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Intense trough on Venetian Alps with problem of heavy rains prognosis and difficulties of snow level forecasting

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The eastern Italian Alps are often theatre of severe meteorological events with heavy precipitation (200/400 mm for each single events). But there are some problems in weather prognosis of these.
1. important difference of rain amounts between Pre-Alps, where Stau effect has a significant result, and northern Dolomites where dynamical atmospheric causes overcome;
2. difficulty to predict snow level, especially in the internal Dolomites' valleys.

In the last winter and spring Venetian Alps were interested by three intense events with the same difficulties of forecasting.
The first step concerns problems connected to intensity and abundant quantity of precipitation on Pre-Alps, often underestimated by models (Ecmwf, Arpège, Aladin and others LAM), while the same model charts overestimate total precipitation amount on northern Dolomites. On the Pre-alpine area, just over the Venetian plain and not far from Adriatic sea, the Stau effect seems to have dominating impact and generates often more intense rains than dynamical situation can indicate, especially when a strong "scirocco" flows from Southeast. In this cases the saturated airflow evaluation and orographic forcing up motion are the main keys for a good diagnosis. On the internal Dolomites, the scenario is very different: the rampart of the Pre-Alps, biggest distance from the sea, the position of orographic protection, the reduction of the stream in narrow valleys and absence of barrier effect due to morphology of the highest mountains. All these factors represent many obstacles which reduce strongly activity of disturbance weather during the cold season. But in relation with strength and direction of flow, on southern Dolomites heavy rainfalls or snowfalls can accumulate in short time. This is not true for the most northern Dolomites.

The second point concerns the topic of snow level during this extreme events with large differences between Pre-Alps and Dolomites and local contrast during the disturbance period. Independently on pertinent forecasting parameters to individuate snow level, it is necessary to have a good knowledge of the specific mountain territory. Particularly it is necessary to understand the differences of the atmospheric structure between Pre-Alps and Dolomites: wind flow, temperature air quality in the boundary level, intensity of precipitation, presence of temperature inversion and chance that these parameters have to resist to intense southern warm advection. The classic keys like freezing level altitude, thickness between different géopotentiel levels, Theta' w at 850 and 1000 hPa, dew point temperatures, forecasted sounding can facilitate prediction but aren't fully adequate for a good snow level prediction on the Alps.

Others slight elements are needed to improve snow level forecasting, for instance concerning the Venetian Alps with two important aspects: one concerning micro-scale temperature air quality in the low level, especially in the intra mountains' basin and very closed valleys and another one regarding important local factor like falling snow level for air cooling by snow-melting.

In the three seasonal cases, there are very significant differences about quantity of precipitation and snow levels between Pre-Alps and Northern Dolomites. Total precipitation amount are two or three times more on Pre-Alps than on Dolomites and limit rain-snow is generally 800/900 m lower, locally 1000 m, on the Dolomites in comparison with Pre-Alps, in spite of strongest intensity of precipitation on Pre-Alps. These variations are

observed on rather short distances: 40/60 km, locally less than 20/30 km.

Considering the limits of the prognosis numerical models, the experience appears as fundamental to improve forecast on the Venetian Alps. The more important steps are: 1- to understand how much different orographic effects (Stau) can influence intensity and quantity of precipitation, 2- to individualize a specific situations in which a non-turbulent air motion determines air cooling by snow-melting with snow level falling in Dolomites area, while this phenomena isn't observed on Pre-Alps.