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Remote sensing observing systems of the Meteorological Service of Catalonia (SMC): application to thunderstorm surveillance

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Remote sensing observing systems of the Meteorological Service of Catalonia (SMC) have been upgraded during the last years with newer technologies and enhancements. Recent changes on the weather radar network have been motivated to improve precipitation estimates by radar as well as meteorological surveillance in the area of Catalonia. This region has approximately 32,000 square kilometres and is located in the NE of Spain, limited by the Pyrenees to the North (with mountains exceeding 3000 m) and by the Mediterranean Sea to the East and South. In the case of the total lightning (intra-cloud and cloud-to-ground lightning) detection system, the current upgrades will assure a better lightning detection efficiency and location accuracy. Both upgraded systems help to enhance the tracking and the study of thunderstorm events.

Initially, the weather radar network was designed to cover the complex topography of Catalonia and surrounding areas to support the regional administration, which includes civil protection and water authorities. The weather radar network was upgraded in 2008 with the addition of a new C-band Doppler radar system, which is located in the top of La Miranda Mountain (Tivissa) in the southern part of Catalonia enhancing the coverage, particularly to the South and South-West. Technically the new radar is very similar to the last one installed in 2003 (Creu del Vent radar), using a 4 m antenna (i.e., 1 degree beam width), a Vaisala-Sigmet RVP-8 digital receiver and processor and a low power transmitter using a Travelling Wave Tube (TWT) amplifier. This design allows using pulse-compression techniques to enhance radial resolution and sensitivity.

Currently, the SMC is upgrading its total lightning detection system, operational since 2003. While a fourth sensor (Amposta) was added last year to enlarge the system coverage, all sensors and central processor will be upgraded this year to the new Vaisala's total lightning location technology. The new LS8000 sensor configuration integrates two lightning detection technologies: VHF interferometry technology provides high performance in detection of cloud lightning, while LF combined magnetic direction finding and time-of-arrival technology offers a highest detection efficiency and accurate location for cloud-to-ground lightning strokes.

The presentation describes in some detail all this innovation in remote sensing observing networks and also reports some examples over Catalonia which is frequently affected by different types of convective events, including severe weather (large hail, tornadic events, etc.) and heavy rainfall episodes.