P3A.8 CESAR RAINFALL EXPERIMENT 2002 (C-REX'02) – EXPERIMENTAL SETUP AND FIRST RESULTS

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1 INTRODUCTION

The Cabauw Experimental Site for Atmospheric Research (CESAR) is a consortium of major universities and research institutes in The Netherlands involved in research regarding ground-based remote sensing of the atmosphere and of the land surface. The Cabauw site, with its 213 m tower for atmospheric boundary layer observations, has been the center of experimental research of the atmospheric research group at the Royal Netherlands Meteorological Institute (KNMI) since the early 1970s. In the framework of CESAR, an important collection of ground-based remote sensing devices has recently been added to the original configuration of in situ instruments. Additional information about CESAR can be found on the CESAR web site (http://www.cesar-observatory.nl/). The CESAR project plan, an overview poster and an overview article can be downloaded from the IRCTR / TU Delft web site (http://irctr.et.tudelft.nl/projects/cesar/).

2 MATERIAL AND METHODS

Between early September and the end of December 2002, the Precipitation Research Group within the CESAR consortium has coordinated the CESAR Rainfall Experiment 2002 (C-Rex'02). The objective of the experiment was to characterize the space-time variability of rainfall across a range of scales with a view to the quantitative use of ground-based and space-borne rainfall remote sensors, such as (the European contribution to) the Global Precipitation Mission [(E)GPM]. Instruments available during C-Rex'02 included: 1) The 3 GHz doppler-polarimetric atmospheric research radar TARA [built and operated by IRCTR / TU Delft, see Heijnen et al. (2000)]; 2) A 35 GHz cloud radar, a 1 GHz wind profiler (Klein Baltink, 1998), and a Gematronik 5 GHz operational doppler weather radar [see Holleman and Beekhuis (2003), all operated by KNMI]; 3) A Metek 24 GHz micro doppler rain profiler, a Joss-Waldvogel disdrometer RD-80 (e.g. Uijlenhoet et al., 2003), two optical spectro-pluviometers (one Précis Méchanique kindly provided to us by Hervé Andrieu of LCPC in Nantes, France, and one Parsivel kindly provided to us by Eduard Beck of PMTech in Karlsruhe, Germany), a Joanneum Research 2-D Video Disdrometer (from ESA / ESTEC), and a network of tipping bucket rain gauges (all operated by Wageningen University). This paper presents a preliminary analysis of rainfall measurements during C-Rex'02.

3 RESULTS AND DISCUSSION

Figures 1–4 show time series of bulk rainfall variables and characteristic raindrop sizes for the Joss-Waldvogel disdrometer RD-80 (JWD) and the LCPC optical spectro-pluviometer (OSP) derived from 30-second raindrop size distributions (DSDs) during a rainfall event for which both instruments detected maximum rain rates of about 100 mm h^{-1}. The raindrop concentrations (characteristic sizes) measured by the JWD are significantly higher (lower) than those from the OSP. This effect becomes even more pronounced after application of the deadtime correction to the JWD-data. The higher order moments of the DSD however, which are much less sensitive to the (large) numbers of small drops, are in much better agreement. We are currently analyzing the other rainfall events during C-Rex'02. Particular attention is being paid to detailed disdrometer-gauge-radar inter-comparisons to improve our understanding of the space-time

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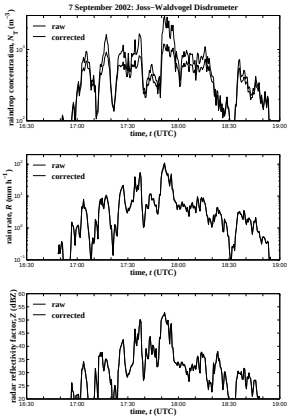

Figure 1: Time series of bulk rainfall variables from 30-s DSDs (with/without deadtime correction) measured with Joss-Waldvogel disdrometer.

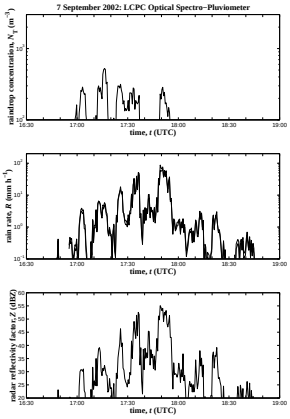

Figure 2: Same as Fig. 1 but measured with LCPC optical spectro-pluviometer.

variability of rainfall microstructure.

4 CONCLUSIONS

With its extensive collection of in situ and remote sensing instruments, CESAR seems ideally suited to serve as a ground validation site for the upcoming Global Precipitation Mission (GPM), and its European component EGPM.

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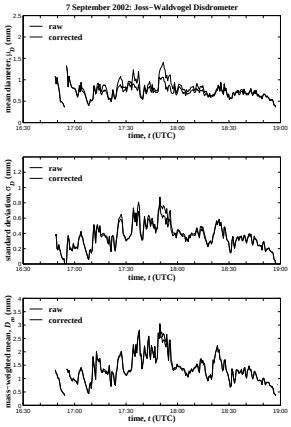

Figure 3: Time series of characteristic drop sizes from 30-s DSDs (with/without deadtime correction) measured with Joss-Waldvogel disdrometer.

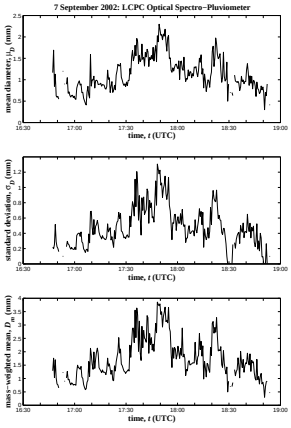

Figure 4: Same as Fig. 3 but measured with LCPC optical spectro-pluviometer.