Operational ALADIN forecast in Meteorological and Hydrological Service of Croatia

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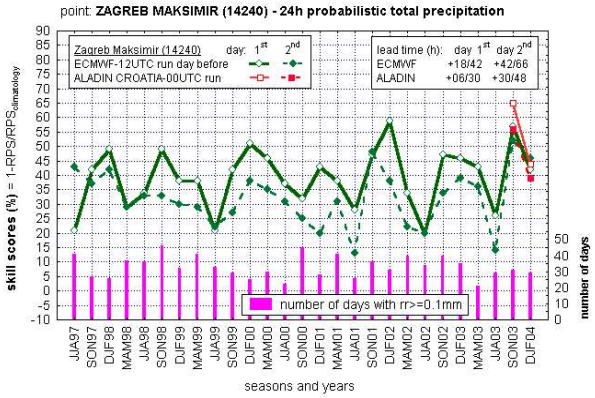
1. Summary

In the Croatian meteorological service ALADIN is operationally run twice a day, for 00 and 12 UTC. Coupling files are retrieved from ARPEGE (Météo-France global model) via Internet and RETIM2000. Model resolutions are 12.2 km for the LACE domain, 8 km for the Croatian one and 2 km for the high-resolution dynamical adaptation domains. The execution of the suite is controlled by Open PBS (Portable Batch System) as queuing system. During the last period more attention was paid to verification of the operational forecast and a few case studies of cyclones in the Adriatic. Results are shown below.

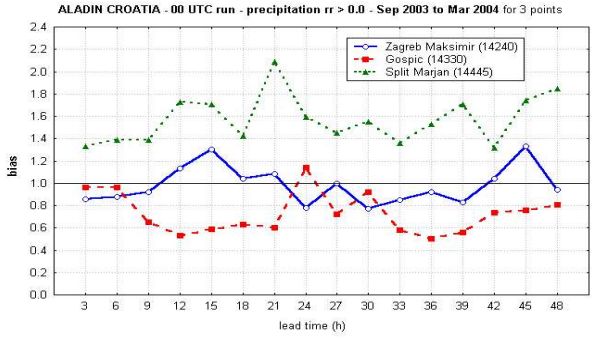
2. Verification

2.1 Precipitation (1)



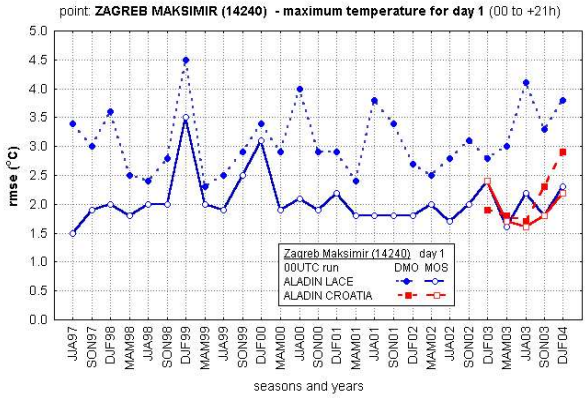
Skill scores for probability of precipitation made from ranked probability scores of quantitative ECMWF and ALADIN/CROATIA precipitation forecasts for "1st" and "2nd" day for Zagreb Maksimir (14240), from summer 1997 to winter 2003/04.
Probability precipitation forecasts are made from quantitative precipitation forecasts. The sum of 6-hourly (ECMWF) and 3-hourly (ALADIN) accumulations during the 24-hour period from 06 till 06 UTC (for 12 UTC model run: from t+18 to t+42; for 00 UTC model run: from t+06 to t+30) and "2nd day" (t+42 to t+66 and t+30 to t+48) is compared with the corresponding 24-hour accumulated precipitation for Zagreb Maksimir (14240) for the period summer 1997 to winter 2003/04. The contingency tables are made by 4 classes (no precipitation, trace to 1.0 mm, 1.1 to 5.0 mm and more than 5.0 mm).

