6.24 RADOME EFFECTS ON THE POLARIMETRIC VARIABLES OF A MOBILE X-BAND RADAR

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In this submission we will analyse the effects of the radome of a mobile X-band Doppler polarimetric radar on the polarimetric data, focusing in particular on the differential reflectivity (ZDR), the co-polar correlation coefficient (RhoHV) and the system differential phase offset (PhiDP0). MeteoSwiss operates this radar system for specific measurement campaigns. Usually it is operated with the radome on but in the course of a measurement campaign in Meiringen, Switzerland, we had the opportunity to remove the radome for a short period of time (from 4 to 7 September 2017), which allowed us to compare the behaviour of the polarimetric echoes of precipitation with and without radome.

The lower part of the MeteoSwiss radar radome has a cylindrical shape of 2.55 m diameter and 1.1 m height while on top there is a 2.55 m diameter semi-sphere. The entire radome has a height of 2.375 m. The radome shell has an A-sandwich structure of fiberglass skins with a polyurethane foam core. It is composed by four panels lap-joined by metallic threaded unions. There are 3 main lateral panels and a small circular panel on top of the radome. The 3 unions of the lateral panels start at the base of the radome and reach the top forming an helical shape.

In the past, our data quality monitoring measurements, performed with the radome on, have always exhibited a sinusoidal-like pattern in azimuth, visible at all elevations and for all the variables controlled (Z_{DR}, ρ_{HV} and ϕDP_0). In addition, the 80-percentile value of RhoHV in rain had unusually low values, on the order of 0.988 instead of the typical values of 0.995 expected. We had always suspected that a possible cause were the metallic threaded unions distorting the antenna diagrams of both the horizontally and vertically polarized channels. Indeed, data collected during a rain event on 4 September (without radome), do not exhibit the sinusoidal-like behaviour and the RhoHV in rain increased to a value of 0.992. Once the radome was put back in place, the usual pattern reappeared. A more detailed data analysis will be provided during the conference.

It is therefore recommended to operate a system with similar characteristics without the radome whenever possible to perform quantitative measurements or alternatively to develop methodologies to compensate for the radome effects.