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Atmospheric Measurement Techniques
Discussions

Interactive comment on "A methodology for investigating dust model performance using synergistic EARLINET/AERONET dust concentration retrievals" *by* I. Binietoglou et al.

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I wish to thank the authors for citing (page 3609, line 26) my ACP paper of 2013. Still, I believe the most pertinent papers which should be cited in the context of this article are the ones written starting 2001 and reported below. This is because those papers addressed the same issues this article addresses (lidar estimates of dust volume/mass profiles and comparisons with dust model equivalent forecasts). Specifically:

Kishcha, P., Barnaba, F., Gobbi., P., Alpert, P., Shtivelman, A., Krichak, S.O., Joseph, J.H. (2005), Vertical distribution of Saharan dust over Rome: comparison between

3-year model predictions and lidar soundings. J. Geophys. Res., 110, D06208, doi:10.1029/2004JD005480

Which compares 34 lidar retrievals of dust volume profiles collected in Rome over a 3-year time span, against the Tel Aviv DREAM model forecasts of dust volume profiles. In 2007 such comparison was extended to the Skiron and to the Barcelona DREAM models:

Kishcha, P., Alpert, P., Shtivelman, A., Krichak, S., Joseph, J., Kallos, G., Spyrou, C., Gobbi, G.P., Barnaba, F., Nickovic, S., Perez, C., and J.M. Baldasano. Forecast errors in dust vertical distributions over Rome (Italy): Multiple particle size representation and cloud contributions. J. Geophys. Res., 112, D15205, doi:10.1029/2006JD007427, 2007.

Conversion of aerosol backscatter signals (from single-wavelength polarization lidar) to the dust volume profiles employed in these two papers was based on the (non-spherical) aerosol scattering model published in:

Barnaba F. and Gobbi. G.P., " Lidar estimation of tropospheric aerosol extinction, surface area and volume: Maritime and desert-dust cases", Journal of Geophysical Research, 106-D3, 3005-3018, 2001 (correction to Table 7 and 8 in Barnaba and Gobbi, JGR, 107, D13, 10.1029/2002JD002340, 2002).

The outcomes of the above aerosol scattering model (Barnaba and Gobbi, 2001) have been validated in the following papers:

Against sunphotometer extinction measurements in: Gobbi, G. P., F. Barnaba, M. Blumthaler, G. Labow and J. R. Herman, Observed effects of particles non-sphericity on the retrieval of marine and desert dust aerosol optical depth by lidar, Atmospheric Research, 61, 1-14, 2002

Against in-situ Extinction, Volume and surface area measurements in: Gobbi, G. P., F.Barnaba, R. Van Dingenen, J. P.Putaud, M. Mircea, and M. C. Facchini, Lidar and in situ observations of continental and Saharan aerosol: closure analysis of particles optical and physical properties, Atmospheric Chemistry and Physics, 3, 2161-2172, 2003,

Against extinction measurements at 351nm in: Barnaba, F., F. De Tomasi, G. P. Gobbi, M. R. Perrone, and A. Tafuro, Extinction versus backscatter relationships for lidar applications at 351 nm: maritime and desert aerosol simulations and comparison with observations, Atmospheric Research, 70, 229–259, 2004.

Relationships between Aerosol extinction and volume obtained by the aerosol scattering model (Barnaba and Gobbi, 2001) have been published in: Barnaba, F. and G. P. Gobbi, Aerosol seasonal variability over the Mediterranean region and relative impact of maritime, continental and Saharan dust particles over the basin from MODIS data in the year 2001. Atmospheric Chemistry and Physics, Vol. 4, 2367-2391, 2004. Ansmann et al. (ACP, 12, 9399, 2012), showed these "mass-specific extinction coefficients" to match most of the observed/calculated ones published in the relevant literature at that date.

It is worth mentioning that the Kishcha et al. (2007) paper was based on comparisons of 34 lidar-derived volume profiles collected at one single station, while this AMTD paper addresses 61, asynchronous profiles collected amongst ten lidar stations. Still, correlations between model and lidar retrievals are similar in both exercises. Conversely, Kishcha et al. (2007) found no particular bias in the differences between model (Skiron and BSC-DREAM) and lidar volume estimates, while an important (mean) negative bias is reported here. In this respect, to help understanding the reasons of such bias it might be useful to compare lidar and model profiles at each single station, so to address the effects that both spatial variability and large variability in number of profiles available at each station (from 1 to 18, Table 4) can have on the average results presented here.

In fact, "bias" is defined here with respect to a retrieval, not actual measurements of

dust volume or mass. Since European Guidelines exist to evaluate the Saharan dust contribution to PM10, and PM10 measurements are widespread and easily accessible all over Europe, it might be of benefit to the paper to assess if the models employed in this work keep showing similar negative biases when comparing their dust loads at the ground to the dust content derived from PM10 ground measurements.

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