Secondary New Particle Formation in Central Europe: Eight years of Aerosol Particle Size distribution data from Melpitz Site, Germany

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New particle formation (NPF) in the atmosphere is a global phenomenon that has been shown to take place in a wide variety of environments (Kulmala et al., 2004). However, the formation mechanisms and the participating substances have not been resolved yet. Long-term data continuous measurements are valuable as they are expected to reveal useful information that enable studies into the dynamics of the NPFs and present control data for climate modelers to predict with more accurately the future climatic conditions.

Here, we present eight years data set (2003-2011) of NPF conducted at the atmospheric research station Melpitz in Eastern Germany (51°32´ N; 12°54´ E; 87 m a.s.l.).The Melpitz station is part of the observation net works German Ultrafine Aerosol Network (GUAN; Birmili et al., 2009) and ACTRIS (Aerosols, clouds, and trace gases research Infrastructure network). Particle size distribution measurements were carried out using dual DMPS systems (Differential Mobility Particle Sizers) with particle size ranges of 3-800 nm.

The particle formation events were identified and classified into two categories i.e., NPF events and non-events. Figure 1a illustrates the total number of NPF events and non events over the period of eight years; while figure 1b shows the monthly frequency of NPF events and non-events for the same period. Earlier study shows that particle formation event days are observed at Melpitz measurement station on 60–100 days in a year (Birmili and Wiedensohler, 2000; Hamed et al., 2010).

Interestingly, for this long-data set, we have observed that number of intensive NPF events shows clear declination, more pronounced, after year 2006. In our earlier study, Hamed et al. (2010) showed that decreasing anthropogenic SO_2 emissions from years 1996/1997 to years 2003/2006 decreased the intensity of new particle formation and thus their frequency and formation rate in Melpitz rural site. Figure 1b shows that the event frequency (the event frequency has been calculated by dividing the total number of days with new particle formation by the total number when the DMPS was working efficiently -we excluded the days when the DMPS system malfunctioned-) was higher during spring and summer months with maximum values in April and May while the minimum was in winter and autumn months. Such high seasonal event frequency in spring has been observed quite often in clean and polluted areas as well. However, the high event frequency in summer contrasts with the observations performed in other rural German site, Hohenpeissenberg (Birmili et al., 2003), which shows a pronounced minimum in the summer (0.075 events per day at Hohenpeissenberg) but at the same time agreed with the observation at the SPC rural site in Italy (Hamed et al., 2007).

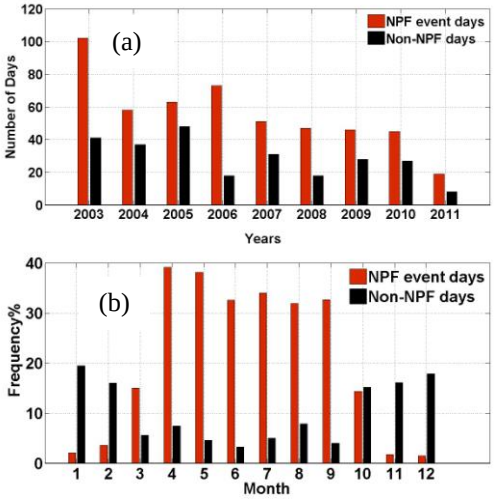

Figure 1: (a) the total numbers of New Particle formation days (NPF-event days; red bar) and non-event days (Non-NPF days; black bar) during each year; (b) monthly frequency of NPF events in Melpitz station, Germany during 2003-2011.

We will show a comprehensive statistical comparison of Melpitz data sets with respect to meteorological and trace gases of NPF events to elucidate the process govern particle formation at Melpitz station. Moreover, comparison of NPF events between Melpitz and other GUAN stations will be discussed in our future presentation.

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