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Dust vertical profiles over Israel: model predictions and lidar remote soundings

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Saharan dust is a significant seasonal atmospheric phenomenon in the Eastern Mediterranean. The dust intrusions are considered as important because of their impact on weather conditions and ecosystems. Therefore, reliable dust forecast is a matter of serious concern. The dust prediction system at Tel Aviv University (TAU) has been put in operational use for short-term dust forecast since November 2000. The model includes packages for dust initialization, transport, and wet/dry deposition, which were initially developed at the University of Athens. To evaluate the reliability of the TAU dust prediction system over the Eastern Mediterranean, a comparison of model results against lidar observations was carried out. The lidar remote soundings employed in this study were collected by a a Nd:YAG laser operating at three wavelengths (1064, 532, and 355nm) at Beer-Sheva, Israel (31.2^oN, 35.7^oE). The vertically directed lidar system collects backscattered signals from tropospheric aerosols up to 10-12 km altitude with vertical resolution 15 m. Concurrent measurements at three wavelengths allow calculating vertical profiles of aerosol extinction, size distribution and volume. The effective aerosol radius, which could be retrieved from the measurements of extinction coefficients at lidar wavelengths, ranges from 0.1 to 2 μm. To interpret correctly the lidar data, evaluation of the expected accuracy of lidar dust volume was given. Close inspection of the juxtaposed vertical profiles, obtained from lidar and model data over Beer-Sheva, suggests that the model forecast of dust vertical distribution is acceptable in the region under investigation. Possible reasons for the detected model-lidar discrepancies were analyzed.