Retrieval of planetary boundary layer height and aerosol vertical profiles employing remote sensing techniques with a focus on ceilometer data

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Abstract:

Active remote sensing instruments such as ceilometers, have been shown to be useful for the investigation of the behavior of the atmospheric planetary boundary layer (PBL) (Kotthaus and Grimmond, 2018). For the first time, high resolution measurements of the backscatter intensity from several ceilometers - up to eight, inland and onshore, producing rich output of the PBL evolution are evaluated in the Eastern Mediterranean (EM) region. The research focus on three main goals as follows. The temporal evolution of the PBL in Israel; Although the Israeli summer synoptic conditions are considered quite stable, results for the summer season (July-August 2014) show the inland PBL was about 200 m higher than the onshore site only 7.5km apart (Uzan, Egert, Alpert, 2016). Secondly, spatial variations of the PBL is investigated; PBL height variations employing a network of 8 ceilometers in Israel, along with ECMWF and COSMO models. This study is done for the month of August 2015. Finally, Analysis of the process and evolution of a dust storm event by aerosol profiles within the PBL; On 7 September 2015 an unprecedented and unexceptional extreme dust storm struck the EM basin. Our research investigates aerosol vertical profiles provided by an array of 8 ceilometers covering the Israeli shore, inland and mountain regions. We employ multiple tools including spectral radiometers (AERONET), ground particulate matter concentrations (31), satellite images, global/diffuse/direct solar radiation measurements' network (22) and radiosonde profiles (Uzan, Egert, Alpert, 2018).