



Detailed flow, hydrometeor and lightning characteristics of an isolated thunderstorm during COPS

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The three-hour life-cycle of the isolated thunderstorm on 15 July 2007 during the Convective and Orographically-induced Precipitation Study (COPS) is documented in detail, with a special emphasis on the rapid development and mature phases. Remote sensing techniques as 5-minute rapid scans from geostationary satellites, combined Doppler-retrievals from up to four Doppler-radars, the polarimetric determination of hydrometeors and spatio-temporal occurrences of lightning strokes are employed to arrive at a synoptic quantification of the physical parameters of this, for the COPS period, rare event.

Inner cloud flow fields are available, gridded on a 500-m-mesh, at four consecutive times separated by 15 minute-intervals (14:35, 14:50, 15:05, 15:20). They contain horizontal winds of up to 15 m/s and updrafts exceeding 4 m/s, the latter collocated with lightning strokes. Profiles of flow and hydrometeor statistics over the entire cloud volume provide reference data for high-resolution, real-world, episode-type numerical weather prediction runs in research mode. Exemplary results are obtained by applying the Meso-NH modelling system in a four-fold nested configuration with a horizontal mesh-size of 500 m.

The study embarks from two multi-channel time-lapse movie-loops from geostationary satellite imagery, which provide an intuitive distinction of six phases making up the entire life-cycle of the thunderstorm. It concludes with a triple image-loop, juxtaposing a close-up of the cloud motion seen by Meteosat, simulated brightness temperatures (as a proxy for clouds seen by the infrared satellite channel), and a perspective view on the model generated system of cloud cells. By employing the motion-geared human visual system, such multiple image loops provide a high, and as yet hardly utilised potential for a well-grounded selection of further sensitivity experiments in the modelling community.