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Rainfall estimation based on MSG observations: operational issues and applications

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LaMMA (Laboratory for Meteorology and Environmental Modelling, http://www.lamma.rete.toscana.it) is an initiative of the Regione Toscana, presently managed by CNR-IBIMET. The main tasks of LaMMA are research, technological transfer and service provision in support of the regional and national operational organisations, in the fields of meteorology and environmental monitoring.

The main research results are continuously integrated in the operational services of LaMMA, as daily public forecasts for different TV and radio programs, as well as forecasts and nowcasts for supporting (even h24) Civil Protection decisions during severe weather events (storms, flash floods, snow, etc.).

Hydrogeological disasters are among the sources of main concern (in terms of expense and health risk) in Tuscany, but generally in Italy and in several European and world countries. If their link to rain is widely apparent, precipitation itself (together with hydrological mechanism) remains largely a matter of study. Therefore the importance of knowing the space-time distribution and intensity of rain fields is well understood.

An MSG-SSM/I satellites based rainfall estimation operational chain has been implemented at LaMMA by applying the Turk's rapid update of rainfall technique. This

technique allows to blend the microphysical characterization of MW-based sensors and the advantages of space resolution and refresh time of MSG satellite. A validation phase over Tuscany has been performed, in order to have a meaningful number of case-studies necessary to classify the algorithm performances versus different meteorological conditions and precipitating systems.

In order to improve quantitative precipitation forecasts of RAMS (Regional Atmospheric Modeling System), the atmospheric model used operationally at LaMMA from 1999, a method for diabatic assimilation of the convective part of rainfall fields in the first hours of the forecast simulation has been developed and tested, both with simulated and observed data.

All these methods have been designed in order to be integrable in a unique nowcasting/forecasting system, and in a way compatible with the operational constrains of the routine LaMMA activities.

The main characteristics of the operational chain for satellite precipitation estimation is presented, as well as the principal validation results. Finally some relevant outcomes of the assimilation of such precipitation fields in RAMS are shown.