



## One Decade of Imaging Precipitation Measurement by 2D-Video-Distrometer

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It was for the first time in April 1996 when a 2D-Video-Distrometer (2DVD) unit was delivered to the customer. The 2DVD is an imaging precipitation gauge, giving front and side contour, as well as fall velocity and precise time stamp for each particle reaching the measuring area. The present review includes system performance aspects and scientific merits the 2DVD has enabled, and is completed by an outlook to future developments. To the best of the authors' knowledge the 2DVD kind of data is unique and superior to that of any other distrometer, nevertheless early 2DVD units had required considerable maintenance efforts. In the beginning the 2DVD was available in its classic tall version only, its system stability over the years has been improved significantly. This could be achieved by increasingly thorough test procedures and various hardware adaptations, enhancing especially stability against thermal variance and splash protection to optical components. Performance specifications were improved as well, e.g. by upgrade to faster cameras. A milestone in system development was achieved in 2003, when the first low-profile 2DVD was delivered. This 2DVD version was developed in answer to studies indicating notable turbulence effects and thus distortions of measurement results in high wind speed conditions. Moreover the low-profile 2DVD provides further enhanced system stability and thus requires less maintenance efforts than the classic tall 2DVD version. The scientific merit of 2DVD employment is based on certain measurement characteristics. Measuring rain drops without upper size limit has explained unexpectedly high values of weather radar differential reflectivity (ZDR) observations. Even for snow events reflectivities are derived with good agreement with actual radar measurements. Cross-polar discrimi-

nation versus co-polar attenuation in satellite transmission has been predicted using 2DVD measured drop axis ratios, well resembling actual beacon measurements. Rain drops' canting angle information is available as well. Studies on relation of rain rate changes (breakpoints) to drop size distribution characteristics are possible by time stamps given for each individual drop. Nineteen 2DVD units have been set up, they are used mainly by research organisations and universities. In order to open such data type to a wider user community the system will further be developed for easier handling and for availability at a lower sales price. A concept for a purely horizontal arrangement of the optical paths has been developed, basic experiments have successfully confirmed its use. Employment of intelligent line scan cameras will allow omission of the Outdoor Electronics Unit, presently housing a full PC. So in the near future gross shipment weight may be reduced down to a third, and sales price down to about half. Imaging precipitation measurement is to be considered the superior technology for most applications. The 2D-Video-Distrometer has successfully been employed for ten years and with step by step system innovations this technology is opened to a wider user community.