Comparison between different methods to forecast snow events in a warm front in Catalonia

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From 2001, the Meteorological Service of Catalonia (SMC) has the responsibility for the weather forecast and the meteorological surveillance in Catalonia, situated in the north-east of the Iberian Peninsula.
The snow events are one of the biggest challenges that have civil protection authorities. These events are very difficult to manage properly. These situations are not very frequent at low altitudes, and the complex orography makes the estimation of the snow line even more difficult.

The SMC is working on obtaining an accurate method to determine snow line. Until now, the operational methods used were two. The first one drops 200 meters from the zero temperature level altitude if relative humidity was up to 60%, and drops 400 meters to the wet bulb zero level for the other cases. The second one uses the hydrometeor species obtained from WRF model. However, these methodologies are not enough accurate. For that reason, other methods where analysed.

The first step done was to study two new methods: the wet bulb temperature with a threshold of 1.5 degrees (WBT1.5), and the use of the hourly precipitation rate and the wet bulb zero level (WBZL) to calculate the snow line. In this work, these methods are applied to a warm front event affecting Catalonia, especially the Pyrenees. For that purpose, five automatic weather stations with snow depth sensor were chosen and, apart from this, two of them were compared with spot observations.

The results show that WBT1.5 at the beginning of the episode estimates correctly the snow line but tends to increase quickly the value as the warm front is approaching. However, when the precipitation rate is high the snow line drops even when there is a warm advection. Consequently, the WBZL method obtains better results.