2.2 Precipitation (2)



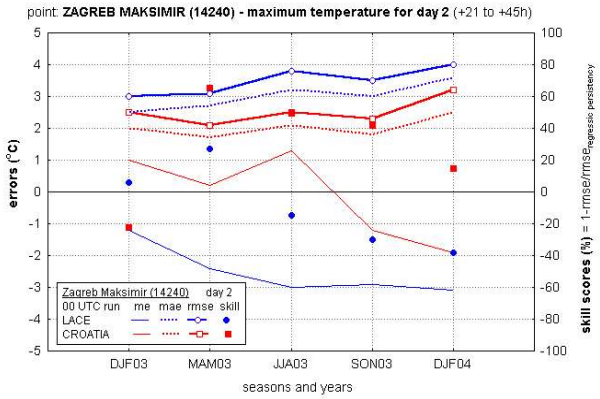
Bias for precipitation forecast (rain versus no rain) of ALADIN/CROATIA for Zagreb Maksimir (14240), Gospic (14330) and Split Marjan (14445), and year 2003.
Hilly point has underestimation. Sea point has overestimation. Heidke and Kuipers skill scores (not shown) are also relatively good (between 0.45 and 0.65 in the majority of cases).

2.3 Maximum temperature (1)



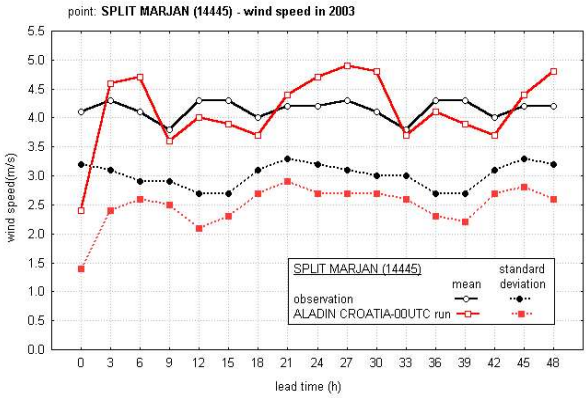
Root-mean-square errors of maximum temperature for day-1 forecast of ALADIN/LACE and /CROATIA for direct model output (DMO) and model output statistics (MOS), for Zagreb Maksimir (14240), from summer 1997 to winter 2003/04.
MOS are made by regression equations ($y=ax+b$) which were calculated from historic data for warm (April to September) and cold (October to March) parts of the year.

2.4 Maximum temperature (2)



Mean errors (me), mean absolute errors (mae), root-mean-square errors (rmse) and skill scores (skill) for maximum temperature for day-2 forecast of ALADIN/LACE and /CROATIA for direct model output, for Zagreb Maksimir (14240), from winter 2002/03 to winter 2003/04.
Reference forecasts used in calculating skill scores were regression persistency for minimum and maximum temperature, respectively; ($Txt=a*Txy+b$, Txt is today's maximum referent temperature, Txy is yesterday's maximum temperature, a,b are coefficients).

2.5 Wind



Mean error and standard deviation of ALADIN/CROATIA wind-speed for Split Marjan and year 2003.

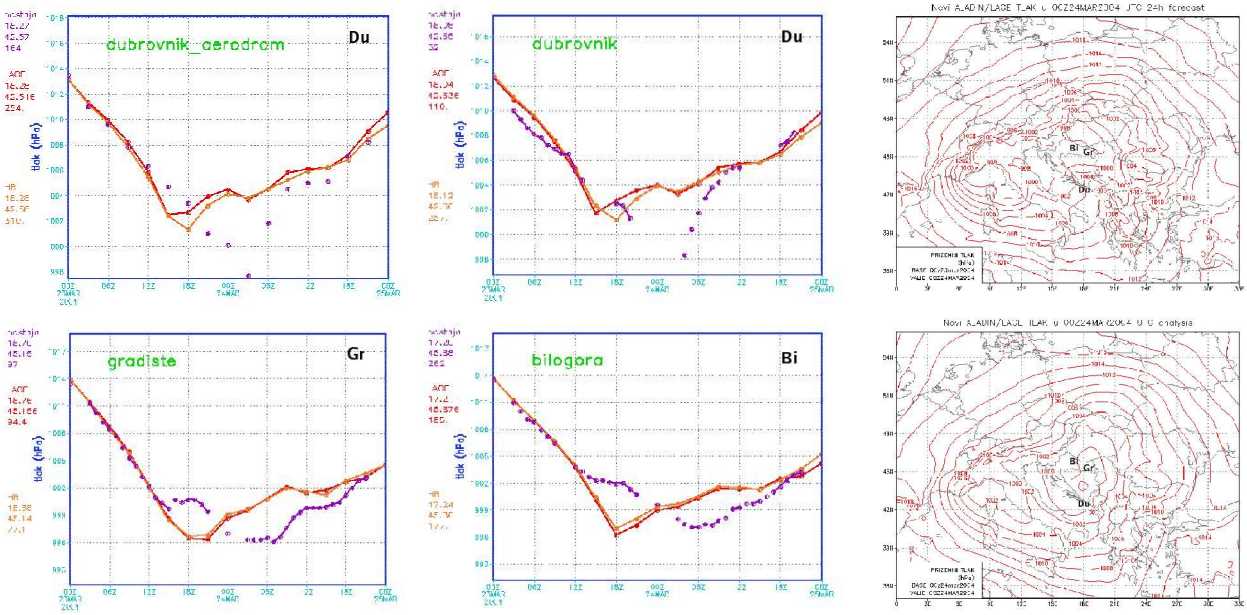
Forecasts are relatively good according to the observations. Problem with reference forecast occurs in calculation of skill scores (not shown) for both scalar and vector values. Wind at 00 UTC is not a good control forecast and mean resultant wind vectors for every day and hour during year are not available for all station.

