Some aspects of the verification of deterministic ECMWF forecasts at Météo-France

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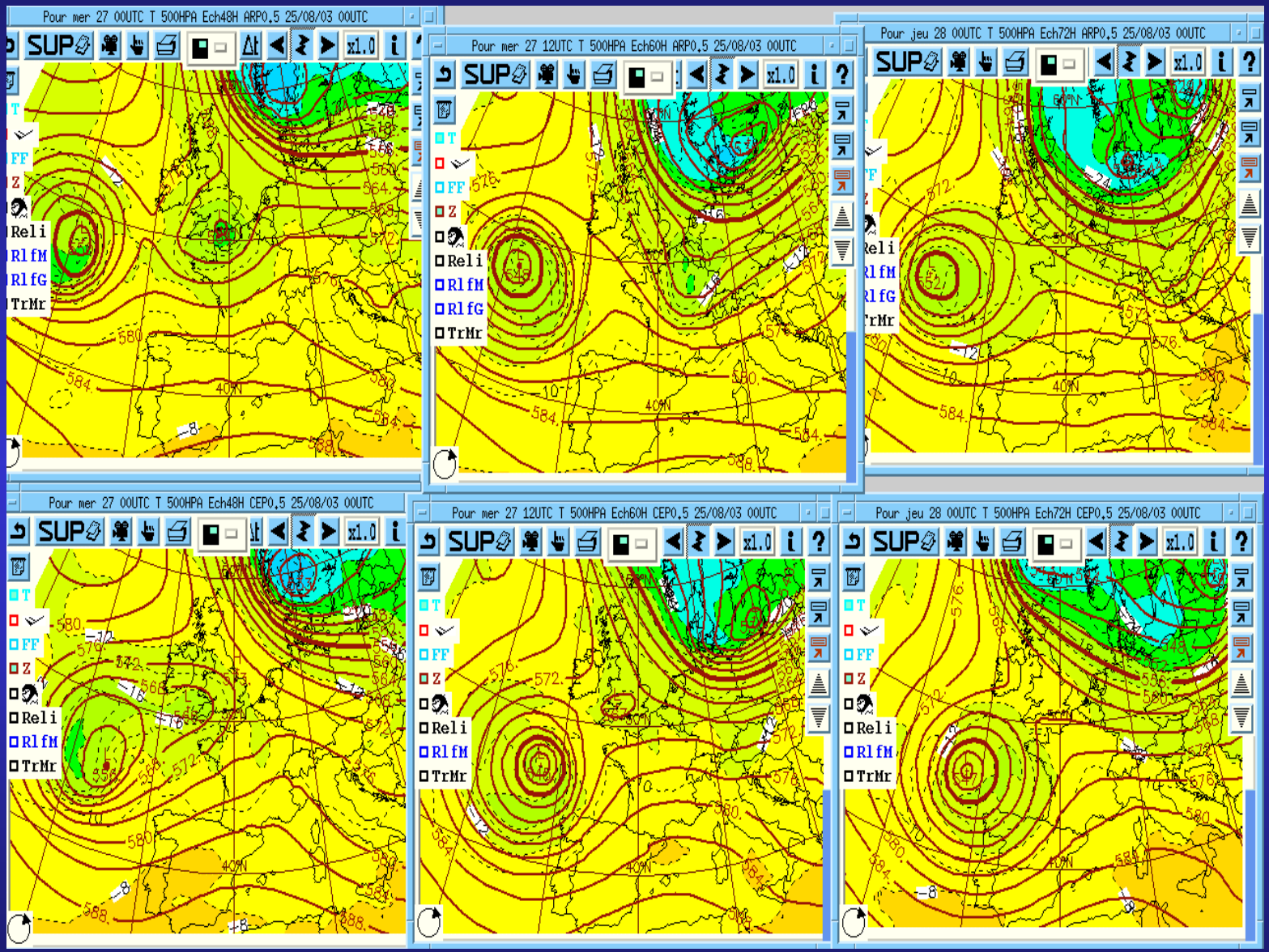
Topics

- 1) Objective comparison ECMWF T511 vs Arpège
  - Which one is better in average?
  - Are forecasts worse when not in agreement?
- 2) Subjective comparison ECMWF T511 vs Arpège
  - Is there a better model?
  - Are forecasts better when in agreement?
  - What about using a 3rd model?
- 3) Local wind forecasts
  - ECMWF T511 model vs Arpège/Aladin : the impact of model resolution

T511 vs Arpège : which one is better ?



