

# New particle formation events in a rural and an urban sites in Po Valley, Italy

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Keywords: nucleation, nanoparticle, size distribution, Po valley.

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Under the framework of the Supersito project, particle number concentration and size distribution were investigated with continuous measurements and intensive field observation at an urban background site (Bologna, about 400.000 residents) and a rural site (San Pietro Capofiume, about 1.500 residents) for three years. The distance between two sites is about 30 km. The Po Valley (northern Italy) is characterized by a high density of anthropogenic emissions: mainly traffic, domestic heating, industry emissions and agriculture.

In this study number particle data of 2013 and 2014 years were collected in order to analyze new particle formation events when they were recorded at the same time in both sites or only in one site, in order to identify meteorological or physical conditions that allowed these differences.

Data have been measured with a Scanning Mobility Particle Sizer with 5 minutes of time resolution (Model 3936, Nano 3085 and Long 3081, TSI Inc., 148 channels) and a twin Differential Mobility Particle Sizer with 10 minutes of time resolution (119 channels) respectively in urban and rural area. The measured particle size ranges were 3-600 nm for both instruments. Others analyzed parameters were meteorological and physical data and gaseous species concentration. PM<sub>2.5</sub> and PM<sub>1</sub> data were also available.

Following Hamed et al. (2007) nucleation events were classified in Non-Event days (NE), Event days (class 1, 2 and 3), Missing Data (MD), Bad Data (BD) and Undefined event (class 0). The percentage of events days during the analysis period (total of classes 1, 2, 3), excluded ND and BD days, is about 20% in urban site and 38% in rural area with the maximum in May and June for both sites (Table 1).

Month	% event days urban site	% event days rural site
May	37	68
June	23	60

Table 1. Comparison percentage of events

On 17% of the days with available data simultaneously in urban and rural site (without ND and BD days), nucleation events are observed in both sites. Over 70% of the days that an event occurs in the urban site it is also present in the other site, while the percentage is much lower for the other case (close 40%).

As expected, the annual average of total number concentration is higher in the urban site, although the

differences considerably decrease for particles with a diameter > 100nm.

Nevertheless during event days, the hourly mean and max in rural site is higher on 22% of the time, while during the other days is almost 10%, despite the significant emission sources in the urban site.

Size distributions (Fig. 1) showed in both cases an increase of total particle number in the nucleation and accumulation mode size range, but in rural site the mode moves toward a lower diameter.

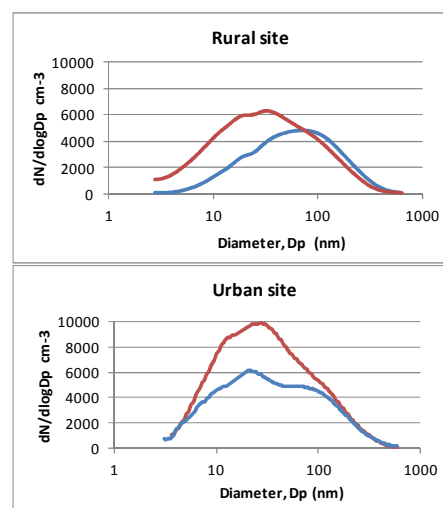


Figure 1. Comparison average size distributions over the two years on event (red line) and on non-event days (blue line)

This research was carried out under “Supersito” Project, supported and financed by Emilia-Romagna Region and Regional Agency for Environment and Energy (ARPAE), Deliberation Regional Government n. 1971/13.

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