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SEMINARIO DEL GIOVEDI'
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"Improvement of RAMS precipitation forecast at the short-range through lightning data assimilation"

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ABSTRACT

This study shows the application of a total lightning data assimilation technique to the RAMS (Regional Atmospheric Modeling System) forecast. The method, which can be used at high horizontal resolution, helps to initiate convection whenever flashes are observed by adding water vapor to the model grid column. The water vapor is added as a function of the flash rate, local temperature, and graupel mixing ratio. The methodology is set up to improve the short-term (3 - 6 h) precipitation forecast and can be used in real-time forecasting applications. However, results are also presented for the daily precipitation for comparison with other studies.

The methodology is applied to 20 cases that occurred in fall 2012, which were characterized by widespread convection and lightning activity. For these cases a detailed dataset of hourly precipitation containing thousands of rain gauges over Italy, which is the target area of this study, is available through the HyMeX (HYdrological cycle in the Mediterranean Experiment) initiative. This dataset gives the unique opportunity to verify the precipitation forecast at the short range (3 - 6 h) and over a wide area (Italy).

It is shown that the precise location of convection by lightning data assimilation improves the precipitation forecast at fine scales (meso-β).

The application of the methodology to 20 cases gives a statistically robust evaluation of the impact of the total lightning data assimilation on the model performance. Results show an improvement of all statistical scores, with the exception of the bias.

Biografia.

Stefano Federico is researcher at ISAC-CNR (Institute for Atmospheric Sciences and Climate – National Research Council) since 2005. He received the degree in physics at University of L'Aquila in 1995 and the PhD in physics in 1999 at University of Calabria.
His PhD thesis was on the "Dynamic Climatology of Calabria" where he applied a numerical mesoscale model to study the interaction between the sea-breeze and mountain-valley flows to a region characterized by a well defined Mediterranean climate.
In 1997 he was visiting scientist at University of Colorado, Fort Collins (CO), where he learned to run the RAMS (Regional Atmospheric Modeling System), that was later used for operational weather prediction over Calabria.
His main research field is mesoscale modeling, both research and application, with particular emphasis to the study of the interaction between Mediterranean cyclones and the complex orography of the Italian peninsula. Recently, he applied data assimilation (3D-Var and nudging) to improve the prediction of meteorological models, especially at the short-term. Other interests are descriptive and physical climatology.
He participated to several national and international programs and coordinated three research project funded by Calabria Region. He is author of more than 80 papers on peer reviewed journal.