

Investigation of the Meteorological Conditions leading to wintertime Pollution Episodes along a major Alpine Valley

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In the framework of the Interreg III B the European Regional Development Fund (ERDF) funded the project "Monitoring and Minimisation of Traffic-Induced Noise and Air Pollution Along Major Alpine Transport Routes - AlpNap" (www.alpnap.org) which involves 11 Partners from 4 Countries and focus on two major transit corridors for road and rail: the Fréjus-route between Torino and Chambéry and the Brenner-route between Rosenheim and Verona.

Between January and mid March 2006 the research group at the University of Trento in strong cooperation with the Environmental Agencies of the local governments, has performed a complex measurement campaign along the Adige Valley (Northern Italy) between Bolzano and Verona. According to the Project objectives, three specific target areas have been identified aiming at highlighting to what extent the local meteorology is influenced by the topography and how the complex and varying meteorological phenomena affect the transport of air pollutants, primarily those emitted by the motorway which goes along the whole valley.

For each one of these target areas, a similar experimental setup has been deployed in order to get a more detailed picture which cannot be obtained by means of standard observing networks. The instruments deployed during the observing phase were following: 4 air quality mobile stations across the valley bottom and the slopes in order to get information on the spatial distribution of the different pollutants (mainly NO_x and PM₁₀); a complete energy-balance measurement system (ultrasonic anemometer, open path IRGA, ground heat flux, 4 channel net radiometer and surface layer temperature profile) on the valley bottom, along with a sodar for the determination of the wind profile up to a height of approximately 400 m a.g.l. (mainly depending on the inversion strength and the background noise); a set of 5 air temperature and relative humidity sensors along the slope for the definition of a pseudo-vertical temperature profile. Along with these data, further meteorological information collected by the standard observing network have been considered, as well as the hourly traffic along the motorway.

The preliminary analysis of the whole dataset has already highlighted some specific

and interesting features which can be summarized as follows: 1. same valley, same motorway and similar conditions but different effects due to local-scale phenomena; 2. good performance of the whole setup in providing a detailed picture of the meteorological phenomena as well as the pollution levels; 3. clear diurnal and weekly cycles related both to the meteorological and traffic factors; 4. strong thermal stratifications as a major responsible for stagnation and limited dilution.

Further steps foresee the completion of the data analysis including a comparison of both meteorological phenomena and pollution events measured on the Southern and Northern side of the Brenner Pass, the meteorological and pollutant transport modeling by means of a set of suitable models and the evaluation of the health-impact.