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Influence of the meteorological datasets on the backtrajectory cluster analysis. A 7-year study in SE Spain

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Cluster analysis has been used to classify air mass trajectories into non-predefined dominant groups by a number of authors. The procedures try to minimize within-cluster variance and maximize between-cluster variance.

K-means cluster analyses of 96 hour trajectories arriving in Elche (SE Spain) at 3000, 1500 and 500m for the 7-year period 2000-2006 have been performed. Hourly latitude and longitude were used as input variables in the clustering process. We have considered some modifications to the procedures followed in the literature (Dorling et al., 1992; Mattis, 2001) to retain the appropriate number of clusters. Back-trajectories arriving at 12 UTC were computed with the HYSPLIT model v.4 using two different datasets available at the NOAA's Air Resource Laboratory: the FNL data, from the final run in the series of NCEP operational model runs, and the NCEP/NCAR reanalysis data on pressure surfaces (RP data in the following).

The distance between same-day backtrajectories corresponding to the different meteorological datasets is log-normal distributed.

The clustering results show differences: The sum over the clusters of their Root Mean Square Deviation, used as figure of merit in the classification procedure, is smaller with the FNL data. Clustering solutions using the RP trajectories present 7 and 6 clusters at 3000 and 1500, respectively, being one more than the found with the FNL data. At 500m 6 clusters are found in both cases. The percentage of days classified in the same type of cluster when using different datasets is between 50 and 60%.

We have related data on suspended particulate matter (PM10 and PM2.5), visibility

and meteorological variables to the two air mass classifications to find out which meteorological dataset shows higher significant differences on those variables. We find that they are more discriminated when using the FNL trajectories.

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