EMS Annual Meeting Abstracts
Vol. 13, EMS2016-601, 2016
16th EMS / 11th ECAC

3D Reconstruction of Individual Raindrops from Precise Ground-Based Precipitation Measurements

Martin Schwinzerl (1), Michael Schönhuber (1), Günter Lammer (1), and Merhala Thurai (2)

(1) JOANNEUM RESEARCH Forschungsges mbH, DIGITAL, Graz, Austria (martin.schwinzerl@joanneum.at), (2) Electrical and Computer Engineering Dept., Colorado State University, Fort Collins, CO

Detailed knowledge about the precise individual and ensemble properties of hydrometeors allows not only to (literally) study the impact of falling hydrometeors on processes like erosion, it also allows to model and subsequently verify conclusions drawn from interaction between electromagnetic waves and precipitation particles. Applications for the latter area include the assessment of tropospheric effects on radio links and especially the scattering observed by (weather) radar. Advanced image based precipitation measurement instruments like for example the 2D-Video-Distrometer (2DVD) allow the in-situ, ground-based measurement of falling rain drops with sufficient precision to not only capture properties like type of precipitation, diameter and volume but also to capture contour data with sufficient precision to allow, for certain classes of particles, a graphical 3D reconstruction of individual hydrometeors.

In this publication, one approach towards the end of such a 3D reconstruction from 2D contour data conducted by the authors is described. The contributing field measurements of several rain events are presented, followed by a brief introduction of the reconstruction method and a discussion about the limits of precision and fidelity of the obtained results. The influence of horizontal wind speeds on the processed raw data is described and a method for correcting this influence is developed. Examples of reconstructed rain drops are presented and especially those results that lend themselves towards an interpretation in terms of theoretically predicted modes of oscillations are highlighted. Further statistical analysis towards better comparison with these modes of oscillations is motivated. In conclusion, limits of applicability of the presented method towards 3D reconstructions of non-liquid precipitation particles like hail, snow or graupel are outlined.