Probabilistic verification at high spatial resolution of the COSMO-LEPS limited-area ensemble system

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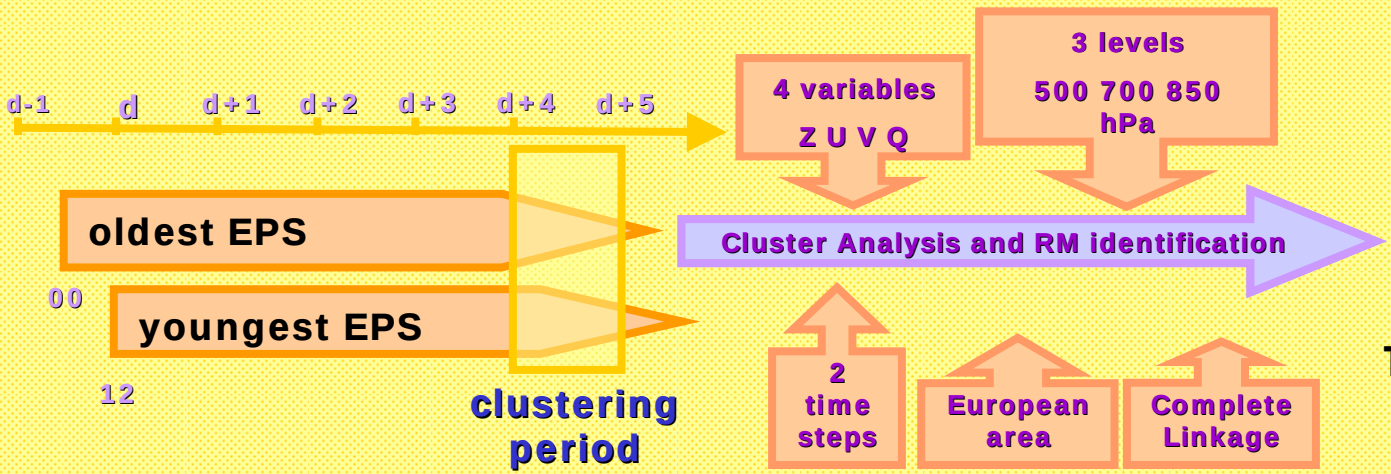
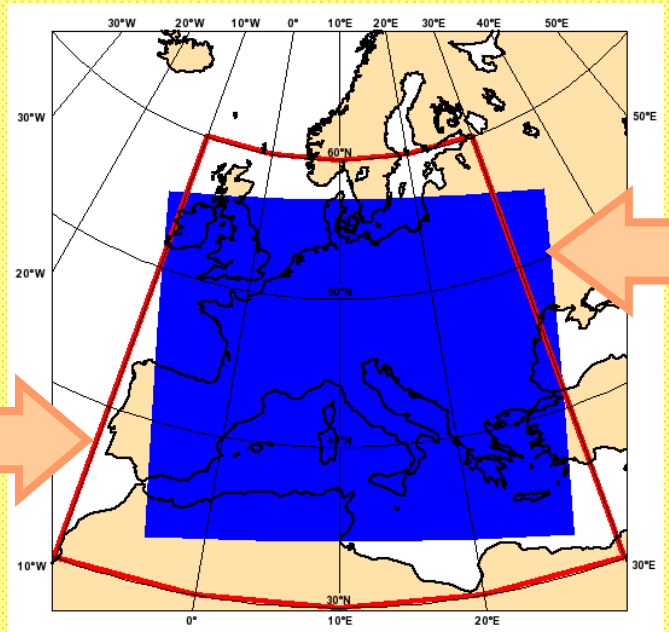
ARPA-SIM, Bologna, Italy

The COSMO-LEPS suite since Feb. 2006



16 Representative Members driving the 16 COSMO integrations

employing either Tiedtke or Kain-Fritsch convection scheme (randomly chosen)

