



Predictions of Extreme Weather Events in a Climate Change Environment in the Northwest Italy

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The recent decade has witnessed an overwhelming increase in convective storms such as heavy rains, hailstorms, tornadoes, strong winds, and lightning leading to extreme weather events around the globe. Principally, the thunderstorm producing cloud is the main environment in which these convective storms related to extreme weather events develop. Convective storms characterize the deadliest extreme weather events that pose wider socio-economic risks and impacts resulting in disruptions of social functions and services, damage to properties and infrastructures, injuries, and loss of life to people. However, the predictability of such extreme weather events still presents the most challenging task in operational weather forecasting. Thus, accurate and reliable forecasts of such weather phenomena are of critical importance to mitigate the adverse impacts and risks associated with extreme weather events.

The current work is intended to simulate the convective weather storms pertaining to hailstorms, lightning, tornadoes, and strong winds that hit the Northwest part of Italy during the most recent decade. The emphasis will be placed on the Ligurian region, which is among the regions forming the North-west part of Italy with complex weather systems. The high-resolution Numerical Weather Prediction (NWP) model, namely the Advanced Research of the Weather and Research Forecasting (ARW) modeling system will be used to simulate such weather events. The study will amount to two tasks. The very earliest task will investigate the implications of three resolutions (10 km, 3.3 km, and 1.1 km) of the ARW modeling system in simulating such weather phenomena. The latter task will use the obtained resolution to further investigate the implications of different parameterization schemes of the microphysics category in the ARW model. Observed data and/or reports from reliable sources will be used to verify the simulations from the ARW model using various approaches. Different results from diverse approaches will be presented and discussion will be performed based on the results obtained. Finally, the conclusion will be drawn based on the results and discussions.