A nowcasting technique for cumulative rainfall for the Mediterranean basin

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In this paper we propose a nowcasting technique for the prediction of cumulative rainfall every fifteen minutes on an area of 50 x 50 km2 pixels. The nowcasting technique is based on the estimation of the cumulative rainfall obtained by radar measurements, and on the nature of cloudiness determined by means of the SEVIRI instrument aboard MSG-3 satellite.

For a given initial instant, we predict the cumulative rainfall estimated by radar for the next fifteen minutes, using the cumulative rainfall relative to the previous 15 minutes together with the degree of cloudiness for the same initial instant.

The radars provide the reflectivity measure every fifteen minutes for pixels of about 1 km on each side. To estimate the cumulative rainfall we have applied the Marshall Palmer relation for two consecutive measurements of radar reflectivity and then we have averaged the instantaneous rainrate value. To verify the reliability of this method, we compared the radar results with the measurements of cumulative rainfall measured by raingauges on the covered area by these instruments. The raingauge measure of cumulative rainfall is punctual as it collects the rain on an area of a few square decimeters. To obtain comparable results with the radar measures we spatialized the raingauges measurement results. Our results show a good correlation between the cumulative rainfall data obtained from the raingauges and those obtained by the radar measurements for an area of 50 x 50 km2 pixels. To determine the nature of the cloudiness we use the MSG-3 measurement channel at 10.8 mm, which provides the thermodynamic temperature of the cloud top or of the ground in case of clear sky.