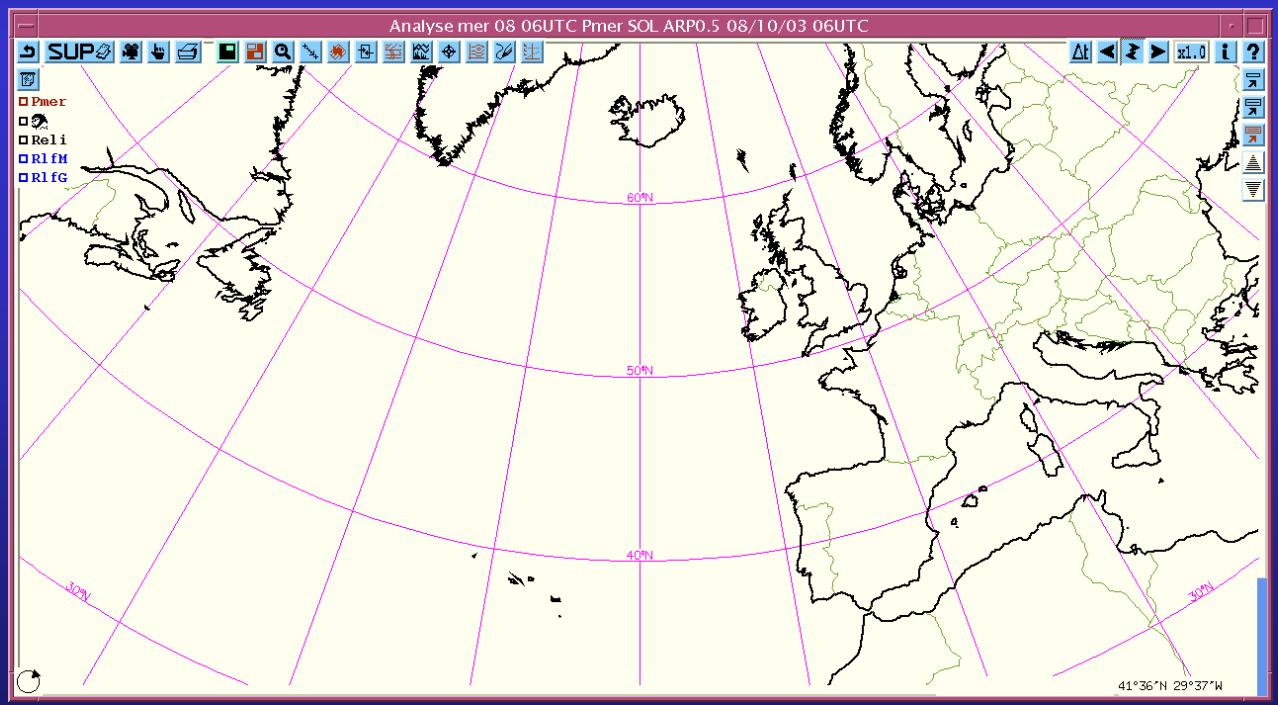
Arpège
+60h

T511
+60h

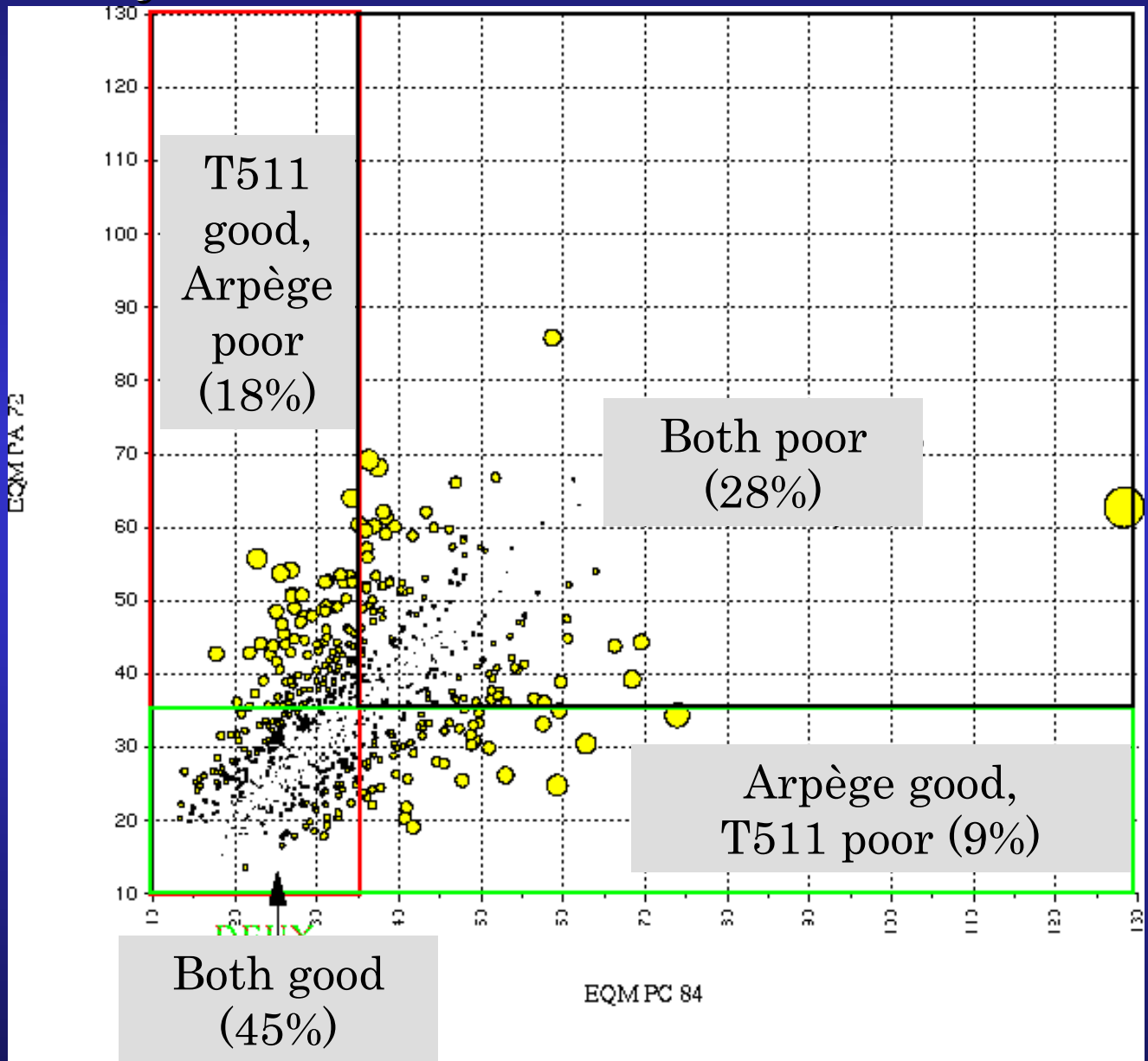
500-hPa geopotential height (day+1)

