Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-931-RC2, 2017

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Spatial Extent of New Particle Events over the Mediterranean basin from multiple ground-based and airborne measurements" *by* Kevin Berland et al.

Anonymous Referee #2

Received and published: 3 March 2017

This manuscript makes an attempt to investigate the spatial extend of atmospheric new particle formation (NPF) over the Mediterranean area. The study is based on continuous measurements at 3 sites, along with air craft measurements. The topic of this study is definitely important, but the conducted analysis is not deep enough at present stage. Before this paper can be considered for publication, the authors should carefully consider and address the following issues:

I wonder why the authors chose 16 nm for calculating the particle formation rate (and minimum size for calculating GR). In both Ersa and Finokalia, size distribution measurements are available down to about 10 nm. Values of J10 are much better comparable to other studies than J16.

Printer-friendly version

Discussion paper

While equation 1 is mathematically correct, the last correction term in it is based on a very narrow size range. This can make J very sensitive to this correction term. Have the authors investigated this sensitivity? An additional problem related to this is that also GR in determined based on this very narrow size range. The authors state that the median GR in Finokalia is slightly larger than GR reported in an earlier study for a wider size range (16-20 nm vs 7-20 nm, lines 202-205). However, the difference is not slight at all, but a factor of 4! This larger difference makes me suspicious about reliability of GR determined here using the very narrow size range. This problem concerns also the GR calculated for Ersa: Figure 4 shows a few very high (= unrealistic) monthly-mean GR values.

I wonder why the authors did not report how frequently NPF takes place during the same days between the different station pairs. This kind of information is quite essential when investigating the spatial extend of atmospheric NPF.

The concept “nucleation area” should be explained better than done here in the main text. By the way, 9 km or 40 km does not represent area, but rather a diameter or some other length measure of an area.

The authors state that particle size distributions showed similar trends in Ersa and Cap Es Pinar during the intensive campaign (line 264). By simply looking at Figure 7, I cannot agree with this statement. First, the time axis of this figure is so squeezed that it is almost impossible to detect diurnal evolution of size distributions during individual days. Second, the occurrence of NPF event starting from the lowest sizes (10-20 nm) do not seem to co-inside very well between these two stations.

In addition to the couple of studies mentioned in the introduction, the authors should summarize/discuss a few other earlier studies in which the spatial extend of regional NPF has been studied using multiple stations. This could be done either in introduction, or later in the paper when discussing the results in more detail. Examples of such studies include: Vana et al 2004, JGR 109, D17201; Komppula et al 2006, Atmos

Chem Phys 6, 2811-24; Hussein et al. 2009, Atmos. Chem Phys 9, 4699-4716; Jung et al, 2013, Atmos Chem Phys 13, 51-68; Jun et al 2014, Atmos Pollution Res 5, 447-454; Kim et al 2016, Atmos Res 168, 80-91; Salma et al 2016, Atmos Chem Phys 16, 8715-28.

The main stated result of this paper is that the spatial extend of NPF is several hundreds of km over Mediterranean. I am not fully convinced that the results really show this because 1) the estimated nucleation areas are rather small (10-40 km in length), 2) it remains unclear how frequency NPF is observed in at least 2 of the stations during the same day, and 3) the available air craft data do not really support this statement either.

Minor things

Lines 114, 131 and 137: the reported size ranges should be given in proper accuracy. 2 digits would sound better than 4 digits for two of these stations.

Line 222: frequency is not weak but low.

Line 229 and later in the text: A widely used acronym for condensation sink is CS, not Cs as used here.

Line 251: globally?

Line 309: may?

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-931, 2016.

Printer-friendly version

Discussion paper