

Field observations of vertical temperature/humidity structure in the Cerdanya Basin –Spanish Pyrenees: Preliminary results and comparison with model forecasts

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The Cerdanya basin is located in the north-eastern Pyrenees and measures 15 km wide and 40 km long. It is unique in that its north-east to south-west orientation contrasts with most other Pyrenean valleys which run north-south. The upper portion has its valley bottom averaging around 1000 m asl, with the surrounding mountain ranges rising to well over 2000 m asl. To the west (downstream) the Segre flows into a narrow gorge which provides a constriction for any down-valley flow. This topography encourages intense temperature inversions through cold air ponding, decoupling the valley atmosphere from the regional circulation, especially in winter. Prediction of minimum temperatures is a challenge.

A network of 40 temperature sensors was installed in 2012 to collect hourly temperatures throughout the cold pool. A transect was also installed in Conflent to the north-east as a comparison, since previous research has shown that the vertical temperature and humidity profiles are less influenced by cold air drainage in this valley system. The sensor data is validated against AWS observations at two contrasting locations. Using two years of data (2012-2014), through calculation of hourly lapse rates in various elevation bands we show frequent inversions developing up to 1450 m, and sometimes extending much higher than this, concentrating in winter. Accumulated potential temperature deficit is shown to be much higher in Cerdanya than in Conflent, and increases in the lower atmospheric layers. Case studies of two intense episodes in December 2012 and January 2013 show that model simulations, despite being able to simulate broad mechanisms of the CAP formation and thermal winds, underestimate the amount of cooling, particularly in incised valley locations.