1) Objective verification

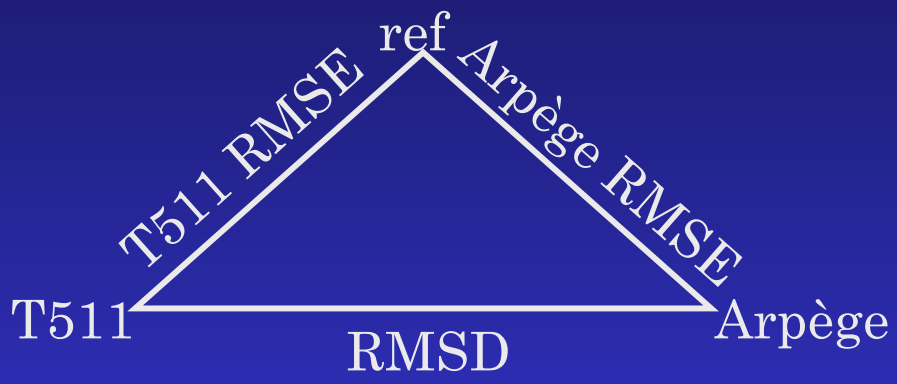
- 500 hPa geopotentiel height RMSE (error)
- T511 - Arpège RMSD (difference)
- Europe-Atlantic domain (synoptic scale)
- Verified wrt Arpège analysis



RMSE and RMSD
778 days (2001-2003) +72/+84 forecasts



Graphical representation



Both good

Arpège poor, T511 good

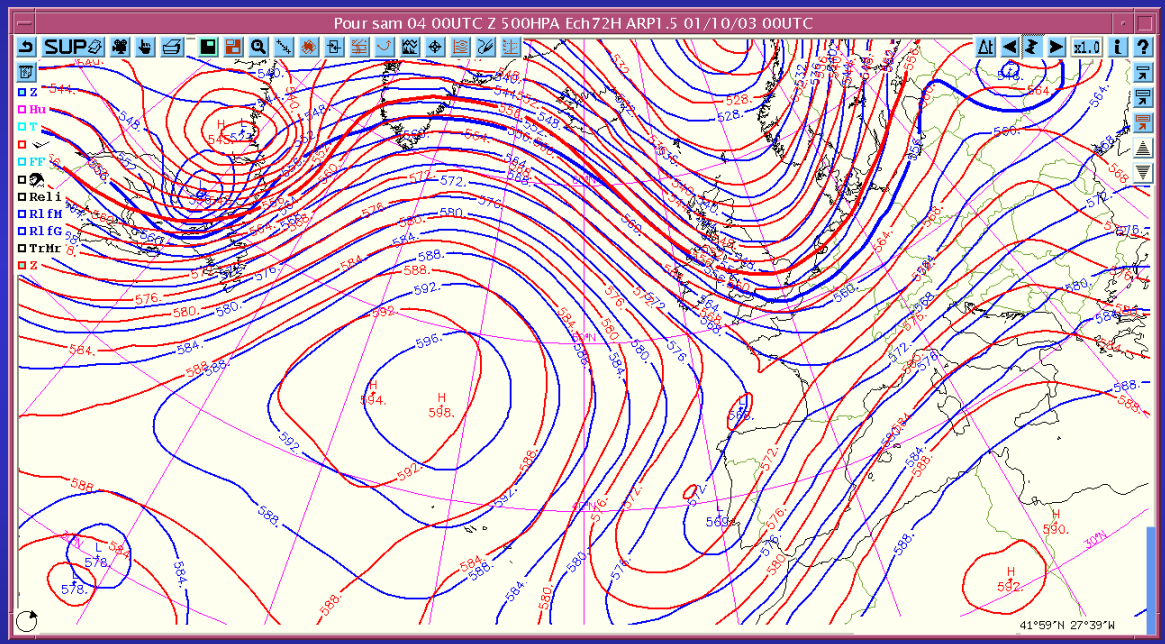
Arpège good, T511 poor

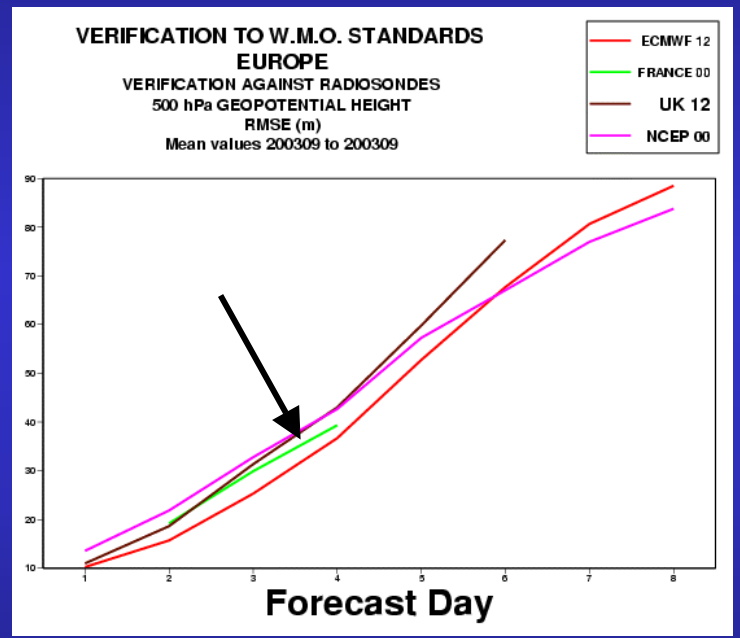
Both poor

Classification according to RMSD and RMSEs

Are forecasts better when in agreement ?

- What is a "good" forecast ? RMSE<35m
- What are "different" forecasts ? RMSD<35m
- 35m ~ day+2/day+3 forecast RMSE

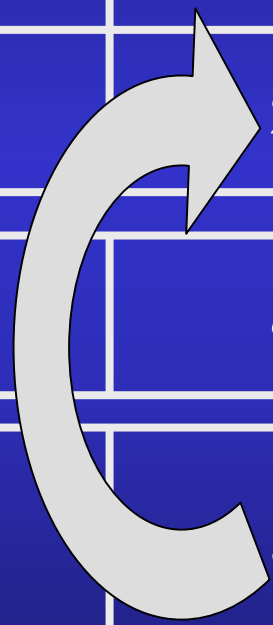




"Good" cases	General case	RMSD > 35m (48%)
Arpège RMSE < 35m	54%	29%
T511 RMSE < 35m	62% (+8)	45% (+16)