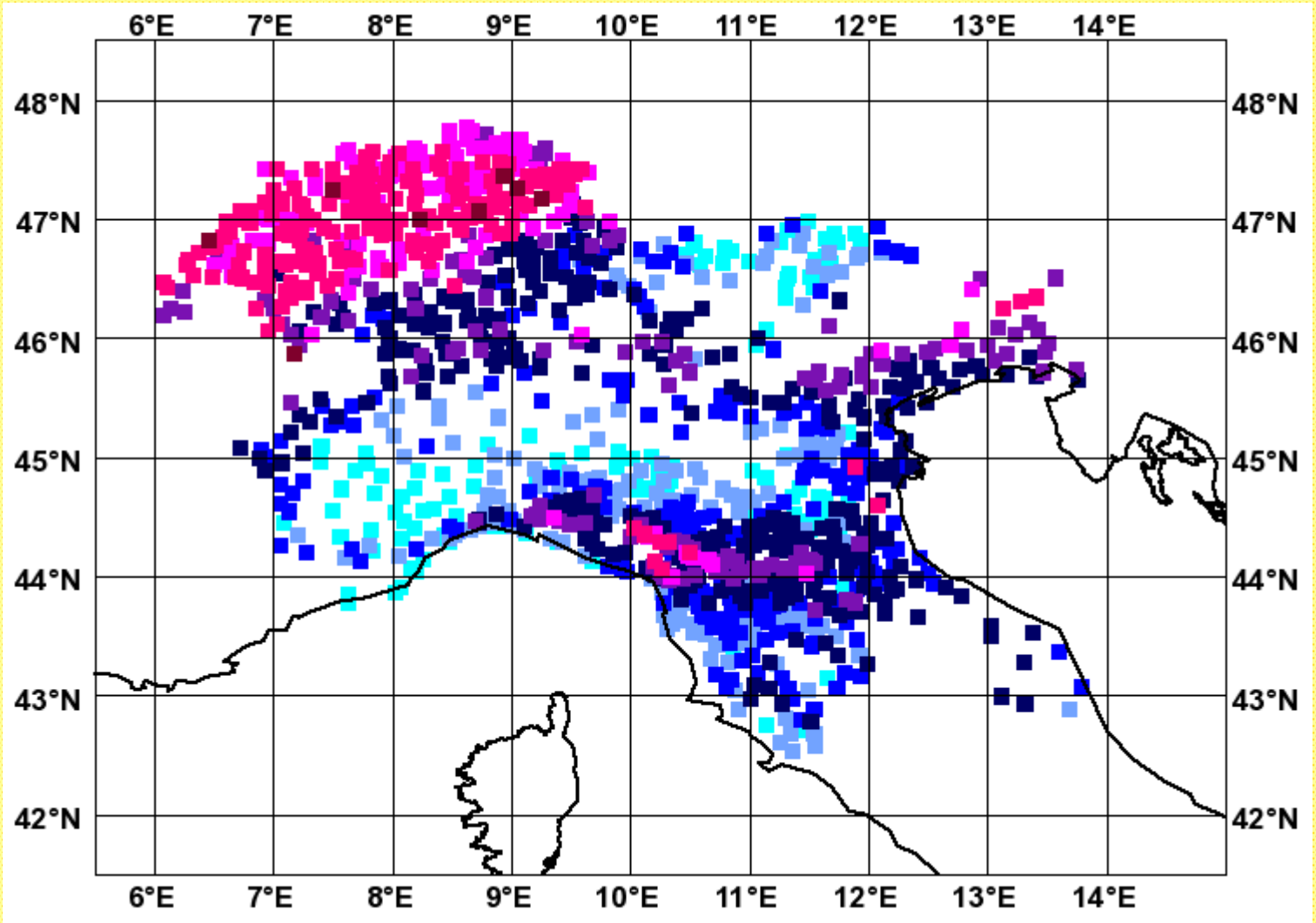


COSMO-LEPS clustering area

COSMO-LEPS integration domain

- 10 km
- 40 layers
- 16 members
- 132 h

observed accumulated precipitation MAM 2006



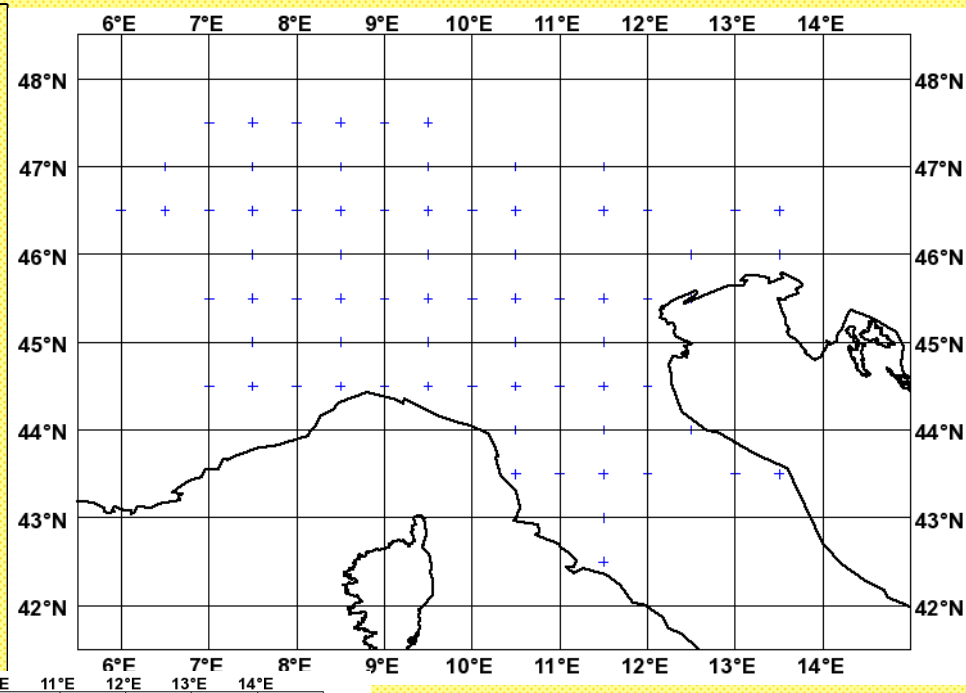
Verification issues

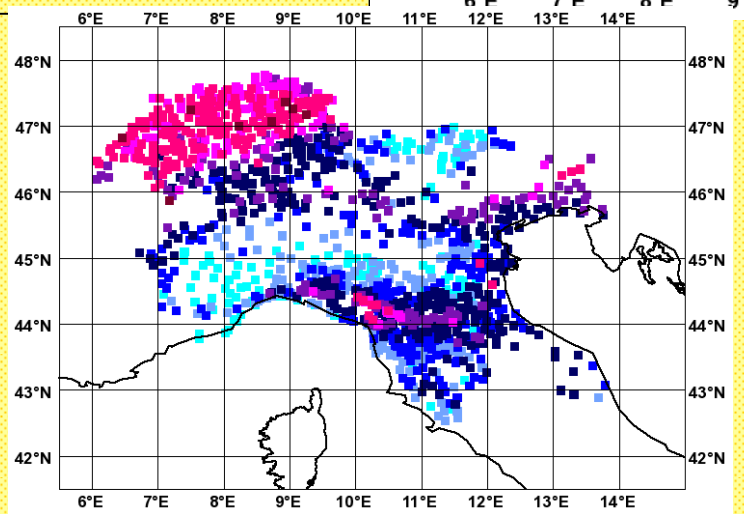
- verification of an **ensemble system**
- **high-resolution** model
