7.18 X-BAND RADAR PARMETERS FROM PARSIVEL2 DATA USING PYDSD

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Disdrometers are fundamental instruments to study the microphysics of precipitation. They can be used to estimate the drop size distribution of rain, as a rain gauge to estimate rainfall rate and, additionally, various polarimetric radar parameters can be computed from the data they provide. This study focuses on the vertical profile of drop size distribution (DSD) comparing retrievals from radar with disdrometer data.

In this contribution, Parsivel^2 data is being processed using and extending a software repository (PyDSD) to compare it to the radar parameters of an X-Band weather radar. PyDSD is an open-source Python-based repository on github created by Joseph Hardin. It makes use of the pytmatrix package (also on github) to compute several polarimetric radar parameters, such as horizontal reflectivity (Z_H) differential reflectivity (Z_{DR}), co-polar correlation coefficient (ϕ_{dp}) and specific differential phase (K_{DP}). In addition to the radar parameters, PyDSD computes physical quantities such as rain rate, RR, median diameter, m_0, and liquid water content, LWC. The disdrometer provides internally computed values for RR and ZH. This allows an additional comparison with the repository's output. In order to process Parsivel2's raw data, a reader was developed and added to PyDSD.

The measurement setup for the comparison between radar and disdrometer data consists of 3 Parsivels. One is placed 10 m away from an X-band Doppler polarimetric radar located at a small airport in a valley in Ticino, Switzerland. The other two are placed on a mountain slope at different elevations but roughly at the same azimuth direction from the radar.

During the conference, the consistency between the PyDSD estimates and the Parsivel^2 output will be discussed and an analysis of the vertical profile of DSD, retrieved both by radar and disdrometer will be shown.

Preliminary results of the comparison between PyDSD data processing and internal Parsivel^2 show a difference in Z_H which seems to be larger at higher RR (PyDSD > Parsivel^2). Furthermore, the difference in RR tend to be larger at cold temperatures with the PyDSD output being larger. The most likely reason for that is the assumption in the repository that all precipitation is liquid. Hence, the Parsivel^2 has a filter for solid precipitation. Furthermore, the method to calculate the rain rate in PyDSD from the Disdrometer raw data was adapted to estimate the maximum considered diameter of hydrometeors by the Parsivel^2's internal algorithm when solid precipitation is present as it filters hydrometeors above a diameter of approximately 1.2 mm.