AN OPERATIONAL INGREDIENTS-BASED METHODOLOGY TO FORECAST ORDINARY AND SEVERE THUNDERSTORM

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I. INTRODUCTION

In the Laboratory for the Meteorology and Environmental Modeling (LaMMA) is operating a regional weather forecasting service with Civil Protection competence on Tuscany, Italy. The WRF-NMM model is run operationally with both ECMWF 0.25 degrees (00 and 12 UTC) and GFS 0.5 degrees (00, 06, 12 and 18 UTC) for initialization and boundary conditions. The NMM is running for 72 hours at the horizontal resolution of 10 km using the kain-fritsch parameterization scheme.

II. PRESENTATION OF RESEARCH

It's well known that the convection's parameterization is very critical in operational uses and for this reason an ingredients-based methodology has been introduced in the forecasting procedures at our laboratory. In literature a lot of indices to forecast the probability and intensity of convective systems (Haklander et al., 2003) with different thresholds values valid for different region of the world are present (Doswell et al., 1990, Manzato, 2003, Jacovides et al., 1990). Many of theses indices are operationally used at LaMMA.

A recent work has been done to create two new indices combining a set of the literature indices and thresholds with the aim of providing a summarizing product for the forecaster.

The first index, called Instability Indicator, describes if the environment is favourable to convective systems with a set of probability classes (low, medium, high, extreme). This index uses the combination of Lapse-Rate, Total Total , Cross Total, etc.

The second index, called Severe Index describes the energy of the environment to produce severe weather in terms of strength classes (ordinary, moderate, strong, extreme) . The Severe Index combines CAPE, LI, BRN, SWEAT INDEX, etc with thresholds adapted from literature to Italy.

In the present paper we want to analyse the performance of this two new-combined indices (Instability Indicator, Severe Index) in comparison with the well-known indices of literature in some case-studies with ordinary convective cells and with severe weather conditions. Besides we will verify the thresholds of the different literature indices to improve the actual thresholds of the new indices.

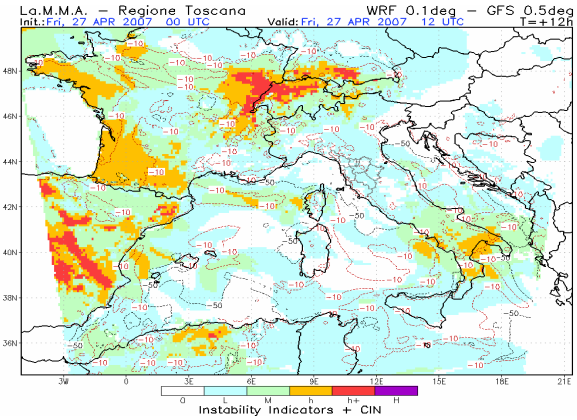

FIG. 1: Example of Instability Indicator + CIN forecast's map.

In order to establish the skills of the new indices we use several data sources, among the other the CESI-SIRF lightning detection network for cloud to ground lightnings in Italy, ground station data for rain intensity and cumulate precipitation, cloud top temperature from IR satellite images, severe weather databases or media-information for hail, tornado detections, squall lines and other MCSs.. Different performances will be estimated using WRF-NMM with ECMWF and GFS initializations.

III. REFERENCES

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