ALADIN Related Activities in TUNISIA

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ALADIN

ALADIN new operational configuration

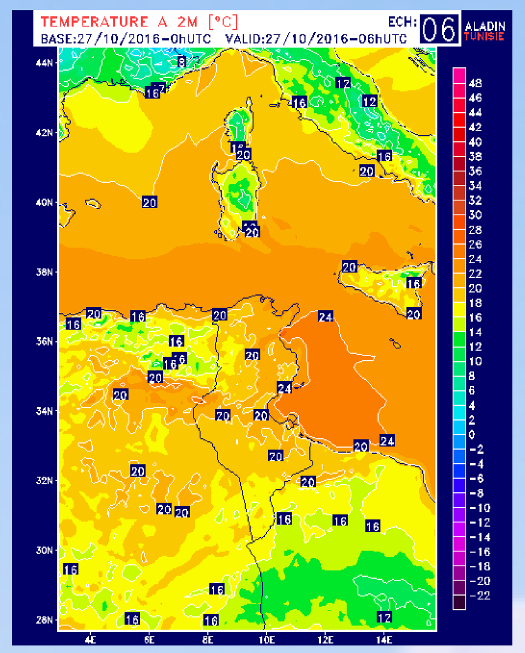

Figure 1: Surface Temperature for October 27th 2016 at 06 UTC ALADIN 7.5km

INM has considered a new ALADIN operational version since October 2016, the new version turns with SURFEX at a 7.5km of resolution and runs on HP Proliant Dl560 Gen8 machine.

Table 1 : Operational ALADIN-Tunisia Model

Parameter	Value
Model Version	CY38t1_bf.03
Resolution	7.5 km
Levels	70
Area	130 x 169
Boundaries	ARPEGE
Time step	450 s
Starting times	00 HTC

3DVAR Data Assimilation Implementation

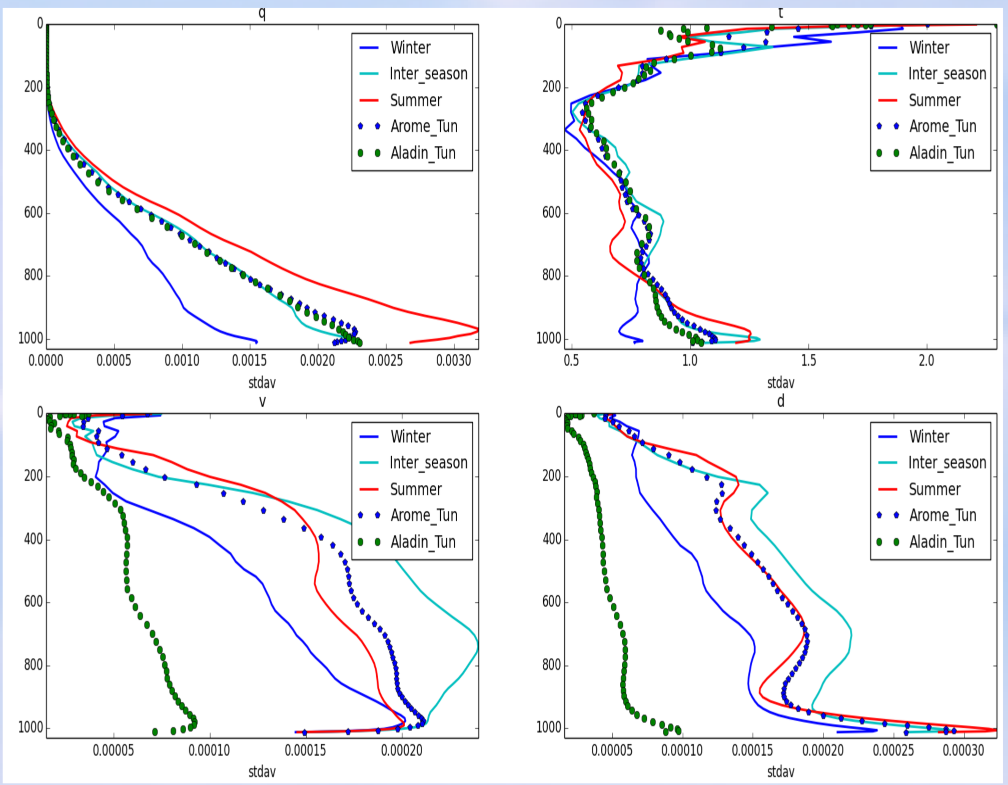

Figure 2: Vertical profile of the standard deviation of specific humidity (q), temperature (t), vorticity (v) and divergence (d) for AROME-TUNISIA during winter (blue line), inter-season (cyan line) and summer (red line) periods; AROME-Tunisia (mean of the 3 periods) (blue dot) and ALADIN-TUNISIA (green dot).