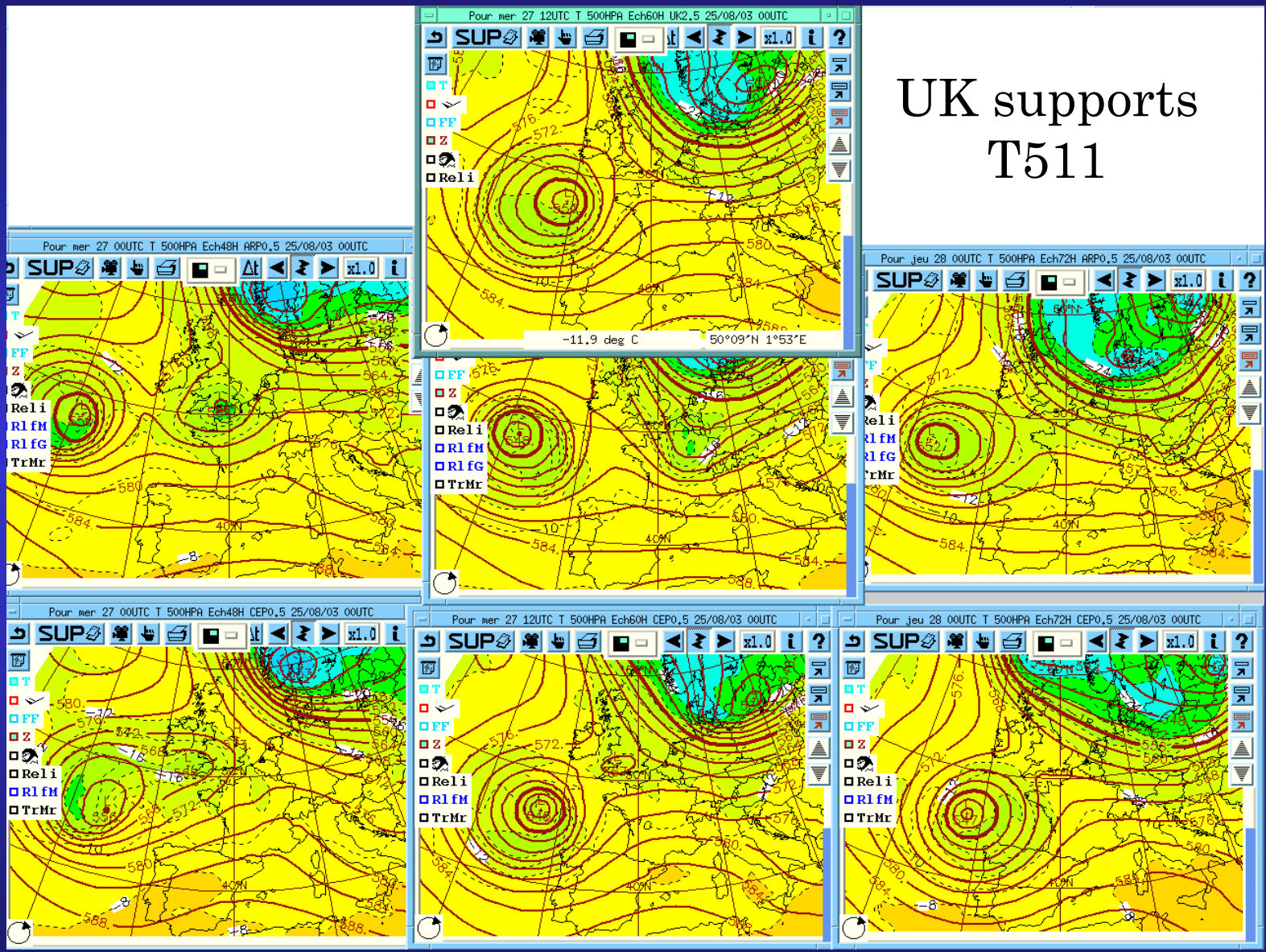
2) Subjective assessment by the forecasters (synoptic pattern wrt the weather in France)

	Day+1	Day+2	Day+3
"Very good" T511	83%	46%	30%
"Very good" Arpège	83%	51%	27%
Synoptic difference	27%	62%	82%
"Very good" Arpège when no difference	90%	62%	52%



A 2-member poorman ensemble!

Using UK when T511 and Arpège differ ?



UK supports T511

When T511 and Arpège differ, where is the UK model ?

	Day+1	Day+2	Day+3
UK supports T511 or Arpège	66%	67%	71%
UK beetween T511 and Arpège	30%	27%	18%
UK gives a 3rd alternative	4%	6%	11%

