Identification of anomalous motion of thunderstorms using radar and satellite data: the splitting thunderstorm of the 10th July 2013 in Catalonia

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Most of adverse phenomena that affect Catalonia (NE of the Iberian Peninsula) are caused by thunderstorms that produce heavy rainfalls, large hail, lightning, strong winds and tornados. These thunderstorms usually experience some kind of anomalous motion during their mature phase, making the thunderstorm to split into two different ones, merging into a bigger system or changing completely the motion direction that was previously following. In order to identify the main features that lead a thunderstorm to experience an anomalous motion, this contribution analyses the splitting thunderstorm of the 10th July 2013. This event affected some regions in the west of Catalonia, causing more than 80% of loses in corn crops and fruit tree fields, due to the large hail and the intense rainfalls. The pattern of the daily accumulated precipitation is analysed and catalogued in order to determine if it was associated to an anomalous movement. This is done by using a methodology that allows discerning whether or not a day has had convective precipitation, by imposing precipitation thresholds to the daily rainfall map. Then, once a convective day has been found, it identifies the convective structures within that day and classifies them into Elliptical (with normal motion) or Non-Elliptical (with some type of anomalous motion). On 10th July 2013 a Non-Elliptical structure is found over the affected region, meaning that probably it was produced by a thunderstorm with anomalous motion. Finally, the present work studies the possible causes that have led the thunderstorm to split, and its characteristic features, by means of volumetric radar data, satellite images and the tracking of the thunderstorm on an orographic map. This process shows that merging different data sources makes the identification of convective events more reliable. It also suggests some convective features to be included in a nowcasting algorithm of a potential anomalous motion of a thunderstorm and, therefore, a potential severe weather at surface. This work has been developed in the framework of the HYMEX project and sponsored by the Spanish HOPE project.