6.13 CENTER FOR CLOUD REMOTE SENSING: DOPPLER CLOUD RADAR CALIBRATION CAMPAIGN

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Doppler Cloud Radars (DCR) have proven to be very useful tools for cloud research, enabling remote retrieval of internal properties and structure of clouds, fog and rain, as well as wind speed. However, up to now, replicable and reliable DCR calibration methods are not commonly available or implemented. Several solutions have been proposed, but they are difficult to generalize due to the particularities of the operating fields. The wide range of DCR hardware, including microwave technologies, antenna types and operating frequency is an important contributor to this complexity. However, scientific applications of these instruments for fog and cloud studies require a reliable calibration method with a well-characterized uncertainty, to ensure the quality and consistency of data between different DCRs. This is a critical issue, as already more than 15 DCRs are currently operating at ACTRIS atmospheric observatories, in Europe alone, a number that is likely to grow.

Research calibration campaigns are performed periodically at the SIRTA atmospheric observatory, located in Palaiseau, France, with the objective of developing a set of standards for DCR calibration. These standard calibration methods will then be implemented by the Center for Cloud REmote Sensing (CCRES) of the ACTRIS research infrastructure. The objectives of the CCRES is to improve the measurement quality of the Cloud remote sensing observatories in Europe, guaranteeing homogeneity to boost meteorological research.

In this work we present the campaign carried out at SIRTA in November of 2017. It consisted of experiments using calibration targets either fixed on the top of a mast or flown by an unmanned aerial vehicle (UAV), following a new method proposed by the Atmospheric Remote Sensing Group of TU-Delft, who is also part of the CCRES. Additionally, calibration transfer using natural targets (such as clouds) was studied using two 95 GHz DCRs: a vertically pointing fixed BASTA radar and a BASTA-Mini, with scanning capabilities and easy mobility.

We will present calibration methods that can be used for DCRs with scanning capabilities, and methods adapted for fixed zenith pointing DCRs. Calibration values, and their distributions, derived from the different methods will be presented. The following topics will be discussed: (1) impact of atmospheric conditions on calibration; (2) repeatability of the different methods under various meteorological

conditions; (3) advantages and disadvantages of target calibration on fixed mast; (4) advantages and disadvantages of targets flown on a UAV and proposed further developments; (5) applicability of the methods to DCR networks. Future calibration experiments to improve calibration methods will also be presented.