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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Observation of new particle formation in subtropical urban environment" *by* H. C. Cheung et al.

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General comments

This paper reports on particle formation episodes in an urban environment of Australia. The authors used an instrument specifically focusing on the study of these events, a TSI SMPS. The authors report on concentrations of ultrafine particles (4-100 nm). The aim of the study was to identify those events responsible of formation of new particles in the urban atmosphere of Brisbane, and the characterization of the growing rates. After reading the manuscript I have detected important lacks concerning the state of the art, the data compiled to carry out this study, and the interpretations given by the authors. Bellow you will find a list of comments:

1) I have found some missing references concerning new-particle formation in other urban areas located widespread in subtropical climate. For example, I have found that

other (recent) studies reporting nucleation episodes in urban areas in coastal locations in Korea (see Lee et al., 2008), Beijing (Wu et al., 2008), near Shanghai (Gao et al., 2009), Spain (Pey et al., 2008 and 2009, Perez et al. 2010, even extracting specific photochemical PCA factors), in Los Angeles (Moore et al., 2007) etc. Thus I consider that the bibliographic research is not complete and it should be. The list of recent references included bellow may help you to discuss about the seasonal evolution of nucleation processes, the growth rates, the types of nucleation episodes observed in other urban areas and its origins, etc.

2) To study the formation of new particles in the atmosphere, in addition of the appropriate instrumentation for measuring the number and size distribution (it is adequate in this case), is necessary to have high-time-resolution meteorological data, and preferably registered at the aerosol monitoring site. The authors use some meteorological parameters from a meteorological station located around 0.4 miles far from its site, but this meteorological station do not have solar radiation information. This lack of information conducts the authors to consider that the solar radiation and the temperature follow the same trend, which is true in some cases but not in many others. Nevertheless, it is known that photochemical nucleation episodes are really dependent of the intensity of solar radiation (see for example Pey et al., 2008), and consequently it is necessary to monitor this parameter in addition to others such as wind direction and speed, temperature and relative humidity. I suppose that in Brisbane, a city with 2 million of inhabitants, there should be a number of meteorological stations even not belonging to the Queensland Bureau of Meteorology. See in this Figure the relation between solar radiation and temperature in a subtropical environment. It is clear that 35°C are reached under sunny and cloudy conditions. With a high probability, the photochemical activity was different in both cases.

3) As for the meteorological parameters, it should be highly recommendable to have the time variability of levels of a number of gaseous pollutants. It is dangerous to assure on the origin of nucleation episodes as in page 22635, Case II and page 22636,

Case III without performing any kind of measurements of gaseous precursors. In my opinion all the mentioned sources are possible to cause the nucleation burst (ships, traffic, industries) but I seriously have doubts about the influence of the aircraft emissions on these nucleation processes. Did the authors though in the role of biogenic emissions? I didn't been in Brisbane but I have note that there are several green areas in the city and in the surroundings. . .With a high probability, the natural contributions are influencing more than the aircraft emissions the bursts of ultrafine particles. As far as I know, there is an Air Quality monitoring station at the Queensland Sciencentre, which is close to your monitoring site. At this station a number of parameters are being measured (carbon monoxide, ozone, nitrogen dioxide and sulfur dioxide, as well as benzene, toluene, xylene and formaldehyde) in addition to meteorology including solar radiation. Why did not use this information to support your interpretations? http://www.derm.qld.gov.au/environmental_management/air/air_quality_monitoring/air_moni

4) In general, although the study contains very interesting data and nice observations, I have found this paper weak concerning the data treatment, the discussions and the interpretations. In the current form I do not recommend its publication in ACP. Only after a major revision this paper might be considered for publication but not in its current form.

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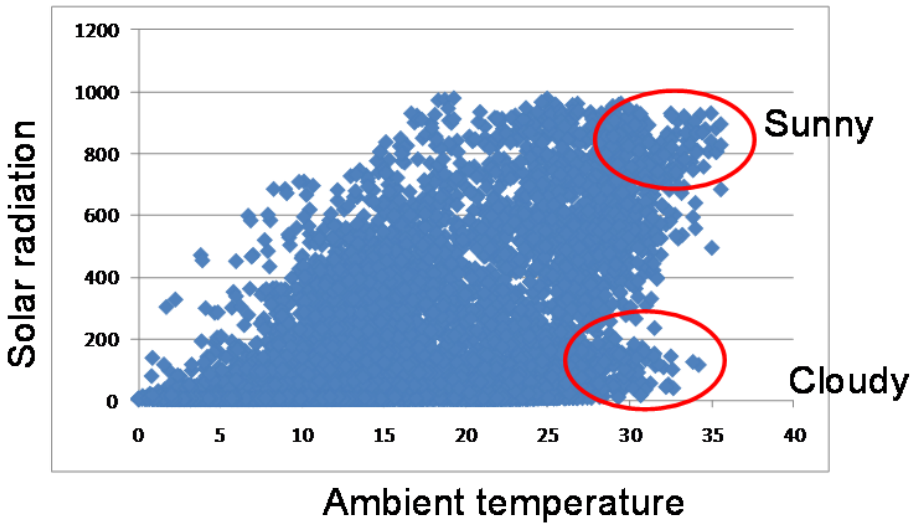

Fig. 1. Solar radiation-temperature