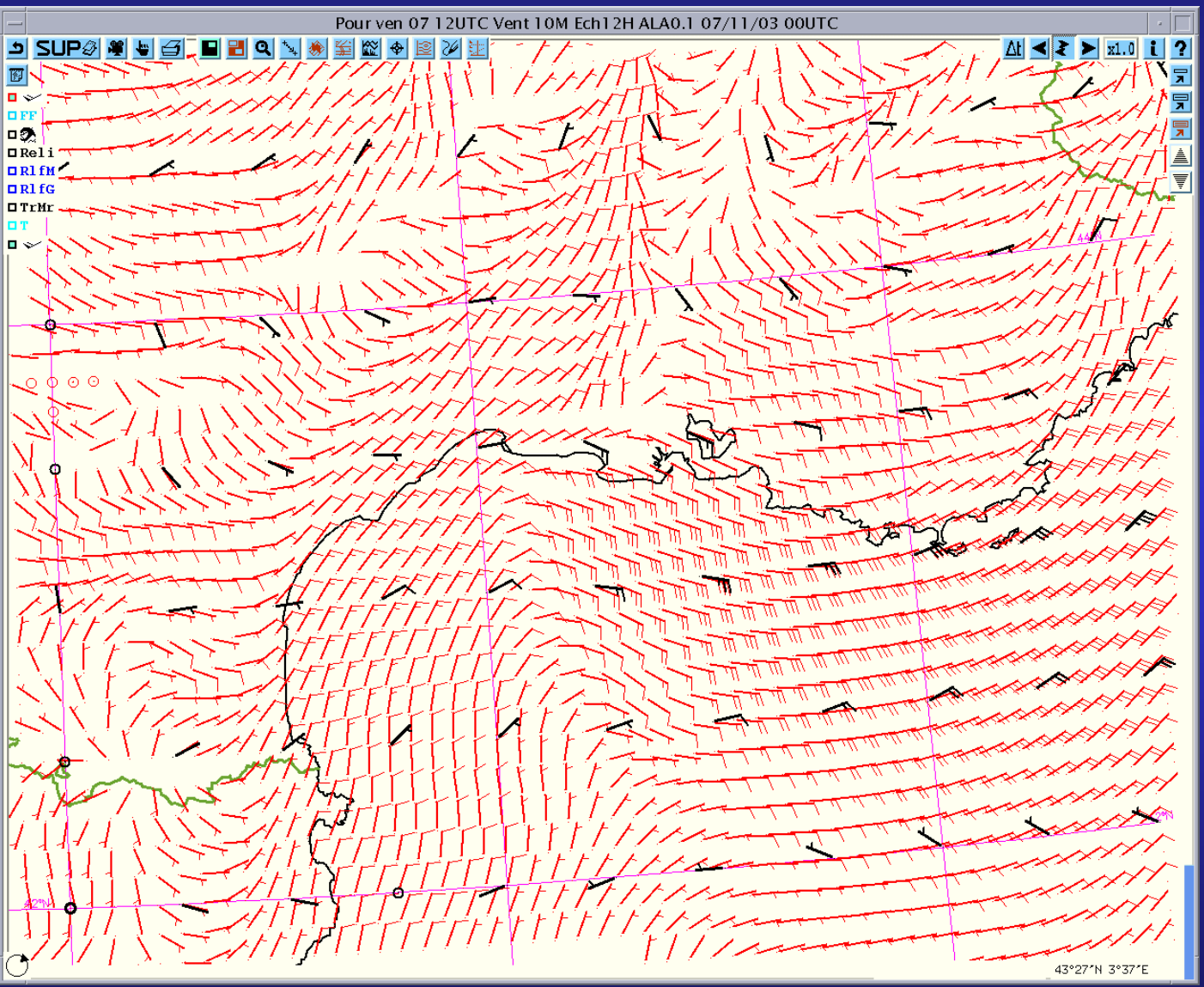
Most of the time a 2-member poorman ensemble is large enough to sample the synoptic uncertainty

A 3-member poorman ensemble ?

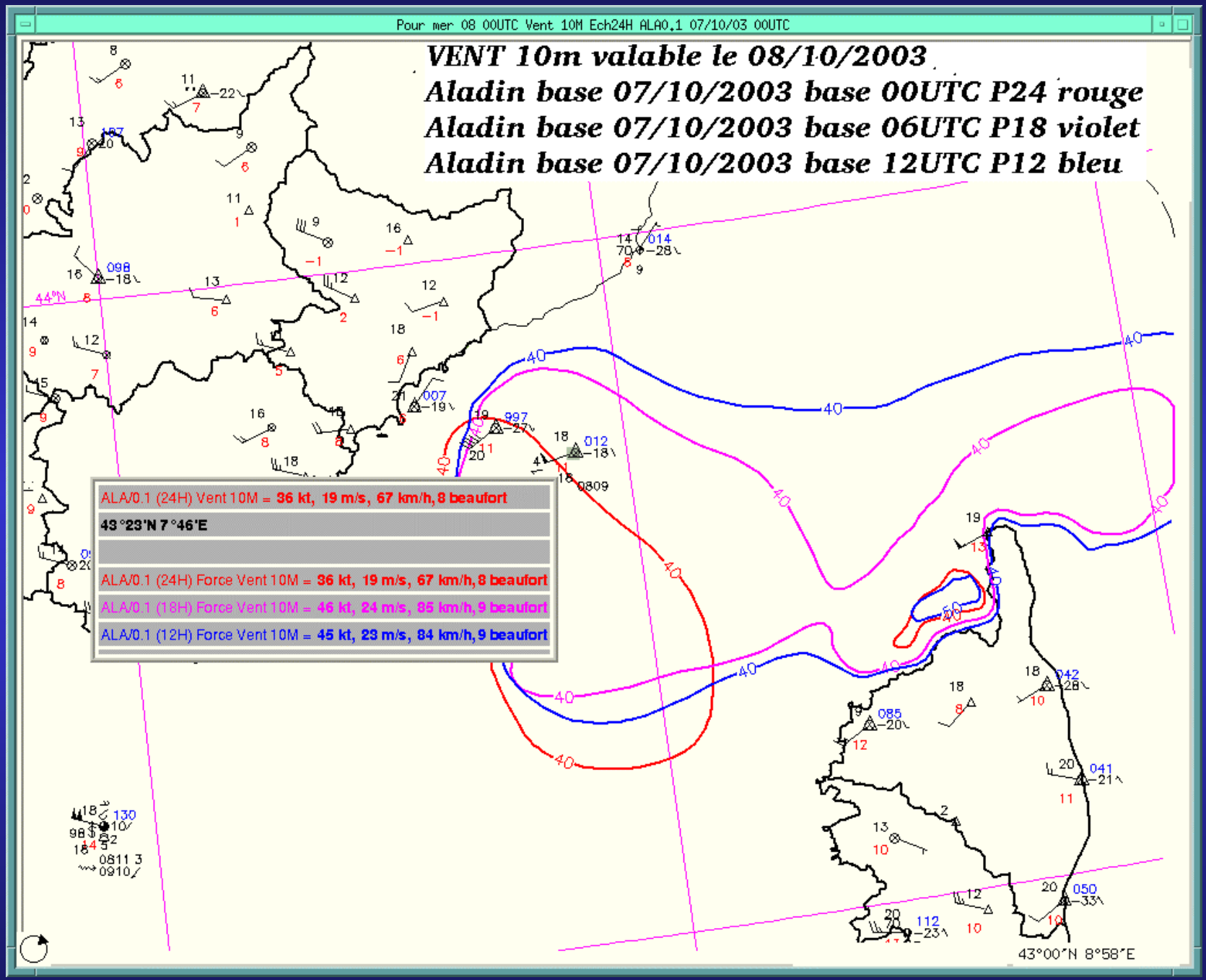
When Arpège and T511 are not in agreement, and one of them is supported by UK, does it help to choose ?

