

Interactive comment on “Radiative properties of mid-latitude cirrus clouds derived by automatic evaluation of lidar measurements” by Erika Kienast-Sjögren et al.

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This is a nice study of thin cirrus over 3 stations in the Alps and Northern Germany.

I have a few questions/comments/suggestions:

1) Which fraction of the thin cirrus originates from contrail cirrus? Liou et al. [1990], e.g., noted a strong increase of thin cirrus over Salt Lake City since about the late 1960's in correlation with increases in jet traffic. The stations are located in regions where line-shaped contrails are ubiquitous [Mannstein et al., 1999; Meyer et al., 2002]. The stations are located near the routes from London to the Near East or the routes from or across Paris to the Far East etc. (see contrail cover results and major traffic

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routes in Fig. 7 in [Schumann, 2005]). Often aged contrail cirrus might have gotten advected from, e.g., the routes over Lyon to the central Alps. The observed optical depth is fully consistent with optical depth for contrail cirrus from other sources [Immmler et al., 2008; Iwabuchi et al., 2012; Vázquez-Navarro et al., 2015]. The computed cover and RF values are consistent with contrail cirrus calculations [Schumann et al., 2015]. Hence, it is very likely that contrails contributed a large fraction to the observed thin cirrus. So far, your nice paper, not even mentions this possibility. I think, at least that needs to be changed.

2) How important for longwave radiative forcing (RF) from thin cirrus for otherwise clear sky is the water vapor in the atmosphere below the cirrus? The longwave RF of thin cirrus correlates far better with the brightness temperature of the atmosphere than with surface temperature, see Fig. 15.4 in [Schumann et al., 2012a]. The brightness temperature is related to the outgoing longwave radiation (OLR) at top of the atmosphere, as available, e.g., from Numerical Weather Prediction (NWP) data, e.g. from COSMOS. Also: how important is the difference between Earth surface albedo and effective albedo of the Earth-Atmosphere system, e.g. when clouds are nearby the location of observations or when the mountains are snow covered or when there is any dust or haze (derivable from known solar direct radiation and from reflected shortwave radiation, RSR, also available from NWP data), as discussed in these papers? Perhaps you can quantify these effects?

3) Why not to test the differences between the nice and simple Corti&Peter parametrization and that which we developed in parallel (see my comment of May 2009 on the ACPD paper by Corti and Peter and [Schumann et al., 2012b])? The input needed (OLR and RSR) is available from COSMO and other NWP models. The model could be used to test the influence of various assumptions on particle habits and particle sizes [Markowicz and Witek, 2011]. The quantitative results may well change by 50 %, and hence change your conclusions.

4) Does the Lidar signal (e.g., depolarization) allow to discriminate, perhaps together

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with other data, contrails from cirrus? Perhaps there are some ideas which could fit into your outlook?

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