

ABSTRACT

7th International Conference on Meteorology and Climatology of the Mediterranean

Spain | Palma | 4 – 6 March, 2019



Id

987

Date

11/07/2018 09:57:11

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Country	Spain	Spain	Spain	Spain	Spain

Session

4) Numerical modelling

Title

Nowcasting precipitation techniques applied to the heavy rainfall event that flooded Sant Llorenç des Cardassar

Abstract

The Mediterranean area is exposed to intense and persistent precipitation events due to its climate and geomorphological characteristics. The presence of mountainous systems that extend parallel to the coast act as a natural barrier that causes wet air from the sea to ascend rapidly forming and intensifying the storms. Flash floods resulting from these storms are among the most severe natural hazards in this area. Such events are difficult to predict with Numerical Weather Prediction (NWP) models but can be anticipated using shorter-term nowcasting techniques. Nowcasting techniques based on radar observations (Eulerian and Lagrangian persistence) show significant skill in forecasting precipitation (location and intensity) for short lead times. This skill decreases with increasing lead time since only past precipitation trends are used to predict changes in precipitation. On the other hand, operational NWP models are now beginning to resolve important processes such as convection, however their predictive skill generally remains limited during the first time steps. Spin-up time is also an important issue, as it covers the time window of the nowcasting-scale forecasts. To improve the forecast skill of storms in the first six hours of the forecast, we implement a new nudging scheme in WRF. The method is based on the assimilation of radar reflectivity data, which is used for scaling the model profiles of latent heat. The process is applied throughout a pre-forecast period (two hours) which results in an increased adjustment to the real state of the atmosphere. In this study we analyse and compare precipitation forecasts developed using different nowcasting techniques based on radar observations and NWP models for the heavy rainfall event that flooded the region of Sant Llorenç des Cardassar in Mallorca on October 9, 2018, which operational NWP models did not predict.

Key words

nowcasting, flash flood, radar observations, WRF, Mallorca