

Interactive comment on “Observations of convective clouds generated by solar heating of dark smoke plumes” by L. Klüser et al.

Anonymous Referee #3

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General:

The authors present observations of convective clouds forming on the edge of a thick smoke plum. They show that the likelihood of such cloud to form without the effect of the smoke is low, and suggest a mechanism by which the thermal gradient between the smoke (by heating the smoke layer and cooling the surface) and smoke-free zone triggers cloud formation.

This is a descriptive paper that shows the phenomenon (the best and most convincing evidence is the movie) and suggests a physical explanation. The paper reads well.

As the authors write, it is not clear how common the effect is. It may occur only in cases of very special conditions when a strong thermal gradient (by thick and reach

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with black-carbon aerosols) creates frontal-like conditions as the hotter body of air climbs the colder one.

Specific comments:

The point of this paper is that the convection occurs on the edge of the smoke where (as the authors suggest) the strong thermal gradient reduces the stability. In the first part of the abstract a more general statement is written, leaving the impression that absorption promotes cloudiness allover the smoke area. It is written "Smoke plumes have the ability to change the atmospheric heat content due to absorption and reduced reflection of solar radiation. By these means they can alter the temperature profile of the atmosphere and trigger convective clouds"; Only later they discuss the edge effect. This should be stated as edge effect from the beginning.

While the methods used in this paper are appropriate for the visualization of the effect, there are not enough details to prove why a statistical method of taking the darkest pixel of data from several days to compile a background reflectance is valid. Indeed with geostationary satellite one has the same geometry (at the time of the day) everyday but such method can select cloud shaded pixels or pixels affected by other absorbing aerosols. Particularly overland, a perfect cloud masking is impossible, as clouds with weak signature will be classified as background. While their pixels may have stronger reflectance the adjacent ones may be affected by the cloud shades.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 549, 2008.

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