RECORD DUST OUTBREAK TOWARDS CYPRUS IN SEPTEMBER 2015: VERTICAL PROFILING OF DUST MASS CONCENTRATION OVER LIMASSOL

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ABSTRACT: Record dust mass concentrations with PM_{10} values exceeding 6000μg/m^3 were measured at Limassol on 8 September 2015. From our own visibility observations (500-800m), we estimate peak dust concentrations clearly exceeding 10000μg/m^3. Due to the presence of a high amount of large and giant dust particles, it is possible that the PM_{10} in-situ measurements failed to provide accurate mass concentrations and underestimated the true peak dust load. Furthermore, most state-of-the art atmospheric transport models failed to predict this major dust outbreak towards the eastern Mediterranean. This is due to the fact that the specific dust event was triggered by intense convective activity over the mountainous areas of Syria, Iraq, Iran and Turkey and this situation is often poorly reproduced at the relatively coarse resolutions of operational mesoscale models. In contrary, a detailed hindcast analysis of the event is provided with the use of the high resolution RAMS/ICLAMS model incorporating nested cloud-resolving grids over the source areas. Modeling results indicate that a density current system (haboob) was generated from the storm downdrafts on 6 September 2015. To improve dust predictions, we suggest that continuous vertical profiling of the dust mass concentration with lidar is required in combination with the assimilation of these profiles into the dust models. In this direction, we present observations taken during 7-11 September 2015 in terms of particle extinction profiles, dust particle optical depth, profiles of the extinction-to-backscatter ratio and dust mass concentrations. Complementary, we used satellite imaginary and photos taken from a high building over Limassol to accurately derive the actual visibility during the peak dust event and to estimate the true dust mass load. Lidar ratios of 40sr clearly indicate the presence of dust particles from the region of Middle East, and the maximum depolarization ratios close to 30% indicate the dominance of dust over days.