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The DOWNBURST MXO: a real-time downburst monitoring service in eastern Spain

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In the framework of the DOWNBURST project, here we present the first real-time downburst monitoring service in eastern Spain. Downbursts are strong winds that descend from a thunderstorm and spread out quickly once they hit the ground. These extreme winds are one of the most damaging natural events and can reach the force and produce damages similar to tornados. Downbursts are challenging to detect because of their sudden onset, isolated and short-lived behaviour.

The DOWNBURST MXO is a monitoring service based on the Valencian Meteorological Society (AVAMET), a distinctive network of weather stations in eastern Spain featuring extensive spatial coverage (over 750 stations) and high temporal resolution (10-minute intervals, with 3-second wind gust measurements), all while maintaining high data quality by citizen science weather observers. The service operates using an algorithm that continuously reads 10-minute data and automatically identifies whether a downburst is occurring based on sudden changes in reference variables such as strong winds accompanied by changes in air temperature, humidity, precipitation, and/or atmospheric pressure. Where established criteria are fulfilled, the Downburst MXO web application marks the location with a symbol that alarms the public about the occurrence of a downburst. In addition, the monitoring service alerts the station owner, allowing them to verify the event. The service also collects different data about downburst events, such as the location (coordinates), time, duration, impacts (tree falls, damages in structures, etc.) and, in future updates, about the type (microbursts, macrobursts; wet and dry downbursts; and heatbursts). Along with the automated data collection, the web-based app incorporates many key data-gathering functions such as uploading images (pictures and movies), audio and a description of the event. Each recorded event is in turn verified by the DOWNBURST project research team and becomes part of a downburst database.

In a warming climate, these straight-line winds are expected to increase in intensity and frequency. Consequently, this real-time downburst monitoring service provides alerts for areas experiencing downbursts and early-warnings to vicinity areas.