Background error covariance matrix computation and assessment for AROME 2.5 km & ALADIN 7.5 km

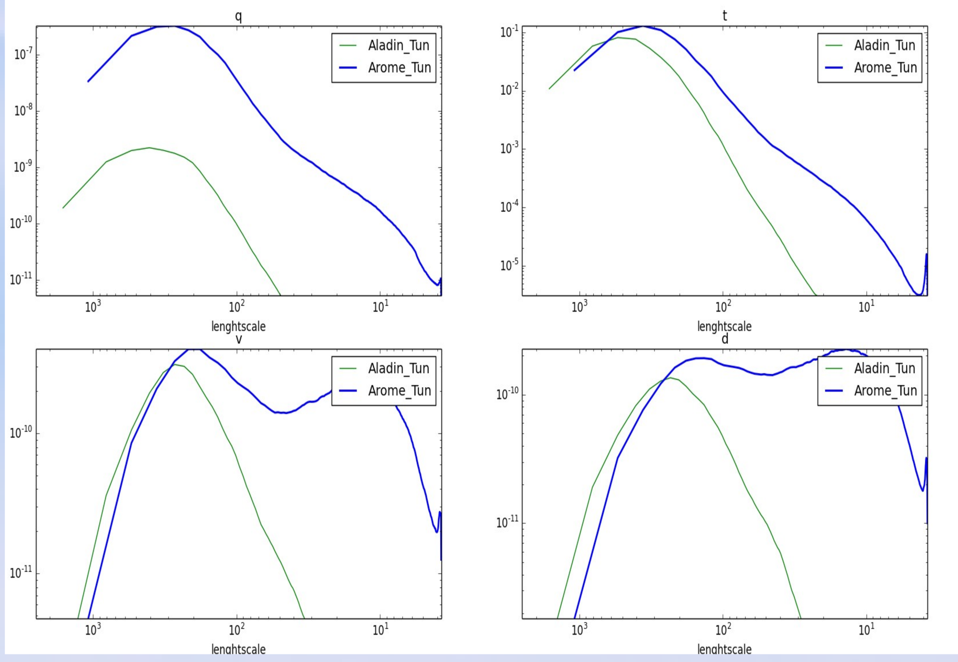

Figure 3: Horizontal variance spectra at 800 hPa of specific humidity (q) temperature (t), vorticity (v) and divergence (d) for AROME–Tunisia (blue) and ALADIN-TUNISIA (green)

On the 23th of September 2016, a flood event occurred on the Tunisian eastern cost caused by an intense **convective system** where we recorded more than **120mm** of precipitation in 24H near Sousse. This case study shows the data assimilation impact on the forecast of the precipitations.

Although both AROME-3DVAR and AROME Spin-up configurations predicted well the situation, AROME-3DVAR gave more accurate forecasts for the precipitation amount and the convective cell localization.

