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Analysis of warm season thunderstorms using a object-oriented tracking method based on radar total lightning data

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Abstract. Monitoring thunderstorms activity is an essential part of operational weather surveillance given their potential hazards, inc lightning, hail, heavy rainfall, strong winds or even tornadoes. This has two main objectives: firstly, the description of a methodology, on radar and total lightning data to characterise thunderstorms in time; secondly, the application of this methodology to 66 thunders that affected Catalonia (NE Spain) in the summer of 2006. An object oriented tracking procedure is employed, where different observat types generate four different types of objects (radar 1-km CAPPI r composites, radar reflectivity volumetric data, cloud-to-ground ligh data and intra-cloud lightning data). In the framework proposed, t objects are the building blocks of a higher level object, the thunder

The methodology is demonstrated with a dataset of thunderstorm main characteristics, along the complete life cycle of the convective structures (development, maturity and dissipation), are described statistically. The development and dissipation stages present similar durations in most cases examined. On the contrary, the duration o maturity phase is much more variable and related to the thunderst intensity, defined here in terms of lightning flash rate. Most of the of IC and CG flashes is registered in the maturity stage. In the development stage little CG flashes are observed (2% to 5%), whi dissipation phase is possible to observe a few more CG flashes (10 to 15%). Additionally, a selection of thunderstorms is used to examin general life cycle patterns, obtained from the analysis of normalize respect to thunderstorm total duration and maximum value of vari considered) thunderstorm parameters. Among other findings, the indicates that the normalized duration of the three stages of thunc life cycle is similar in most thunderstorms, with the longest duratio corresponding to the maturity stage (approximately 80% of the tot

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