

## Study of radar signatures of hail in the Basque Country

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Identifying the signatures of hail is one of the challenges in the Basque Meteorology Agency (EUSKALMET) of the Directorate of Emergencies and Meteorology, (DAEM), Security Department of the Basque Government. The Basque Country has a complex topography not only because of its mountains, but also because its surroundings, including the Cantabrian Range and the Iberian System.

Hail storms are the reason for many accidents that cause human and economic losses. The damage depends on the intensity of hail and its trajectory. The goal of the study is to improve the understanding of the mechanism and the identification of radar signatures or radar patterns associated to hail.

The polarimetric doppler weather radar is the best observation system, available in the area of Basque Country, to follow the evolution of storms. It is located inland, which means that it covers all the convective process from the origin to the end and offers good temporal and spatial resolution.

The methodology is based on gathering the maximum number of cases of hail storms from different sources: radar observations, metar (direct sources) and traffic information, facts derived from hail impact on vegetation or other objects, and new/social media (indirect sources).

Once the information is reviewed, only those cases in which the hail is verified in time and space are used in this study. Hail size is also an important feature but it is the most subjective information. Therefore it is used as complementary information. The meteorological situation, the weather warning and real-time information delivered by EUSKALMET, were studied together for verification purposes to improve future forecasts.

The results of the study reveal that the parameters of the Zhail product have a dependency on the meteorological situation (winter versus summer signatures). Finally, combination of radar products and signatures of degradation of the quality of the radar, and other meteorological sources are verification tools for Zhail product.