

# Potential vorticity error assessment applied to ensemble forecasts of Mediterranean cyclones

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The western Mediterranean is a very cyclogenetic area and many of the cyclones developed over that region are associated with high impact weather phenomena that affect the society of the coastal countries. In the framework of PRECIOSO, a Spanish project devoted to improve the short and mid-range numerical forecasts of cyclones, ensemble prediction systems based on perturbed initial and boundary conditions are being designed. In this study, a Potential Vorticity (PV) Inversion Technique is used to perturb the initial state and boundary forcing of a mesoscale model. Original and perturbed PV fields in the three dimensional domain through the forecasting period are defined, and with the PV Inversion Technique the balance fields (temperature and wind) are calculated. Then, the difference between the original and perturbed balance fields provides the initial and boundary perturbations for each member of an ensemble of simulations. These simulations are performed with the MM5 mesoscale model nested in the ECMWF forecast large-scale fields, which provides results at 22.5 km resolution for a two-day period over the western Mediterranean countries (Domain 1 in <http://mm5forecasts.uib.es>).

In an attempt to introduce realistic perturbations in the ensemble prediction system, a PV error climatology (PVEC) has to be done. This climatology allows to perturb the ECMWF forecast PV fields using the appropriated error range. The PVEC is calculated using a large collection of MEDEX cyclones, and provides the displacement and intensity error of the PV fields in the study region. Analytical functions have been fitted to model the error statistics (percentile levels of displacement and intensity errors) as function of pressure level and PV value. This PVEC is used to implement the above mentioned ensemble system by randomly perturbing the fields. Preliminary results showing the potential of this methodology will be presented for selected MEDEX cyclones.