

2.35 MESOSCALE FACTORS IMPACTING STORM INITIATION OVER THE TORINO METROPOLITAN AREA, ITALY

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The importance of mesoscale and local factors, like orography, land cover, insolation, and local winds in thunderstorms development is an active topic of research. Over the metropolitan area of Torino severe storms can be dangerous due to the inadequate fine-scale predictability and the potential impact in a highly urbanized area. The interaction between atmospheric flows and the hill surrounding the city on the east side (700 meters above mean seal level, i.e. ~400 meters above the city center) is one of the main factors influencing convective initiation over the metropolitan area.

This research investigates the distribution of thunderstorms in the study area, using the operational Bric della Croce weather radar, ground observations, and numerical weather prediction models (NWP), considering eight years of observations (2010-2017). The work focuses in particular on the role of the Froude number. Fifty-nine ordinary thunderstorms, which developed between 2 pm and 6 pm local time, have been analyzed according to different values of the Froude number derived from Milano radiosounding at 925 hPa and 850 hPa pressure levels. A detailed analysis of the initial stage of the thunderstorms formed over the metropolitan area of Torino is carried out.

The study confirms the impact of the Torino hill on the storms development and it shows how different atmospheric flows, respect to the hill, determine different areas for storm initiation. In particular, when the Froude number is less than one (between 0.10 and 0.8) for both pressure levels, storm cells are most likely to occur around the hill (on the southern and western side), with low-level winds from the plains splitting around the orographic obstacle. When the Froude is higher than one (between 1.10 and 1.8), storm cells are found to develop downwind of the hill, while Froude number near unity at both pressure levels are associated with storm cells occurring on the ridge of the hill. It is argued that the operational use of the Froude number may improve the predictability of the storm initiation, helping to anticipate the location of the convective activity across the Torino metropolitan region.
