Development and application of a target simulator for weather radar calibration purposes

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Radar calibration is difficult

Sphere calibration

Manual maintenance

Sun calibration

Ground truth

Radar target simulator
Different approach: Radar Target Simulator

What is an RTS?

- An RTS generates an artificial target on the radar display, which can be used to calibrate the radar accurately.
- Commercial RTS systems are very expensive and therefore unaffordable for most meteorological services.
MeteoSwiss’ X-band RTS system

Horn antenna and HF cables removed.

Analog up- / down-conversion, amplification

Analogue ⇔ digital conversion

Digital up- / down-conversion

Signal processing
Laboratory tests

Pulse received by RTS
Pulse emitted by RTS

Radar target simulator
Tests with a marine radar
Sphere / RTS calibration

- Distance RTS - Radar: 1.5 km.
- Sphere height: 300 m.
- Expected reflectivity: 35 dBZ.
Sphere calibration results (DX50 data)

20 cm diameter sphere

Reflectivity [dBZ]

Sphere: Al solid, radius 10cm
Radominfluence: dry air, PW: 500ns
Range: 1500m, Time: 20160824092903

37.00 data$_{\text{max}}$
36.31 gaussMP$_{\text{max}}$

Expected: 35 dBZ
Vertical pol.: 34.2 dBZ
Horizontal pol.: 35.9 dBZ
RTS results (MXPol data)

Artificial target at 26 km

Artificial target at 92 km

Data extracted at target range gate
**Pulse logger**

Data from marine radar.

- Sample and store every individual radar pulse.
- Analyze the pulses via a graphical user interface.
Conclusion

- RTS systems might become useful for radar calibration.
- MeteoSwiss’ RTS system is under development
- Possibility to log and analyze individual pulses.

Outlook

- Calibrate the RTS.
- Go to C- and S-band.
- Expand technology to dual-polarization.