Scale characterization and correction of diurnal cycle errors in MAPLE

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Lagrangian extrapolation of recent radar observations is a widely used deterministic nowcasting technique in operational and research centers. However, this technique neither takes into account errors due to changes in precipitation motion nor for the non-systematic growth and decay, thus limiting forecasting skill.

In this work, McGill Algorithm for Precipitation Nowcasting by Lagrangian Extrapolation (MAPLE) errors have been computed for 9 years of data. The study of these errors has shown an important and systematic error due to the diurnal cycle. This error is related to the solar cycle during the day that causes an increase on the average rainfall intensity in the afternoon and a decay of the average rainfall intensity during the night. However, this external forcing interacts with the atmospheric system creating local growth and decay depending on orography, land use, cloud coverage, etc. For example it can be observed that in sea areas this effect is temporally shifted. For this reason, the diurnal cycle signal in the errors has been studied at different locations, scales and lead-time in order to recognize where, when and for which scales the signal is significant.

This information has been used in the development of a scaling assimilation scheme where the systematic biases due to the diurnal cycle are corrected. The results show that the developed methodology improves the forecast for the scales and locations where the diurnal cycle signal is significant.