Arpège	67%	47%	22%
T511	67%	36%	26%
The one supported by UK	78%	47%	31%

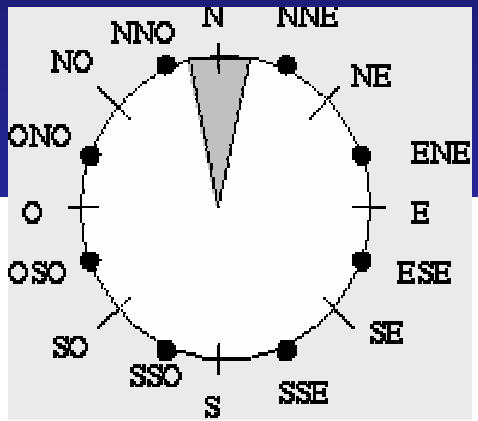
3) Local wind forecasts
The impact of model resolution



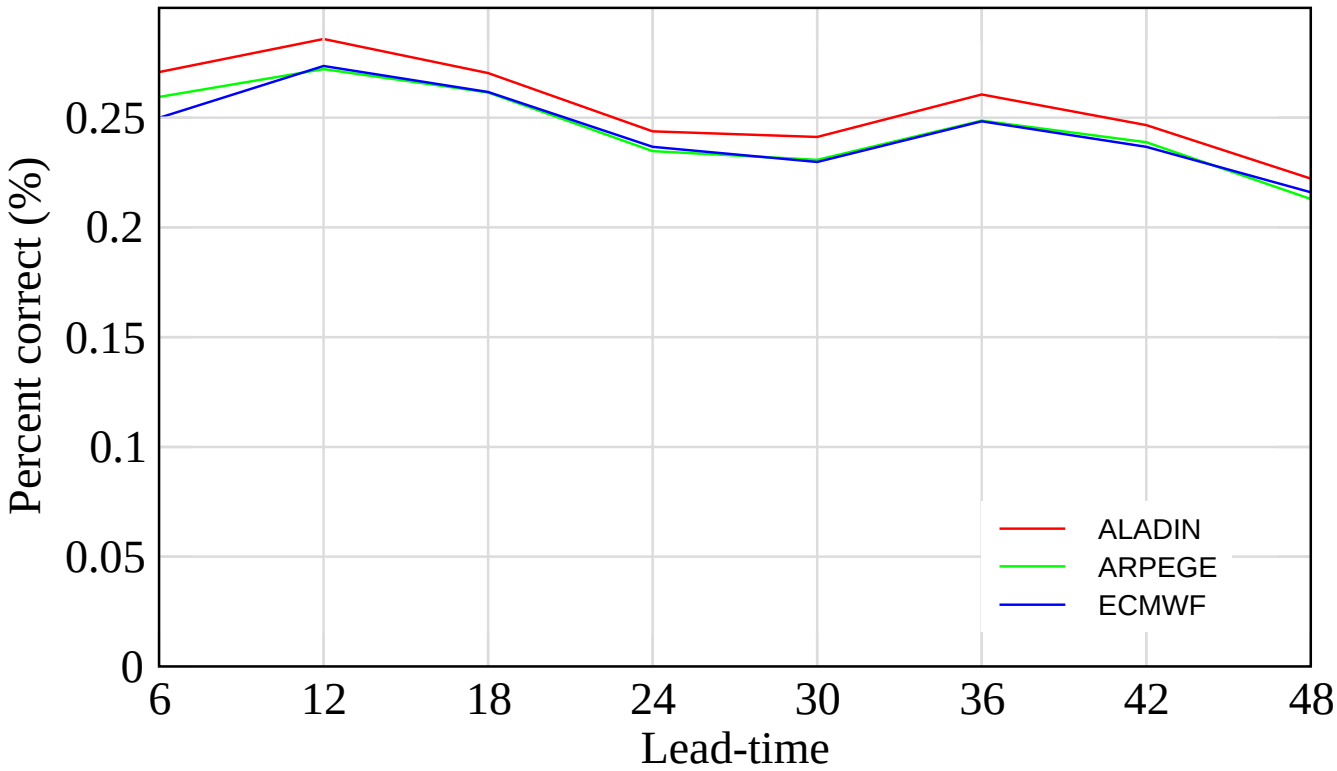
Black : T511 (0.5°)
Red : Aladin (0.1°)

