The paper by Kontkanen et al. describes measurements made at the San Pietro Capofiume (Italy) measurement station made during summer 2012. The instruments used include a Particle Size Magnifier (PSM), a Neutral Air Ion Spectrometer (NAIS) and a Differential Mobility Particle Sizer (DMPS). The main results of the paper are (i) the frequent observation of high concentrations of neutral clusters and new particle formation events, (ii) a small contribution of ion-induced and ion-mediated nucleation (in the percent range), and (iii) the observation that the neutral cluster concentration is not strongly influenced by the presence of high condensation sinks. According to the authors the latter observation can be explained by the hypothesis that the precursors of the neutral clusters and the pre-existing particles share the same origin. The paper is well-written and I consider the results to be important enough to be published in ACP. Therefore, I recommend its publication after addressing the comments listed in the following.

**General comments:**

(a) I agree with the authors that ion-induced nucleation (IIN) plays only a minor role for the conditions of the present study. However, in my opinion the authors should further emphasize that IIN seems to starts earlier compared to the neutral nucleation (see e.g. lower left panel in Figure 5). In this respect some discussion about the consequences that can be derived from this observation would be important. One conclusion could be that the charged clusters are more stable and require lower concentrations of other compounds for their growth. This could then indicate that at other sites, where the concentrations of these compounds are low, IIN could be more important.

(b) Regarding the sub-3 nm particles/clusters it would be interesting to know whether these can be regarded thermodynamically stable, or not? In other words at what size are the clusters considered to be stable particles? In previous publications written by some of the authors listed in the present publication new particle formation rates were e.g. derived for a size of 1.5 nm. Can it therefore be generally said that all particles are stable above a size of 1.5 nm which would then include the clusters relevant for this study?

(c) It is surprising to see that the sub-3 nm cluster formation seems to be a continuous process (Figure 7), which occurs also during the night and even on a day which is classified as a non-event day (formation rate of 2 nm clusters between 0.1 and 3 $cm^{-3}$ $s^{-1}$, see page 33093, line 22/23). If this is the case it would mean that the importance of sulfuric acid might be overestimated because it is not present at high concentrations during the night. Instead other compounds could be important which additionally follow the photochemical production of sulfuric acid during the day.

**Minor comments:**

(1) Page 33080, line 17: add “a” before “minor contribution”

(2) Page 33080, line 24: replace “in the” by “under”

(3) Page 33082, line 16: add “the” before “sulfuric acid”

(4) Page 33083, line 16 (or in section 2.1): please mention the size range of the DMPS and also state over what size range the condensation sink was calculated

(5) Page 33085, line 18: In how far is the growth rate (GR) calculated from the positive ion size distribution representative for the GR of the neutral particles? Especially for the smallest size range (1.5 to 3 nm) the charged particles probably grow faster due to ion-dipole interactions compared to neutral-neutral collisions for the uncharged particles. Has this effect been taken into account?

(6) Page 33086, section 2.4: For what conditions was the $SA_{proxy}$ calculated? Mikkonen et al. (2011) report that only conditions where the global radiation exceeds 50 W $m^{-2}$ accurately predict the sulfuric acid concentration. Has this constraint been applied?

(7) Page 33087, line 4: please specify the meaning of “FNL”

(8) Page 33087, line 18: do the authors mean “compared” instead of “respect”?

(9) Page 33088, section 3.1: It is not clear in how far the NPF event day and the non-event day differ in their conditions. Obviously the conditions are different in the afternoon but this is not the important time for new particle formation. In the morning (around 7 a.m.) the conditions from Fig. 1 seem to be quite similar for the NPF event days and the non-event day. In this respect it also not evident in how far the parameters shown in Fig. 1 reflect the results by Sogacheva et al. (2007) meaning that stronger mixing in the PBL favors NPF. Maybe other meteorological parameters (e.g. wind speed) can support the statement.

(10) Page 33091, line 7 to 9: Something is missing in this explanation. The longer measurement time cannot be solely responsible for the slower median growth rate.

(11) Page 33092, line 10 and 11: Do these numbers include the effect of ion-ion recombination? If not, the authors should also provide the numbers if this effect is included.

(12) Page 33094, line 9: replace “nigh-times” by “night-time”

(13) Page 33095, line 1: It is mentioned here that the $SO_2$ concentrations were observed to be higher on NPF days than on non-event days (Hamed et al., 2007). Is this the case here also?

(14) Page 33116, Figure 7: the figure legend is too small

(15) Page 33117, Figure 8: In an earlier comment it was pointed out that the $SA_{proxy}$ should only yield accurate results when the global radiation exceeds 50 W $m^{-2}$ which is the case only during day time. The color code suggests that the $SA_{proxy}$ was calculated for a full day (24 h). How is this possible? In addition, the sulfuric acid concentration should be shown on a log-scale to avoid hiding the low values.