Atmos. Meas. Tech. Discuss., 4, C987–C989, 2011
www.atmos-meas-tech-discuss.net/4/C987/2011/

Atmospheric Measurement Techniques Discussions

Interactive comment on "First correlated measurements of the shape and scattering properties of cloud particles using the new Particle Habit Imaging and Polar Scattering (PHIPS) probe" *by* A. Abdelmonem et al.

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Received and published: 1 July 2011

The Referee #1 Wrote:

"Choise of the laser type The laser used for the Polar Nephelometer system (CrystaLaser, model CL532-300-L) has the coherence length of about 300 meters in the Single longitudinal mode, and about 0.5 - 3 mm in the Multiple longitudinal mode. In other words, the Spectrum line-width is very small, about 0.15 nm or less. Consequently, the angular scattering intensity of a single particle has a very strong oscillating

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component. Such oscillations are seen on the theoretical curves on Figures 4 and 14. The nature (origin) of the oscillation is the same as the nature of the interference Patterns (speckle structure) the authors mentioned in the first paragraph of the page 6. In such conditions it is impossible to obtain the calibration factors (page 9) or to model the measured data using the RTDF (page 20). A more appropriate solution is to choose as a source a laser, which has the Spectrum line-width as large as possible. And, the theoretical curves used for calibrations and modelling MUST be averaged over the spectral interval of the laser source. (The power spectral density curve should be taken into account.). Such an averaging will smooth the angular scattering intensities of a single particle, i.e. the oscillations will be eliminated. Thus, it will be possible to obtain calibration factors or to model experimental data using the RTDF."

Authors' response:

The referee excited here a great idea to overcome the difficulty of calibration due to the strong oscillations in the scattered intensity of a single particle. However, a preliminary study on the lowest acceptable spectral line width, which can reduce these oscillations sufficiently, led to the following conclusion. A laser of spectral line width of about 2nm (like used by Gayet et al. 1997) would be good enough along a wide range of scattering angles (from 30° to 140°, roughly speaking "the side scattering"). The wider the spectral line width, the smoother is the angular scattering intensities of a single particle. Smoothing over the full range (forward, side and back scattering) would be achieved if we use a spectral line width greater than 5nm. The question which arises itself here, is it possible to obtain such lasers from the market provided keeping the rest of requirements (like compact size, low beam divergence ... etc). This should be one of the challenges of the PHIPS-HALO phase.

Reference: Gayet, J.F., Crépel, O., Fournol, J. F., and Oshchepkov, S.: A new airborne polar Nephelometer for the measurements of optical and microphysical cloud proper-

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ties. Part I: Theoretical design, Ann. Geophys., 15, 4, 451-459, 2001.

p.s. our last response on the referee comments will be published early next week.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 2883, 2011.