Nighttime lidar water vapor mixing ratio profiling over Warsaw - impact of the relative humidity profile on cloud formation

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A long-term study, assessing ground-based remote Raman lidar versus in-situ radiosounding has been conducted with the aim of improving the knowledge on the water content vertical profile through the atmosphere, and thus the conditions for cloud formation processes.

Water vapor mixing ratio (WVMR) and relative humidity (RH) profiles were retrieved from ADR Lidar (PollyXT-type, EARLINET site in Warsaw). So far, more than 100 nighttime profiles averaged over 1h around midnight from July 2013 to December 2015 have been investigated. Data were evaluated with molecular extinctions calculated using two approximations: the US62 standard atmosphere and the radiosounding launched in Legionowo (12374). The calibration factor CH_2O for lidar retrievals was obtained for each profile using the regression method and the profile method to determine the best calibration factor approximation to be used in the final WVMR and RH calculation. Thus, statistically representative results for comparisons between lidar WVMR median profiles obtained by calibrating using radiosounding profiles and using atmospheric synthetic profiles, all of them with the best calibration factor, will be presented.

Finally, in order to constrain the conditions of cloud formation in function of the RH profile, the COS14 algorithm, capable of deriving cloud bases and tops by applying thresholds to the RH profiles, was applied to find the cloud vertical structure (CVS). The algorithm was former applied to radiosounding profiles at SGP-ARM site and tested against the CVS obtained from the Active Remote Sensing of Clouds (ARSCL) data. Similarly, it was applied for lidar measurements at the Warsaw measurement site.