The Jonico-Salentino project: meteorology, air quality and health risks in the Apulia region (Italy)

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The Jonico-Salentino project (PJS) is funded by Apulia Region (Det. N. 188_RU - 10/11/2015) with the aim of assessing health risks in the provinces of Lecce, Taranto and Brindisi, where citizens are exposed to emissions from several sources (industry, biomass burning, vehicular, shipping and air traffic, natural radioactive sources). Several research and institutional groups are involved in the project. The goal is by the combination of meteorological, chemical and epidemiological results to assess the main sources of pollution and health risks for people living in the Jonico-Salentino area.

Here we present the methodology and first meteorological, chemical and epidemiological analyses obtained by the University of Salento unit, which consists of the Laboratories of Micrometeorology, Environmental Chemistry and Hygiene. Three experimental campaigns (approximately one month each) have been performed in the cities of Galatina (province of Lecce), Torchiarolo (province of Brindisi) and Statte (province of Taranto) in spring and summer. Particulate matter (PM) has been sampled and micro-meteorological variables measured for evaluating the contribution of different sources on PM levels, Biological effects on residents have been then evaluated through a molecular-epidemiological study.

PM has been sampled using a low volume sampler and individual particle analysis has been performed to identify natural and anthropogenic sources using scanning electron microscopy coupled with energy dispersive X-ray analysis (SEM-EDS). Meteorological variables (wind speed and direction, temperature, humidity, precipitation, solar radiation) were measured by advanced acquisition system and turbulent fluxes have been estimated using ultrasonic anemometers. An epidemiological survey has been performed on schoolchildren (6-8 years). Parents o subsequently were given a questionnaire with questions on personal and behavioural information on their sons as well as exposure factors related to the home context.

The meteorological analysis has shown prevailing winds from north-west and south-east, with average wind speeds of about 2m/s. PM was classified into fourteen groups (alumosilicates, silicates, calcium sulfates, sulfate-silicates mixtures, carbonaceous particles, soot, biological particles, sea salt, iron oxides, iron mixtures, metal oxides, secondary particles, fluoride and calcium carbonates). Such particle groups have been assigned to different emission sources through a source apportionment analysis: soil, industry, secondary, soot, carbonates, calcium sulfates, sea salt and other. As an example, in the city of Torchiarolo Saharan dust advection (non-local source) was detected in specific days with high winds (about 4m/s) from southern sectors. On the other hand, weak southern winds seemed to enhance the concentrations emitted by local sources of particulate. The epidemiological study suggested that children living in Torchiarolo were more exposed to pollutants coming from fireplaces and passive smoking (which may act as local sources), while children living in Brindisi were exposed to traffic pollution. These results will be integrated with the analysis of turbulent fluxes, chemical composition and biological sampling. The collection of exfoliated buccal cells from individuals will allow to evaluate the frequency of micronuclei and thus verify the presence of lifestyles related to DNA damage in addition to environmental factors.