7.9 ASSESSMENT OF PROPAGATION EFFECTS AND RADAR DATA QUALITY WITH A DUAL-POL TARGET SIMULATOR DURING THE OLYMPIC WINTER GAMES

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A target simulator is an instrument that receives radar pulses and retransmits them with a pre-defined amplitude, time delay and Doppler shift in order generate a virtual radar target. By accurately controlling the properties of the pulse that is sent back to the radar, the generated target can be used as a calibration reference for a wealth of radar parameters, such as the radar constant and the differential reflectivity offset. During the Olympic Winter Games in PyeongChang, the worlds first dual-polarization X-band radar target simulator has been employed for seperate experiments with two different dual-polarization radars. First, the differential and absolute calibration of a Gematronik 60DX radar has been evaluated by generating a virtual radar target at 90 km distance to the radar. This target was repeatedly scanned with a sector scan and subsequently the measured radar reflectivity was compared to the pre-defined target properties. It could be shown that the horizontal radar channel was accurately calibrated within an estimated accuracy of 1 dB. The vertical channel however suffered from a hardware defect and hence could not be assessed.

For a second experiment, the target simulator was installed for several weeks in 13 km distance to EPFL's MXPOL radar. While the EPFL radar was located at an altitude close to sea level, the target simulator's altitude was approximately 700 m above. This set-up made not only possible the long-term assessment of the MXPOL's transmitter and receiver stability by evaluating clear-sky measurements, it also allowed the measurement of hydrometeor induced signal attenuation between the two instruments during precipitation events. Of special interest were cases, in which the melting layer was located between the altitudes of the two instruments in order to directly measure the attenuation of the melting layer.

Since Palindrome's target simulator is also capable to measure the phase of the incoming radar pulses, it became feasible to directly study precipitation induced phase changes on propagation which in return opened the possibility to discriminate between backscatter and propagation induced differential phase changes. Recent research shows that such unprecedented measurements are of special interest for melting layer studies.