

# Case study on the impact of 3DVAR assimilation on ALADIN Morocco model

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## Abstract

This study concerns the situation of September 6<sup>th</sup>, 2010 which was characterized by a convective instability, associated to a warm and humid flow in the lower layers coming from the Canary Islands and approaching the Agadir bay. There was the development of convective clouds (Cb) in the afternoon and early evening on the Haouz, the High Atlas mountains and the south of the Oriental.

## Description of 3DVAR experiment

- Run : 06/09/2010 at 00UTC.
- Model : ALADIN MAROC (16 km)
- Lateral boundary conditions : ALADIN NORAF
- Cycle : cy32t3
- B matrix : NMC method
- Observations : SYNOP, SHIP, AIREP, DRIBU, TEMP, SATEM (AMSU-A, AMSU-B and HIRS)
- Reference for verification : ECMWF analysis

## Case choice

3DVAR simulation (EXP1) compared to dynamical adaptation one (EXP2) using ECMWF analysis as reference shows a larger bias of EXP2 concerning zonal wind at 700hPa level for 12hour forecast term (fig 1).

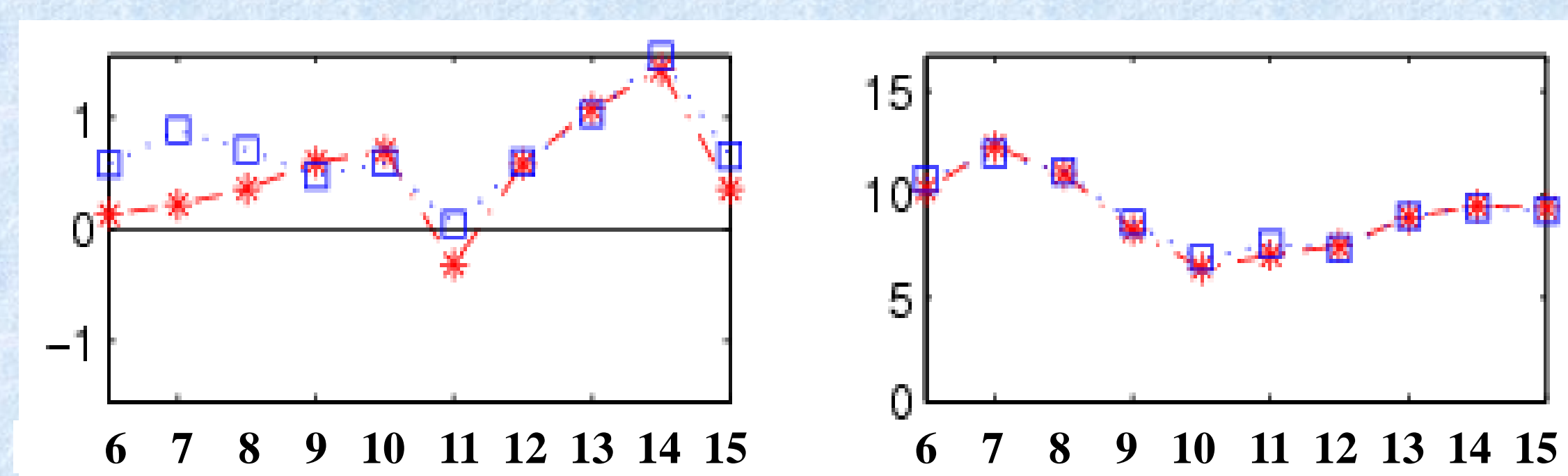


Figure 1 : Bias (left) and RMS (right) of zonal wind ( $\text{ms}^{-1}$ ) at 700 hPa level for 12hour forecast term from 6<sup>th</sup> to 15<sup>th</sup> September 2010. EXP1 (red) and EXP2 (blue)

## Comparison of results : 3DVAR versus Dynamical adaptation

The 12 hour forecast of EXP1 experiment shows a southwest wind (10kt to 15kt) associated with humidity flow on the Agadir bay at 700hPa (figure 2-a). At 18 hour the model simulates a moisture infiltration on the continent associated with convergence in the same region (figure 2-d).

The 3DVAR analysis has a significant impact on the wind pattern. Indeed, there is at 12hour and at 18hour a change of the wind direction (from southwest to west) and speed (5kt) over the target area (figures 2-b and 2-e), which is closer to the reference simulation (figures 2-c and 2-f). This change in wind speed and direction at 700hPa involves a repositioning of humidity areas in a configuration more consistent with the ECMWF analysis.

