Estimated desert-dust ice nuclei profiles from polarization lidar: methodology and case studies.

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This is a much improved version of the paper which, with further minor changes, should be acceptable for ACP.

l. 36 … understanding of heterogeneous ice formation under given…..

l.86 … assumption about the ratio…

l.103 …assumptions about the ratio….

l.119 ……..advantage for the following reasons: as ……..

l.125 …always show a ….

l.201 Details of these…

l.213 polarization-sensitive

l.254 …, based on the AERONET observations mentioned above..

l.266 … the particle… (omit 'shown')

l.276 I understand that you are trying to keep the paper short but the retrieval of the dust backscatter and extinction from the lidar measurements is key to this paper, and merits one or two sentences outlining the principles before directing the reader to Mamouri and Ansmann (2014) for the details.

l.281 ..two-step method distinguishes backscattering….

l. 294 …. Under these conditions….

l.297 situations (plural)

l.310 ..characteristic of…

l.334 .. is illustrated in Fig. 3.

l.340 ..index i from ….

l.358 …. avoid analyzing …

l.367 …correlation was lower because……

l.371 …is largely determined…

l.407 From the studies…

l.418 …seems to be small, given the high overall … Fig. 4 which includes….

l.425 In situ observations of aerosols from aircraft do not always involve 'significant manipulations' (whatever that means). A well-characterised (or indeed no) inlet and careful attention to the air flow through the instrument will give correct in situ aerosol measurements. Of course, you are correct that such measurements are few and expensive – but not that the method is flawed.

l.430 statistically

l.451 …$APC_{280}(p_z,T_z)$ from ambient pressure …

l.479 …parameterizations for higher….

l.488 This paragraph needs some attention. What do you mean by 'remaining variability'? – this half-sentence doesn't make sense. How can the equation 'allow a prediction with a standard deviation of a factor of 5' yet 62% of the time it agrees with field measurements to a factor of 2? Do these numbers (5 and 2) refer to different kinds of aerosol? We are then told that Eq 3 has an uncertainty of a factor of 2. Yet, as far as I can see from Fig 5 the predictions of the two parameterisations differ by a factor of 100 at -35°C. Some discussion of the very large differences between the two parameterisations is needed.

l.570 … 40 sr. Our own measurements…

l.605 ...profile using Eq. (2)…

l.630 …were given…

l.637 …overview of the CALIOP attenuated….

l.674 ...almost impossible because ….

l.676 layers: only ……penetrate deeply …… troposphere could ice formation be observed.

l.688 As can be seen…

l.710 …paves the way for INC vertical profiling to support ground-based…

l.721 ..with a focus…

l.723 … next step towards characterising the aerosol …

l.732 …account for the large…

l.735 …is high, in comparison with the uncertainties…

l.739 …for INC profiling …. situations dominated by fine-mode….

l.743 Under such conditions…

l. 745 …no longer apply so that….

l.746 We may also test

Fig.5 Please use different colours to distinguish the lines at different temperatures (-15 and -35 look identical to me, and -25 isn't that different)

Fig.6 and Fig 11 The inset diagram is too small to read the axis labels and annotations. Please make them readable.

Fig.8 Noisy curves are blue, not black

Fig.10 Colours in right-hand plot are light and dark blue, not green and blue