3. Case studies

3.1 Adriatic cyclone (1)

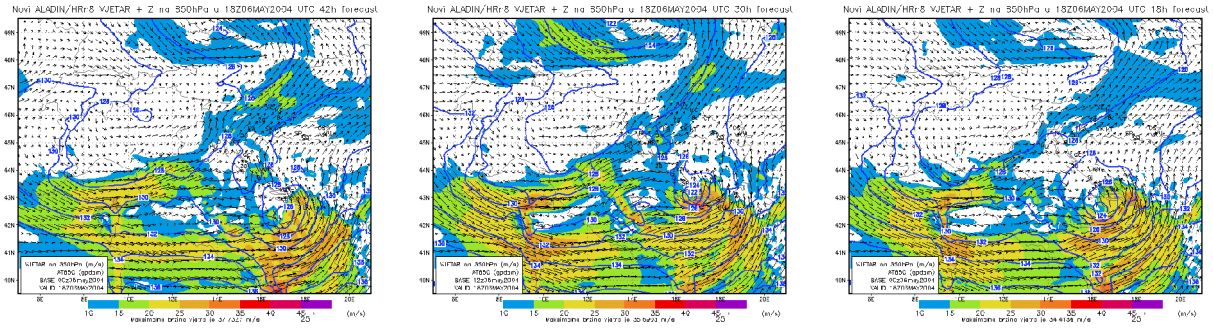
On 24th March 2004 03 UTC a cyclone stroke the southern part of Croatian coast in the Dubrovnik area. Unfortunately, the movement was forecasted too fast and the depth of this cyclone was severely underestimated.

Comparison of the forecasted mean-sea-level pressure at 12 km (red) and 8 km (orange) resolutions to measurements from the SYNOP (violet) stations is presented hereafter : mean-sea-level pressure forecast (top right) and analysis (bottom right) for 00 UTC 24th March 2004.

