



Assessment of the destructive potential of hail

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Hail produced by severe convective storms represents a natural hazard, and is of particular interest to the insurance industry. Severe hail can cause substantial damages to automobiles, buildings, and crops. The amount of hail damage is mostly a function of the frequency and intensity of the hailfalls. Since the spatial distribution and temporal variations of the hailfalls are strongly localized, ground reports from weather stations should be complemented with other types of information. This study focuses therefore on the combined analysis of data recorded at ground and weather radar measurements. Radar data has the advantage of high spatial and temporal resolutions, resulting in a very feasible option to detect hail in comparison to operational weather stations. As the first study of its kind in Romania, the analysis was undertaken on a limited area which is defined by the total coverage area of the Doppler weather radar system operational at Bucharest. Hail kinetic energy derived from radar reflectivity is used to identify hail on the ground. The hail reports from the weather stations and automobiles, building and crop damage locations are used for validation. While many studies used only the 55 dBZ threshold for hail identification, in our research we have investigated and used several reflectivity threshold levels to improve the hail detection. In this regard, several convective weather case studies were analyzed. Hail kinetic energy was the main parameter used to reflect the destructive potential of hailfalls. To identify areas at risk of hail damage, maps of hail kinetic spatial distribution were developed. It is observed that hail kinetic energy corresponds well with hail recorded at the ground. An additional parameter developed to help at the identification of areas prone to hail damage is the frequency of detection (FOD) of radar echoes above a certain threshold (e.g., 53 dBZ). FOD maps were constructed for the convective days when hail was detected. Maps of frequency of detection of radar echoes correlates well with the spatial distribution of total hail kinetic energy. This indicates that FOD is a useful parameter in the study of hail damage on properties and crops. Preliminary results of the study are consistent and encouraging, so that the research can be continued and expanded to cover larger areas in order to achieve final products of interest for potential users.