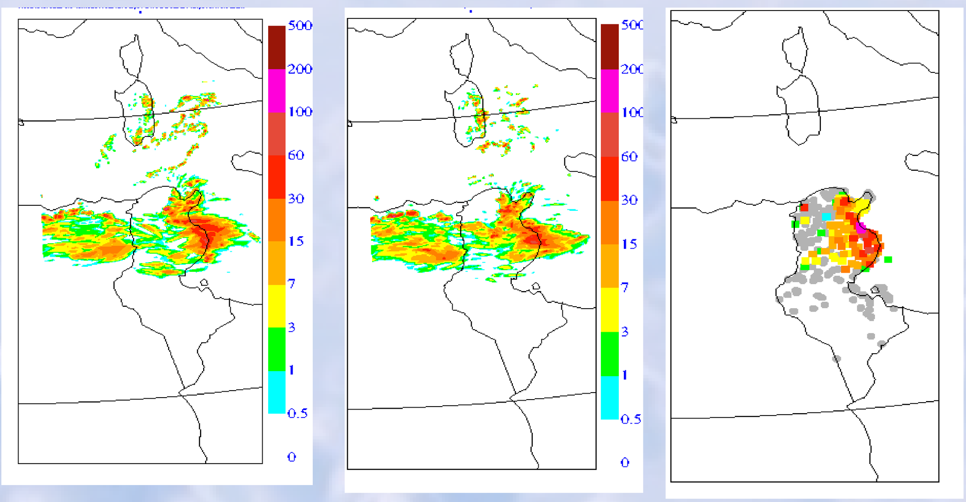

Figure 4: 24H accumulative rainfall for September 23rd 2016

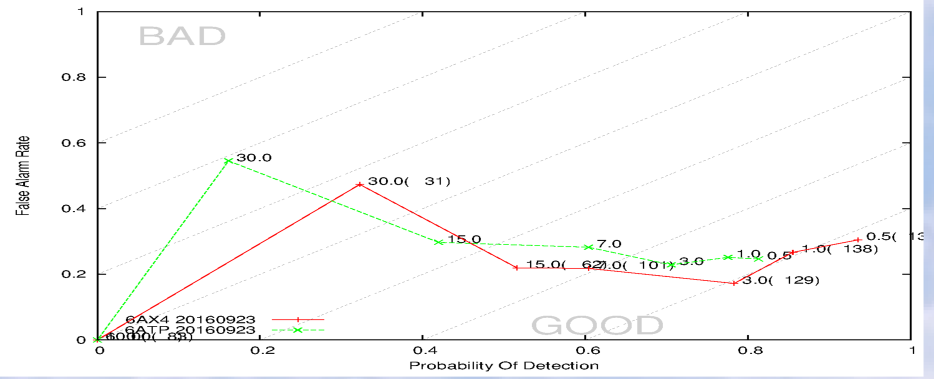

Figure 5: Detection Rate and False alarm rates for September 23rd 2016

As it is shown in the figure 5, AROME-3DVAR (red line) improved the detection rate and reduced the false alarm rate for all the thresholds compared to AROME on spin-up mode (green line).

AROME-Medjerda: A Tool for a Better Decision Making

The catchement of Medjerda, located in the north-western region of Tunisia, is an area at risk that suffers from severe flooding every year.

As it holds the biggest river in Tunisia and several dams around it, Medjerda watershed represents an important hydrometeorological study area.

The need of a better forecast over this area leaded to configure a new AROME domain with a 1.3 km resolution.