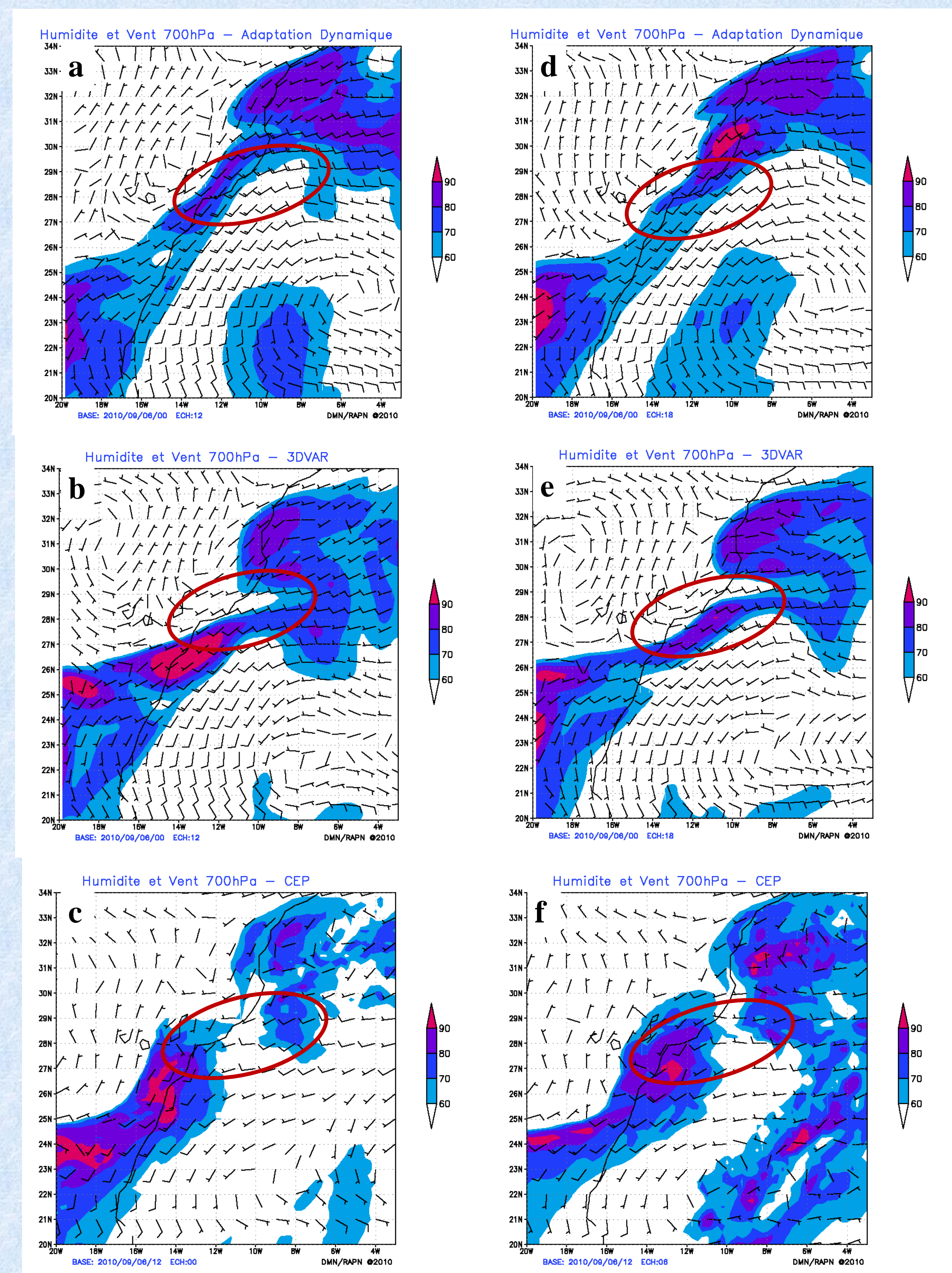


Figure 2 : Forecast of wind and Relative humidity at 700 hPa. a) EXP2 at 12UTC, b) EXP1 at 12UTC, c) ECMWF at 12UTC, d) EXP2 at 18UTC, e) EXP1 at 18UTC, f) ECMWF at 18UTC

## Conclusion and future work

- For the situation of September 6<sup>th</sup> 2010, 3DVar analysis allowed a better prediction of wind and moisture (key parameters in this situation) over the southern region of Morocco.
- Ongoing work :
  - ✓ New 3DVAR suite (cy36, 10km) on HPC (new calculator).
  - ✓ B matrix with ensembles method.
  - ✓ Surface analysis (canari, blending).
  - ✓ Assimilation of new observations : ATOVS from METOP, SEVIRI, GPS zenithal delay.
  - ✓ Assimilation of pseudo observation : Potential vorticity from GOME-2/METOP ozone.