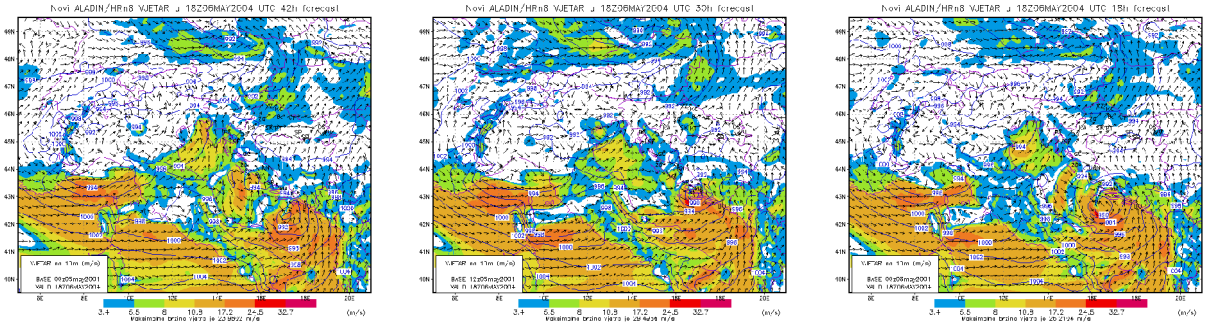


3.2 Adriatic cyclone (2)

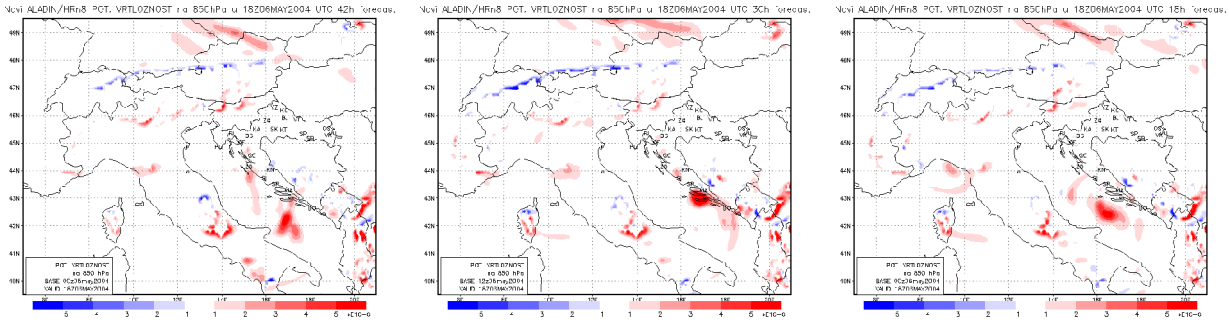
On 6th May 2004 18 UTC a small cyclone crossed the Adriatic to the Balkan peninsula. The depth, path and speed were reasonably well forecasted by the 00 UTC run from the day before. The next runs only confirmed this cyclone. The depth of the cyclone was a bit overestimated.



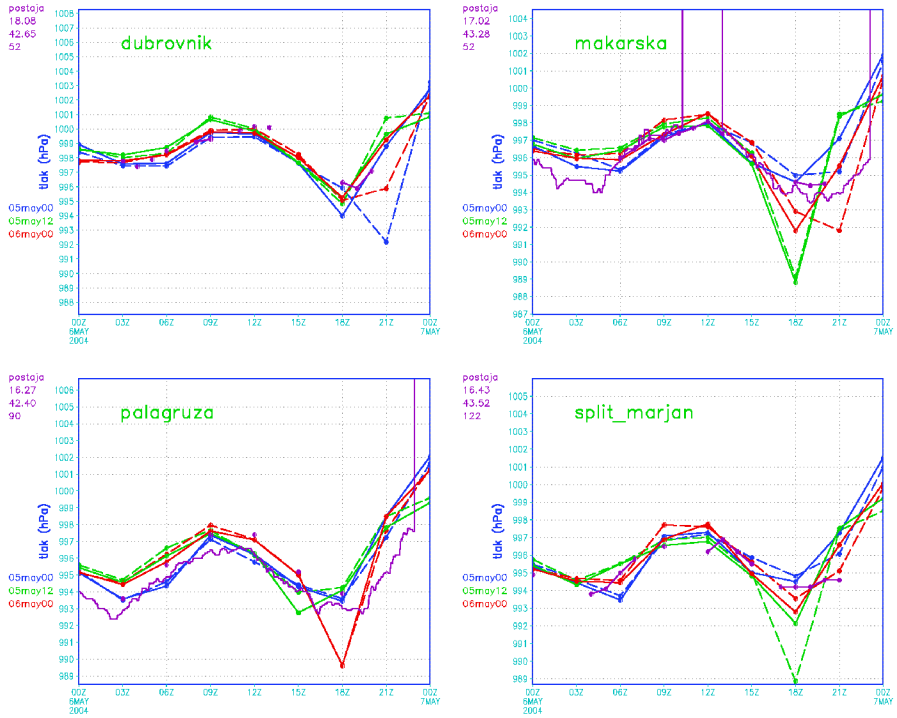
850 hPa wind and geopotential for : 42 hour forecast (left), 30 hour forecast (center) and 18 hour forecast (right) from 3 consecutive forecast runs for 18 UTC 6th May 2004. Although the position and depth vary, the cyclone persists through runs.



10 m wind and mean-sea-level pressure for : 42 hour forecast (left), 30 hour forecast (center) and 18 hour forecast (right) from 3 consecutive forecast runs for 18 UTC 6th May 2004.



850 hPa potential vorticity for : 42 hour forecast (left), 30 hour forecast (center) and 18 hour forecast (right) from 3 consecutive forecast runs for 18 UTC 6th May 2004.



Comparison of the forecasted mean-sea-level pressure from the 3 consecutive forecast runs (00 UTC run 5th May 2004 is blue, 12 UTC is green and 00 UTC run 6th May is red) with measurements from the SYNOP (violet, with dots) and automatic (violet line) stations.

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