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Statistical forecast of thunderstorms from model-derived instability indices in NE Italy

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Thunderstorms are a form of severe weather that can have high-impact and cause many problems on safety of everyday life and energy-managements issues. For that reason thunderstorm forecasting is important, but it is also a challenging problem. In this work we propose a statistical technique of forecasting thunderstorms, interpreted as the "probability of lightning occurrence", based on a stepwise linear multi-regression of instability indices calculated on forecasted atmospheric vertical profiles. The algorithm is developed on the ECMWF NWP data from 2006 to 2012, having at 0.25 degrees of spatial resolution and with the full vertical resolution available in the troposphere, with the aim to estimate the number of cloud-to-ground lightning occurring in a particular grid-box for a given 6-hour period of the day.
Since the domain (NE Italy), on which the algorithm is developed, has different topographical characteristics, ranging from coastal to mountain areas, and the lightning climatology has a seasonal cycle, the instability indices, used as candidate predictors, are spatially and temporally homogenized referring to their climatological value (mean and standard deviation) for each grid-box, Julian day and period of the day.
This method could be arranged in more complex weather nowcasting systems as the system developed in the INCA-CE project, giving a contribution to the nowcast and alert of severe weather such as thunderstorms.