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Cloud physics guidance in morphing precipitation for nowcasting applications

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Recently NOAA proposed a morphing approach (CMORPH) to the satellite-based precipitation mapping in which precipitation estimates derived from microwave satellite scans are propagated by motion vectors derived from geostationary satellite IR data. Actually, CMORPH is not a precipitation estimation technique but rather a technique that creates spatially and temporally complete information using existing precipitation products like those derived from passive microwave observations. The very appealing characteristic of CMORPH, respect to other MW-IR combined approaches for estimating precipitation, relies on the fact that IR measurements are used only as a transport vehicle. Underlying assumption is that error in using IR to transport precipitation features is less than error in using IR to estimate precip. The limitation is that CMORPH estimates are available about 18 hours past real-time. Although more timely estimates, 3 hours past real time, are distributed by NOAA using the QMORPH, based on persistence of the precipitation pattern in the moving coordinates (Lagrangian Persistence, LP). The physical limit to the predictability by LP is growth and decay that can be only partially overcome by enhancing the spatial resolution of the advection vectors. The real challenge relies upon the possibility to recognize the cumulus stage development of small convective cells and use also this additional information to drive the morphing phase. The topic will be discussed through the multisensor analysis of the 22nd May 2005 event occurred over Piemonte and recorded in detail by the ARPA Piemonte C-band polarimetric radar systems. A deeper understanding of the dynamical and microphysical processes, especially at the initial stage of convective cells, has been derived by SEVIRI IR brightness temperatures coupled with particle identifica-

tion carried out by polarimetric radar observations, and related with the ongoing lightning activity. The effect on the satellite based predictability of the storm evolution has been finally evaluated by comparing IR-based cloud advection vectors and Doppler radar-based advection of precipitation and their effect on the precip nowcasting over the orographically complex sub-Alpine environment. The analysis of the potential of morphing approach and its operational implementation is included in the framework of EUMETSAT SAF on Support to Operational Hydrology and Water Management(H-SAF).