- verification of **precipitation**
- **sparse observations** (high density)
- comparison of two systems with **different horizontal resolution** (10 and 50 km)
- give assistance to **forecasters**

observation masks

COSMO-LEPS

ECMWF EPS



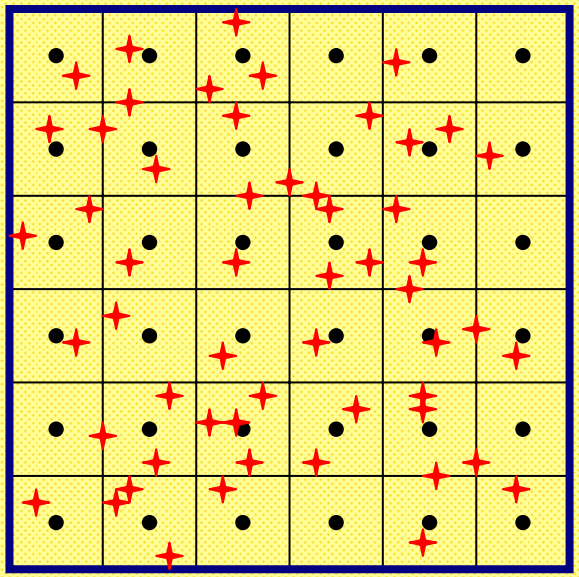


Verification of the distributions

The verification has been made in terms of:

- Average value
- Maximum value
- 50th percentile (Median)
- 90th percentile

} in a box



Station observation

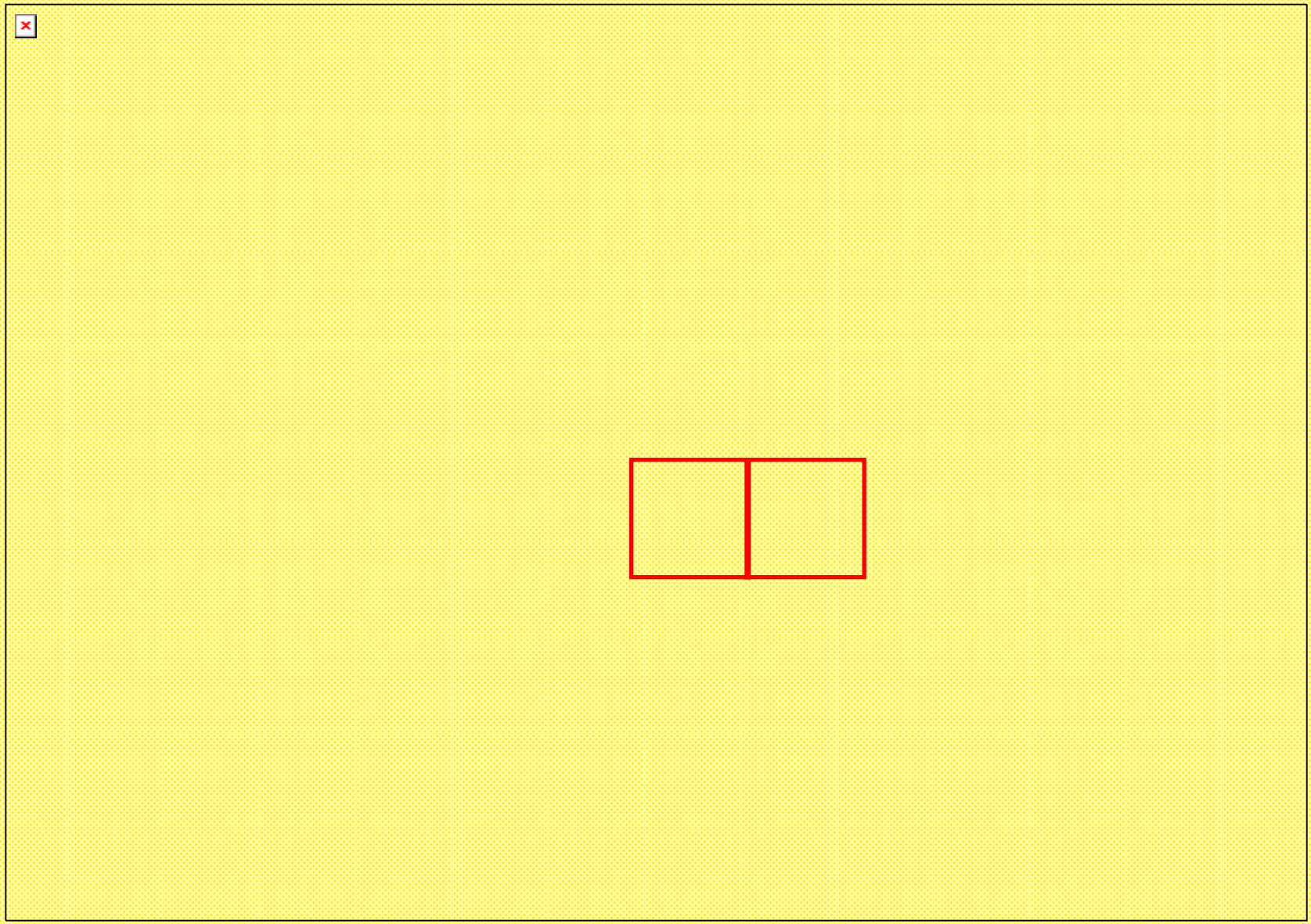
Grid point forecast

Each ensemble member is treated separately!