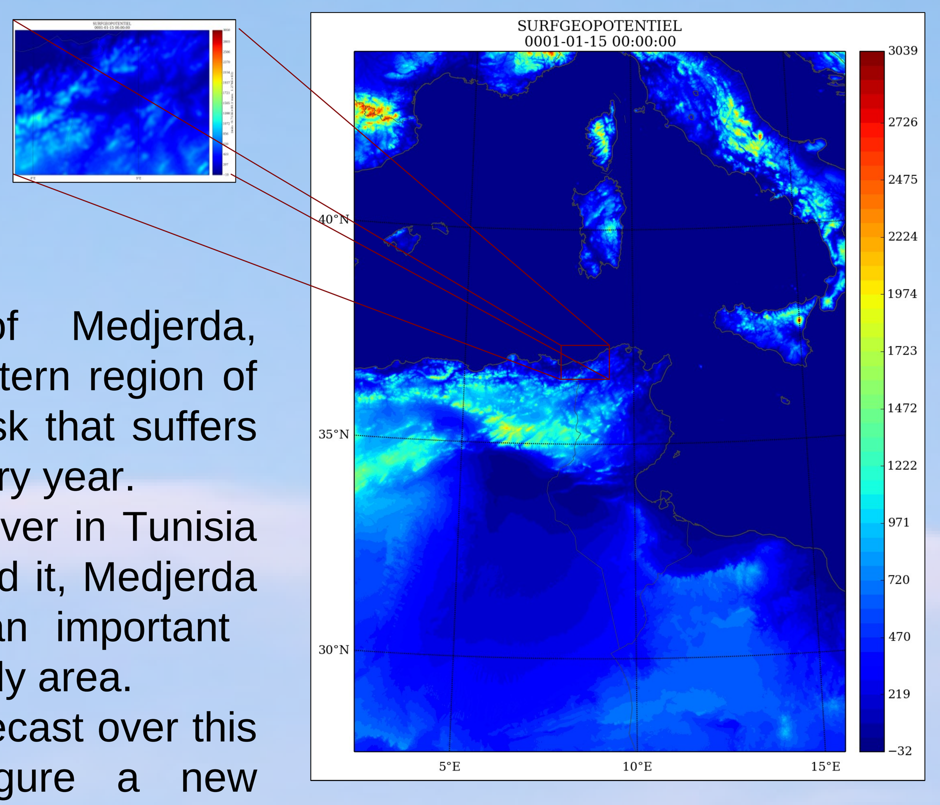

Figure 6: Terrain map of AROME-Tunisia domain (km)

Table 2 : AROME-MEDJERDA Model

Parameter	Value
Model Version	CY40_OP.02
Resolution	1.3 km
Levels	90
Area	128 x 85
Boundaries	ARPEGE (10 km)
Time step	45 s
Forecasts	Hourly

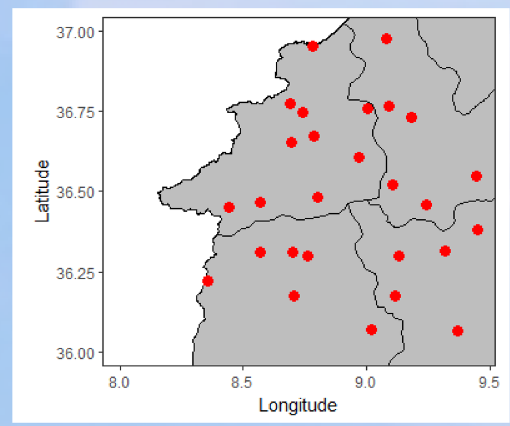

Figure 7: Rainfall observation stations in AROME-Medjerda domain

Tunisia is periodically affected by floods and sometimes catastrophic floods which can lead to loss of lives and heavy material damage. This was the case on February 25th and 26th 2015. Severe thunderstorms hit the northwestern region of the country and were accompanied by heavy rainfall, hail falls and strong wind gusts. The torrential rains exceeded 100mm (141mm fell in Bni Metir, Department of Jendouba)

This heavy rainfall event caused the overflow of the Medjerda river and resulted in considerable material damage in residential communities as well as in the agricultural areas.

How did AROME-Medjerda predict these events?

— In order to evaluate the AROME-Medjerda configuration, case studies are underway and the results are promising.

Concerning the case of February 25th and 26th floods, results of AROME-Medjerda simulations were compared to those provided by the ALADIN-Tunisia 12.5km, and to available observations from rainfall stations (Fig.3) in the area of interest.