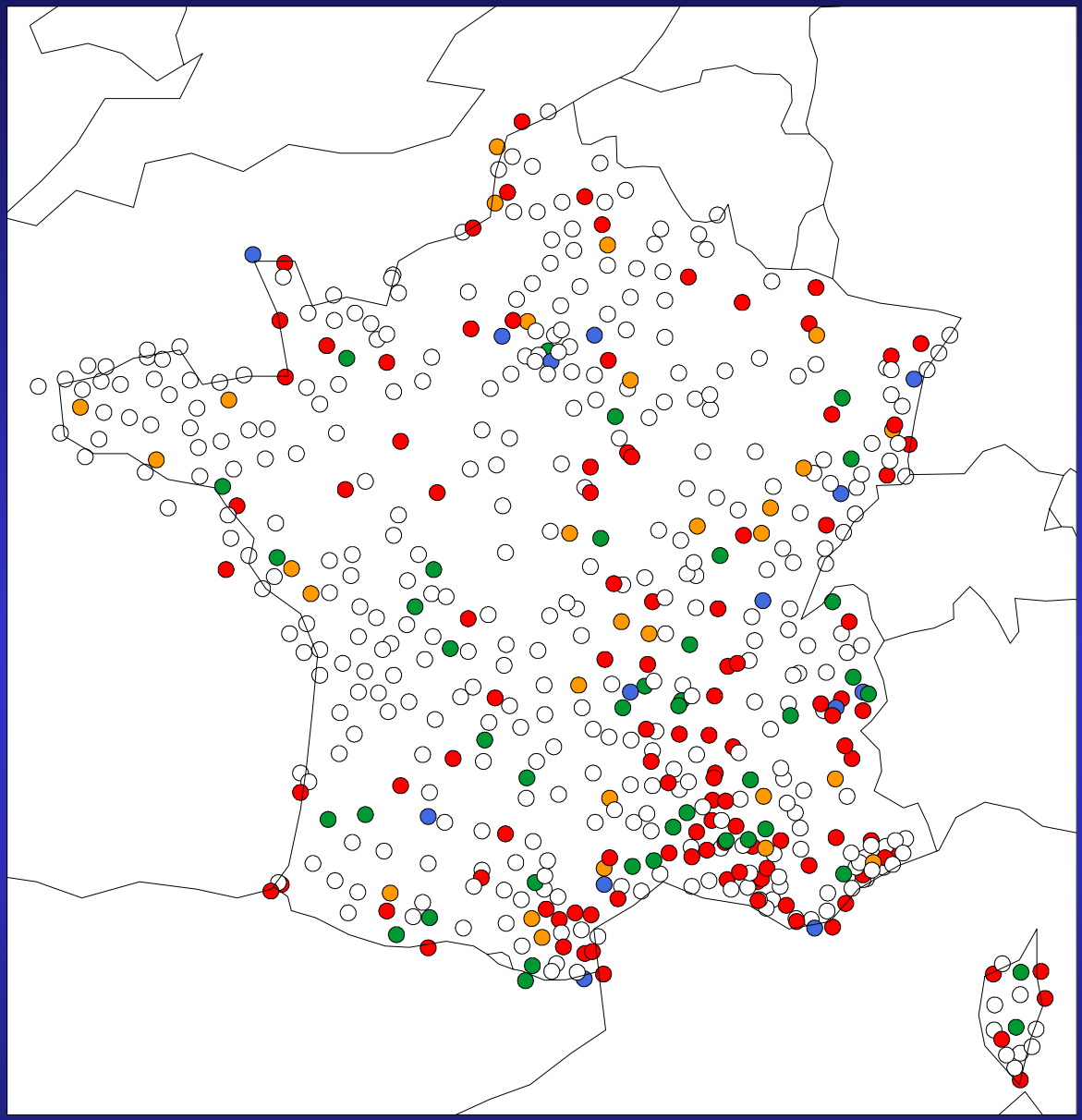

Pour mer 08 00UTC Vent 10M Ech24H ALA0,1 07/10/03 00UTC
VENT 10m valable le 08/10/2003
Aladin base 07/10/2003 base 00UTC P24 rouge
Aladin base 07/10/2003 base 06UTC P18 violet
Aladin base 07/10/2003 base 12UTC P12 bleu
ALA/0.1 (24H) Vent 10M = 36 kt, 19 m/s, 67 km/h, 8 beaufort
43°23'N 7°46'E
ALA/0.1 (24H) Force Vent 10M = 36 kt, 19 m/s, 67 km/h, 8 beaufort
ALA/0.1 (18H) Force Vent 10M = 46 kt, 24 m/s, 85 km/h, 9 beaufort
ALA/0.1 (12H) Force Vent 10M = 45 kt, 23 m/s, 84 km/h, 9 beaufort
44°N
43°00'N 8°58'E

10-meter wind direction



12 months (2000-2001)
587 locations in France
16 sectors percent correct





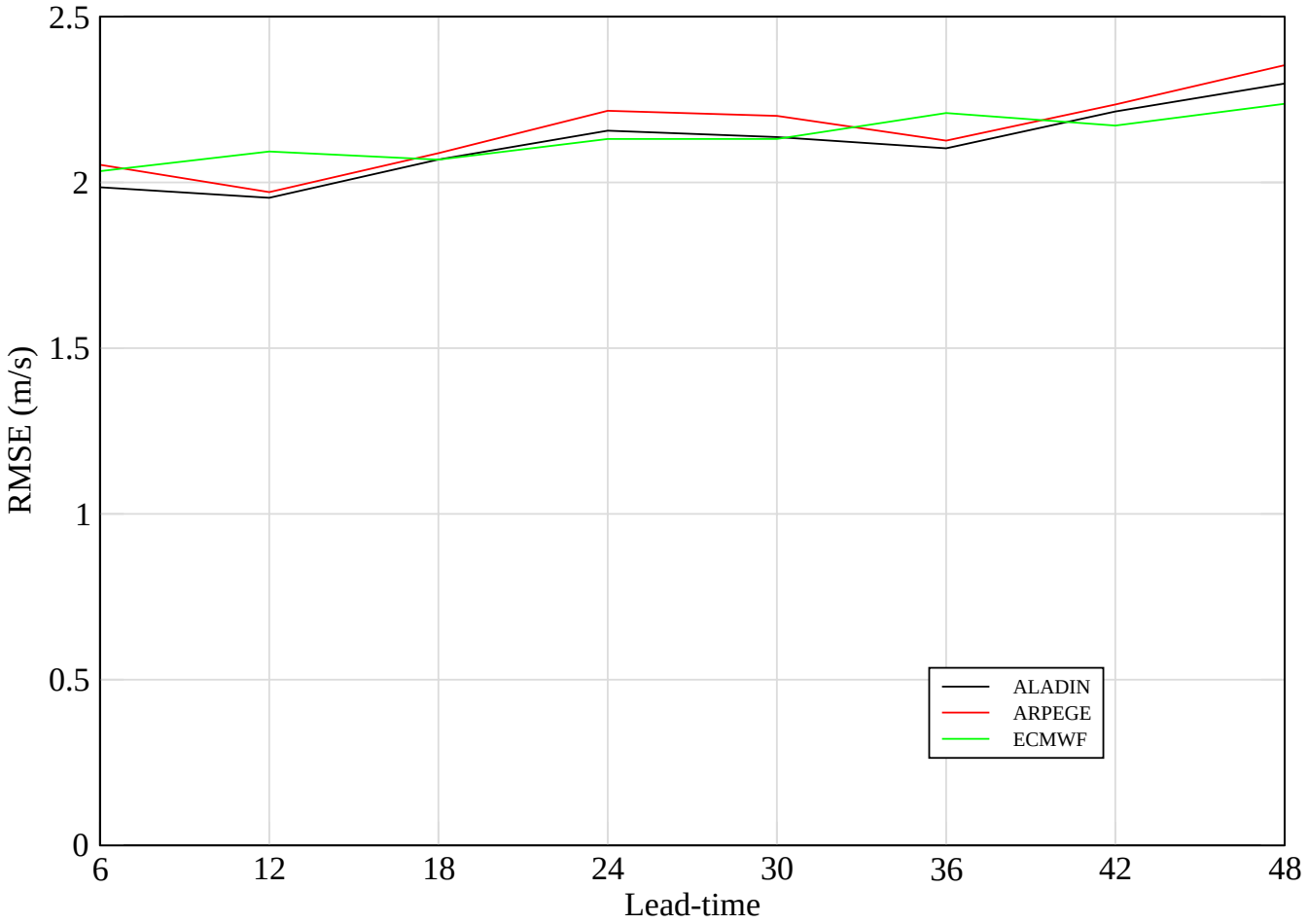
- Red/orange = Aladin better
- Green/blue = T511 better
- Level of significance of the difference between T511 and Aladin (non parametric statistical test based on resampling)
- Wind direction percent correct
- Day+1, 12 UTC

