THE SETTING - Study area and objectives

This study is part of a wider project to evaluate the impact on ambient air quality of a new highway in the Venice hinterland, characterized by the presence of several pollutant anthropogenic sources. The infrastructure has been projected to remove road traffic from the city of Venice-Mestre, and is starting in 2005 and is going to be completed in 2009. Air quality evaluation has been carried out before the beginning of the project paying great attention to the "Corridor 5". Building activities started in 2005 and are going to be completed in 2009. Air quality characterization concerning PAHs, ions and trace elements.

EXPERIMENTAL - Sampling and pollutants

Some mobile monitoring stations were set in sampling sites and performed several campaigns carried out in fall-winter (1st Oct-31 Mar) or spring-summer (1st Apr-30 Sep), before and during building activities. Daily PM10 samples were collected on filters using low-volume samplers carrying out 24 campaigns in 18 sites from November 2005 to August 2007. Three types of membrane filters (47 mm diameter) were used: binder free glass fibre filters for PAHs, teflon membrane filters for ions and mixed cellulose ester filters for trace elements. Chemical analysis on filters were performed with ICP-MS for trace elements (As, Cd, Pb, Ni), ICP for water soluble ions (K+, Mg2+, NH4+), IC for water soluble ions (K+, Mg2+, NH4+, NO3-, SO42-), and HPLC-Fluorescence for PAHs: benz(a)anthracene (BaA), benzo(b)fluoranthene (BbF), benzo(k)fluoranthene (BkF), benzo(a)pyrene (BaP).

DATA ANALYSIS - Results and discussion

PM10 mean values range from 28 to 82 µg m\(^{-3}\), in agreement with results recently obtained in stations close to Venice (Rampazzo et al., 2008). Average PM10 concentration for every winter campaigns (69 µg m\(^{-3}\)) is about double with respect to all summer campaigns (36 µg m\(^{-3}\)). Mean PM10 levels of each campaign were compared to a reference urban background station. Figure 2 shows a good correlation with reference to control sites data, whereas construction sites are characterized by higher concentration levels.

Principal components analysis was applied to PAHs, ions and trace elements. The set of campaign sites has been divided in two significant clusters. Principal component analysis has shown that the first component, PC1, explains 59% of the total variance. It has a strong positive load on most ions and PAHs. PM2.5 is a boundary cluster point and is shifted towards positive semiaxis of PC2. They are characterized by higher abundance of these analytes. The relative abundance of these analytes can be connected with excavation and building activities in construction sites. This result could be linked to the outstanding effect of atmospheric conditions. Long periods of thermal inversion in winter play a significant role in maintaining high levels of pollutants, that seem to override the contribute of construction activities.

Figure 1. The study area with the new highway future path (dashed) and monitoring sites.

Figure 2. Scatterplot of PM10 mean values.

Figure 3. Projection of variables on the PC1-PC2 plane.

Figure 4. Projection of campaigns on the PC1-PC2 plane.