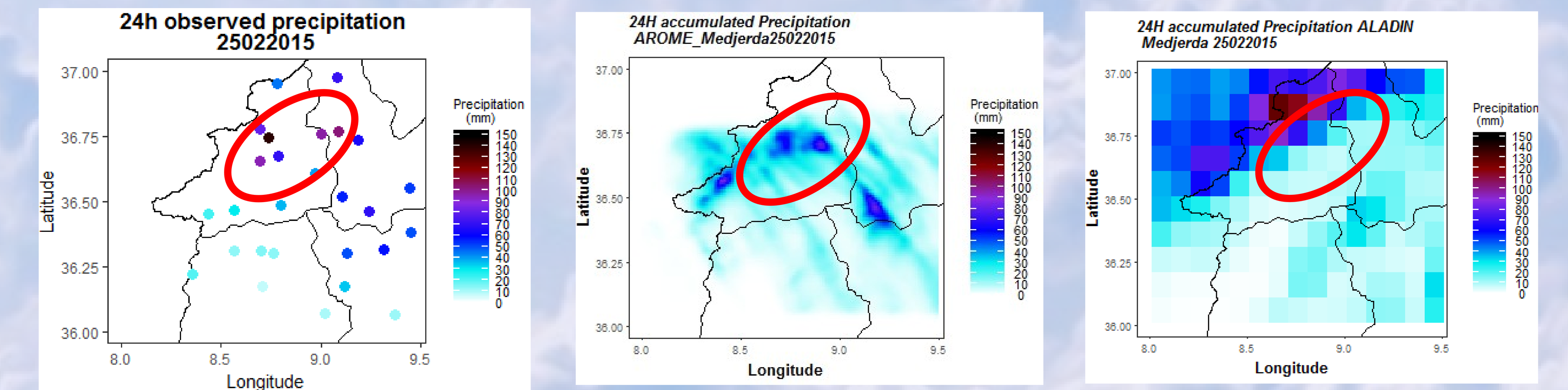

Figure 8: 24h accumulated rainfall for February 25th 2015
From Left: Observation, AROME-Medjerda and ALADIN12.5km forecasts

Case of February 25th and 26th 2015

This case study showed AROME-Medjerda's ability to well localize the nucleus of heavy rainfall being closer to the observations (red circles in Figure 4 and Figure 5) with more realistic simulations of the convective cloud structure.

In addition, the localization was improved compared to the results of the ALADIN model which shifted the core of rainfall to the coast at Tabarka City.

Other intense nuclei have been predicted by AROME-Medjerda, notably on February 26th 2016 but have not been validated due to lack of observations.

Thus, AROME-Medjerda delivers additional and much more detailed information needed by forecasters and managers to refine their forecast and policies, particularly in terms of the meso-scale meteorological phenomenon localization, hence its interest in the decision-making perspective.

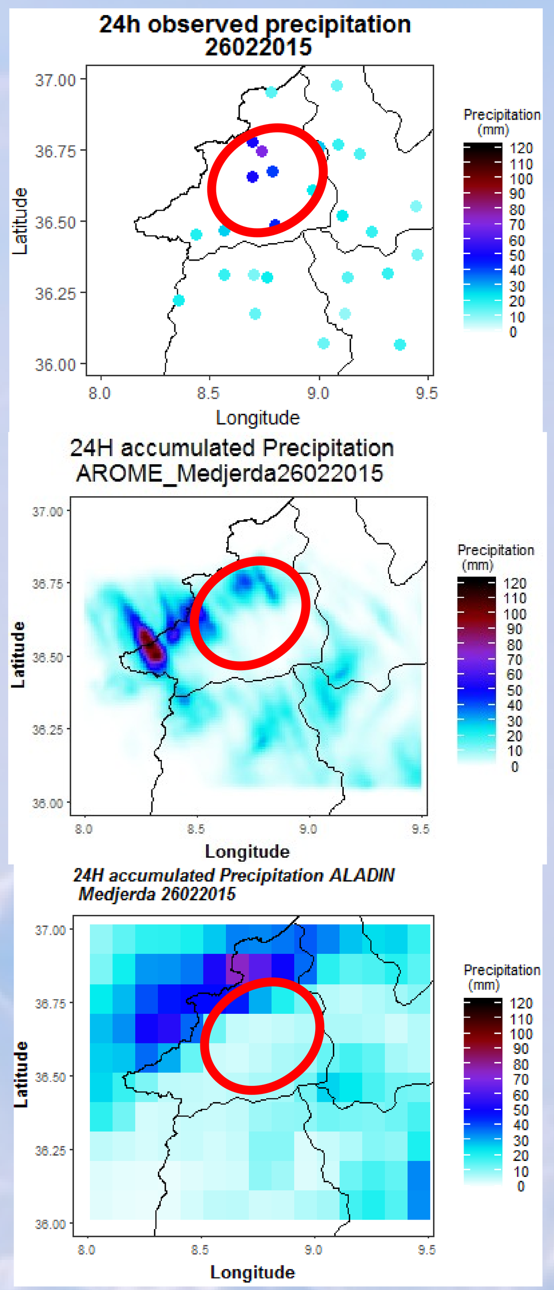

Figure 9: 24h accumulated rainfall for the February 26th 2015
From Top:
Observation, AROME-Medjerda and ALADIN12.5km Forecasts