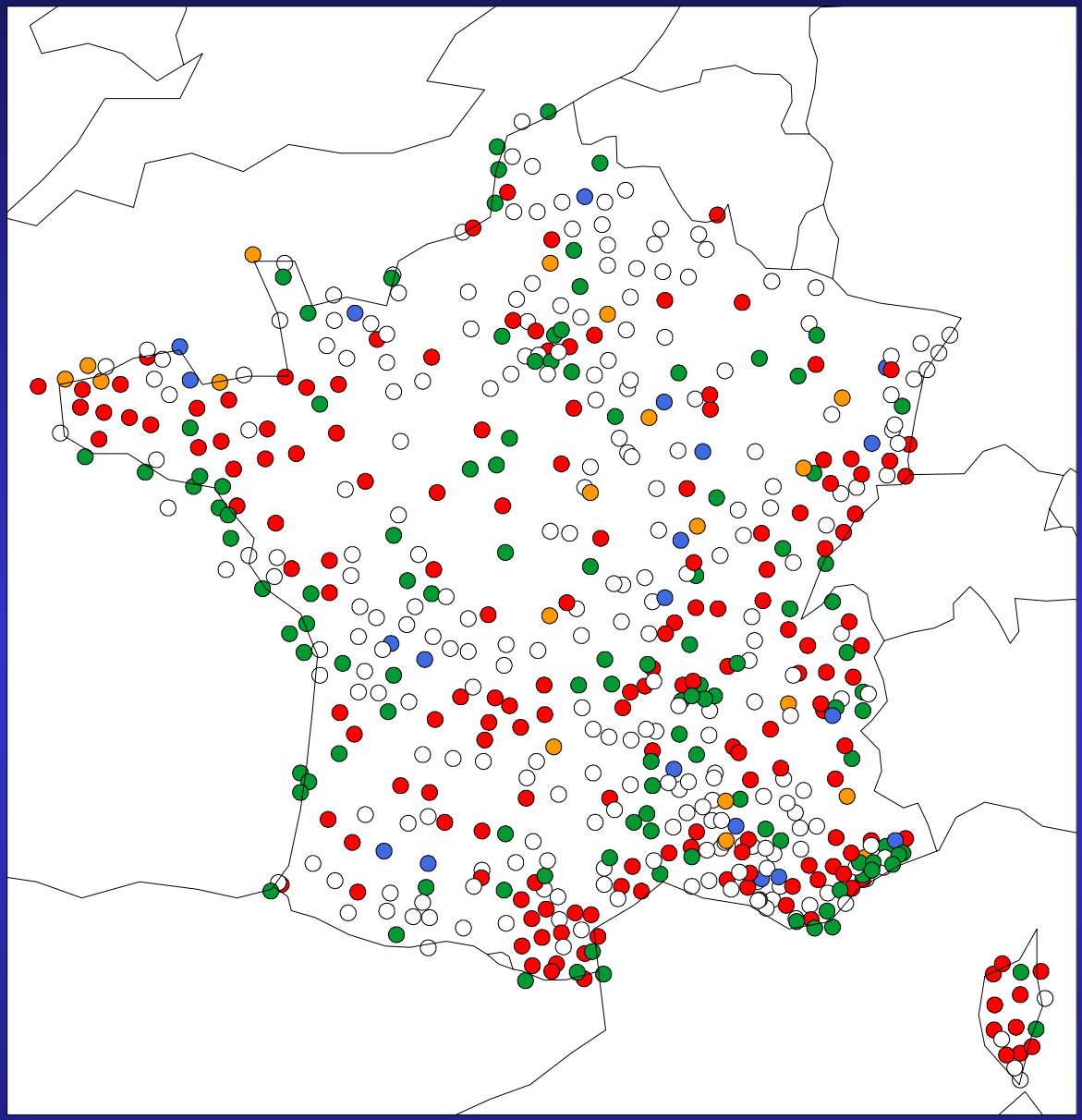
10-meter wind speed

12 months (2000-2001)

587 locations in France

+/- 2 kts percent correct (5kts, 10kts, etc)





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- Level of significance of the difference between T511 and Aladin (non parametric statistical test based on resampling)
- Wind direction percent correct
- Day+1, 12 UTC

Summary

- Objective verification says T511 gives better guidance
- Subjective evaluation says T511 and Arpege have a similar level of performance
- Both subjective and objective verification show the efficiency of a poorman ensemble approach
- Model resolution does matter when forecasting local surface wind, but:
  - Impact is clear for direction, not really for speed
  - Local effects dominate the performance

Acknowledgements

- Objective verification : Marc Tardy
- Subjective evaluation : Bruno Gillet-Chaulet
- Wind forecasts : Isabelle Souyri