusters can be directly inferred by the levels of pm10.

Common stuff we noted

1. Almost all models create a stratification. The planar regions show in general an high value of pm10, and are indeed frequently clustered together (like milan area or milan + mantova). While moving upwards towards the alps we find less and less polluted clusters. There seems to be some """outliers""" (are just noticeble stations, fully explainable but emerging) in the south west area which are in all models clustered together and separately from the surrounding cluster of Milan. Indeed they have lower pm10 concentrations and high levels of LA_hvi (c'hanno molti alberi).

“WE_mode_wind_direction_100m”

Altitude and vegetation:

These are the most relevant natural effects as we can see by the stratification of the clusters, following the different altitude levels

High and low vegetation are complementary: in high altitude we have high vegetation and viceversa and the growth of both types is the same during the year: high levels in summer and low in winter.

We can interpret this effect in 2 ways:

- It’s the altitude that brings the pm10 down
- In high altitude we have higher vegetation which is the one bringing down the pm10

Or the effects of both combined

In general high vegetation and high altitude are correlated with lower pm10 levels

WE_tot_precipitation: brings down pm10, as we can see on what happens in October (peak in rain, drop in pm10)

WE_wind_speed_100m_max brings up pm10, but it’s covered by the effect of rain (see October where both wind and rain are high but pm10 goes down)

In December, where we can filter out the effect of rain since precipitations were low, high wind speed brought the levels of pm10 up

EM_nox_sum: it’s positively correlated with pm10, during winters levels are higher, as pm10 is

it’s higher for the clusters in the regions that presents high levels of industrialization and transport.

The distinction is stronger in the models with covariates.

Note on outliers

On all models we can see the presence of small clusters that can be considered to be outliers

Their pm10 behavior is different from the others in a sensible way: the trend is the opposite of the others, low levels in winter, high levels in summer

These stations are located in regions of high altitude

The model gaussian ppmx tends to cluster the stations together in one single cluster while the others keep them split in smaller and isolated clusters

Also these outliers have the lowest values of pm10 and EM_nox

Possible causes of the inverse trend: since they are located in higher regions and the trend is inverted a possibility could be the role of snow in lowering the levels during the winter months