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Relation of air mass history to nucleation events in Po Valley, Italy, using back trajectories analysis

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Abstract. In this paper, we study the transport of air masses to San Pietro Capofiume (SPC) in Po Valley, Italy, by means of back trajectories analysis. Our main aim is to investigate whether air masses originate over different regions on nucleation event days and on nonevent days, during three years when nucleation events have been continuously recorded at SPC. The results indicate that nucleation events occur frequently in air masses arriving from Central Europe, whereas event frequency is much lower in the air transported from southern directions and from the Atlantic Ocean. We also analyzed the behaviour of meteorological parameters during 96 h transport to SPC, and found that, on average, event trajectories undergo stronger subsidence during the last 12 h before the arrival at SPC than nonevent trajectories. This causes a reversal in the temperature and relative humidity (RH) differences between event and nonevent trajectories: between 96 and 12 h back time, temperature is lower and RH is higher for event than nonevent trajectories and between 12 and 0 h vice versa. Boundary layer mixing is stronger along the event trajectories compared to nonevent trajectories. The absolute humidity (AH) is similar for the event and nonevent trajectories between about 96 h and about 60 h back time, but after that, the event trajectories AH becomes lower due to stronger rain. We also studied transport of SO₂ to SPC, and conclude that although sources in Po Valley most probably dominate the measured concentrations, certain Central and Eastern European sources also make a substantial contribution.

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