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Weather regimes, weather types and their relation to local scale phenomena

How the ECMWF Weather Regimes Probabilities chart can support meteorologist in Lombardy to provide more accurate forecast? My thesis paper tries to answer this question. After reproducing the four weather regimes over the Euro-Atlantic area (NAO+, NAO-, BLO, AR), the daily series of occurrence of the regimes 1950-2019 was constructed. The analysis of the series made it possible to derive statistical information on the regimes: trend, variability, persistence.

As Lombardy covers a very small area compared to the Euro-Atlantic one where the regimes are defined, the same time frame was also studied in terms of weather types over the Euro-Mediterranean area.

The comparison between the two schemes showed how each pattern over the Euro-Atlantic area affects the distribution of weather types over the Euro-Mediterranean area.

Therefore, some events of interest from the point of view of operational meteorology were analyzed in terms of weather regimes and weather types. In particular, the following were chosen: the PM10 drop recorded in winter 2010, the heat waves in July 2015, the heavy rainfall in November 2014, the drought of 2017, the fires in spring 2017 and the foehn episodes in January 2019. This analysis revealed several connections between synoptic scale patterns and observed local events. The data collected support the hypothesis that both weather types and weather regimes can be used to characterize local scale phenomena and suggest that the issue can be investigated further. A systematic investigation would make it possible to consolidate the hypotheses made in this first exploratory phase and make the ECMWF Weather Regimes Probabilities chart a tool for forecasting practice.

Primary author: LEGNANI, Laura (Università degli Studi di Milano)

Co-author: Dr MINARDI, Gian Paolo (ARPA Lombardia)

Presenter: LEGNANI, Laura (Università degli Studi di Milano)

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