

Interactive comment on “Land use change suppresses precipitation” by W. Junkermann et al.

Anonymous Referee #2

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General comments

The paper by Junkermann et al studies the influence of land use on particle formation from two distinctive areas one with intensive agriculture and the other a natural forest region. What is of great importance is that they observe significantly larger particle production over agricultural areas that lead to increased number of CCN. They observe that the increased number of CCN lead to larger number concentration and smaller cloud droplet size that would eventually result in a change in precipitation patterns. This is a significant finding of great importance.

The manuscript is very well written and the data presented in a clear way. I would only have few minor comments. I would recommend that the manuscript is published with only minor changes.

Specific comments:

Page 11483, first paragraph: In the literature review on particle formation in the Australian environment the authors use relatively old references by Bigg et al. There was more work done in the past few years but only on the east coast of Australia. I would like to point out to the authors several publications from the group from Queensland University of Technology on particle formations on the east subtropical coasts.

Hai Guo, et al. "Size distribution and new particle formation in subtropical eastern Australia", *Environmental Chemistry*, Vol. 5 No. 6 Pages 382 - 390, 2008.

G. R. Johnson, et al. "The Hygroscopic Behavior of Partially Volatilized Coastal Marine Aerosols Using the VH-TDMA Technique." *Journal of Geophysical Research*, 2005, 110, 2005

and a recent one: R. L. Modini, et al: "New particle formation and growth at a remote, sub-tropical coastal location", *Atmos. Chem. Phys. Discuss.*, 9, 12101-12139, 2009

Page 11484, 1st paragraph. The authors point out to the review by Ayers (2005) "... current state of research indicated the difficulties to relate rainfall depletion to increased anthropogenic aerosol numbers...". I would like to point out to the authors one more publication from Australia (Brisbane area) showing statistically highly significant negative trends with rainfall and air pollution in contrast to the discussion by Ayers. E.Keith Bigg, "Trends in rainfall associated with sources of air pollution", *Environmental Chemistry*, Vol. 5 No. 3 Pages 184 - 193,2008

Page 11486, line 9. "Instead, all ultrafines were found exclusively over the agricultural land." You compare your findings with findings by Suni et al. 2008 who have observed large particle production from Eucalypt forests. I am not aware how dense the forest is in your area of observation compared to the ones in Suni et al. (whose observations were in a dense Eucalypt forest). If the area east of the fence did not have that dense forest maybe that could be one of the reasons that you did not observe strong particle production. Please comment on this.

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Page 1186 line 21. You have observed clear particle formation above the salt lakes. It is not clear if the higher particle concentration on the west side of the fence is due to production only from the lakes or is it a combination of the production from the lakes and the agricultural area? I would think the later.

Page 11487, line 3, “However, the aerosol chemistry might be similar to aerosols present in coastal environments with a large contribution of organo-halogen compounds.” I am not sure if the lakes are dry or not. If they are dry it is not likely that the organo-halogen compounds are involved but more likely molecular iodine (see reference: A. Saiz-Lopez, et al: "Modelling molecular iodine emissions in a coastal marine environment: the link to new particle formation", Atmos. Chem. Phys., 6, 883-895, 2006.). The same comment also refers to page 11490, 4th paragraph.

Page 11487, second paragraph. Was the CCN concentration displayed on figures 4b and 5b calculated as explained in this paragraph? If yes please state that clearly.

Page 11487, line 27. “However, the exclusive appearance of ultrafine particles above the wheat fields...”. In a previous paragraph you claim that particles were produced from surface emissions from salt lakes. Please clarify this, is it salt lakes or wheat fields, or both? This issue expands on several other places.

Technical corrections

Figure 2. I found figure 2 rather hard to follow as the graphs overlay the aerial photography and the colours overlap. Maybe the graphs could be put bellow the aerial photography.

Figure 3. If you remove the grey background the particle size distributions would be more clear.

Figure 4. Does figure 4c present the same information as on the lower inserts of figure 2.? If yes remove one of them.

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