

Interactive comment on “A long-term satellite study of aerosol effects on convective clouds in Nordic background air” by M. K. Sporre et al.

Anonymous Referee #2

Received and published: 25 June 2013

This is a nice study that puts in the right perspective the aerosol effects on clouds and precipitation with respect to the meteorological conditions. The study deserves to be published after some clarifications will be made, based on the comments below:

1. Table 3 shows poor correlation between N80 and precipitation, while other indications show a much clearer relation. Please explain the apparent contradiction. In my view the signal appears only when looking at partial derivatives of the relations, i.e., under narrow ranges of conditions while holding everything else near constant.
2. Please explain how TB is calculated.
3. Page 13865 line 18: The drops do not grow faster when the mixed phase is reached. Rosenfeld and Lensky (1998) wrote that the development of ice particles is indicated

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as larger cloud drop effective radius, when the calculation of r_e assumes water drops.

4. Page 13866 last line: Same as the previous comment.
5. Page 13870 lines 5-1. The dbzc is in fact a logarithmic transformation of the rainfall intensity. For consistency, the authors should test the correlation with respect to the lograithmic transformation of the other rainfall datasets.
6. Page 13870 lines 15-16. According the invigoration hypothesis (Rosenfeld et al., Science 2008) the invigoration requires warm cloud bases. Li et al. (2011) showed that invigoration does occur for cloud base temperature >15C but not for lower cloud base temperatures. Cloud base temperatures at the study areas are lower than 15C. Therefore, the observations here cannot be considered as going against the invigoration hypothesis and previous observational studies that support it.
7. Figures 2 and 3: The units of the SH are mixing ratio (unit less) and not g/kg. If the authors want to show g/kg they have to multiply the scale by 1000.

References:

- Li Z., F. Niu, J. Fan, Y. Liu, D. Rosenfeld and Y. Ding, 2011: Long-term impacts of aerosols on the vertical development of clouds and precipitation. Nature Geoscience, 2011, doi:10.1038/ngeo1313
- Rosenfeld D. and I. M. Lensky, 1998: Satellite-based insights into precipitation formation processes in continental and maritime convective clouds. The Bulletin of American Meteorological Society, 79, 2457-2476.
- Rosenfeld D., U. Lohmann, G.B. Raga, C.D. O'Dowd, M. Kulmala, S. Fuzzi, A. Reissell, M.O. Andreae, 2008: Flood or Drought: How Do Aerosols Affect Precipitation? Science, 321, 1309-1313.