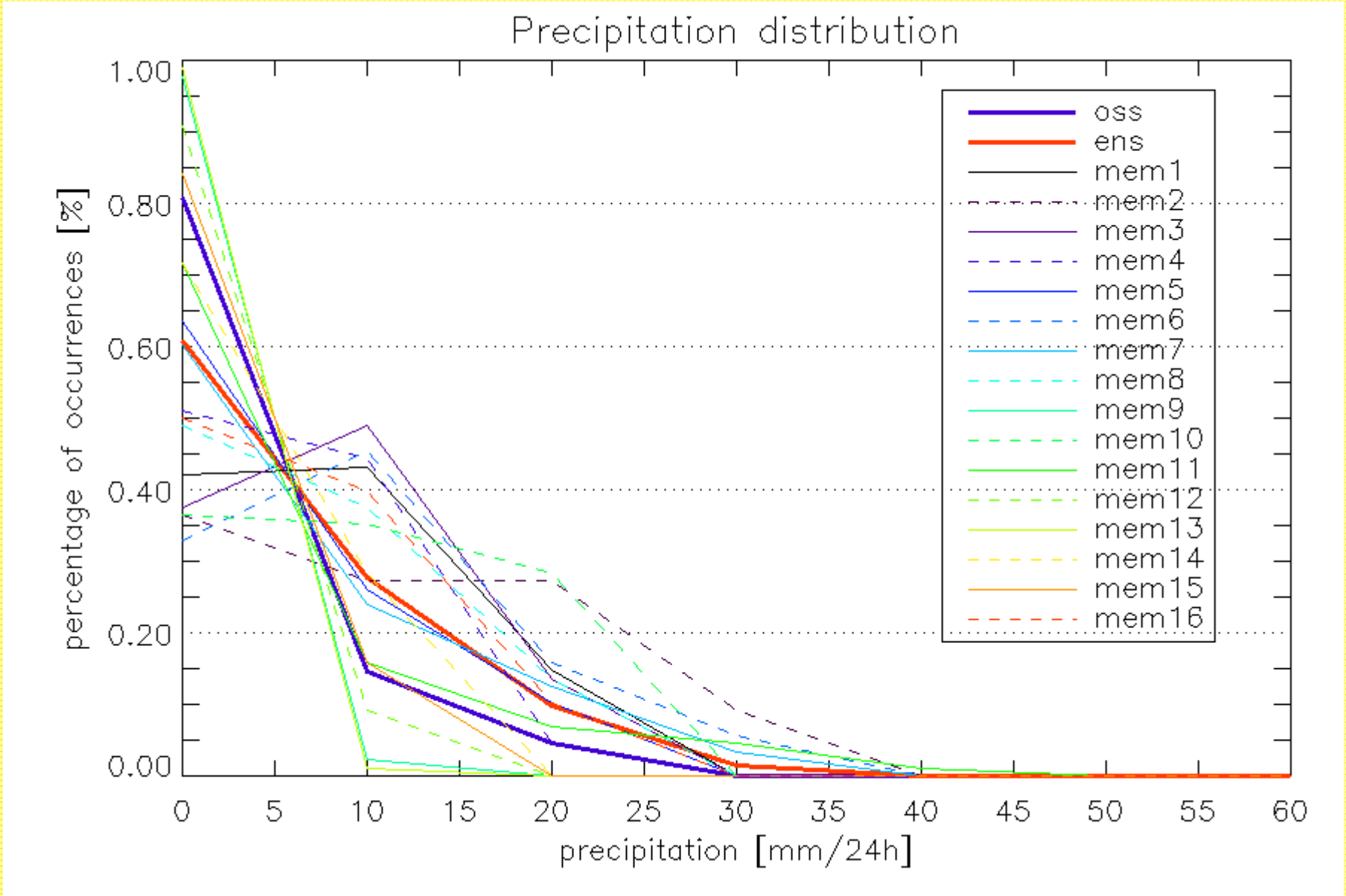
box 9 and 10

nobs~100

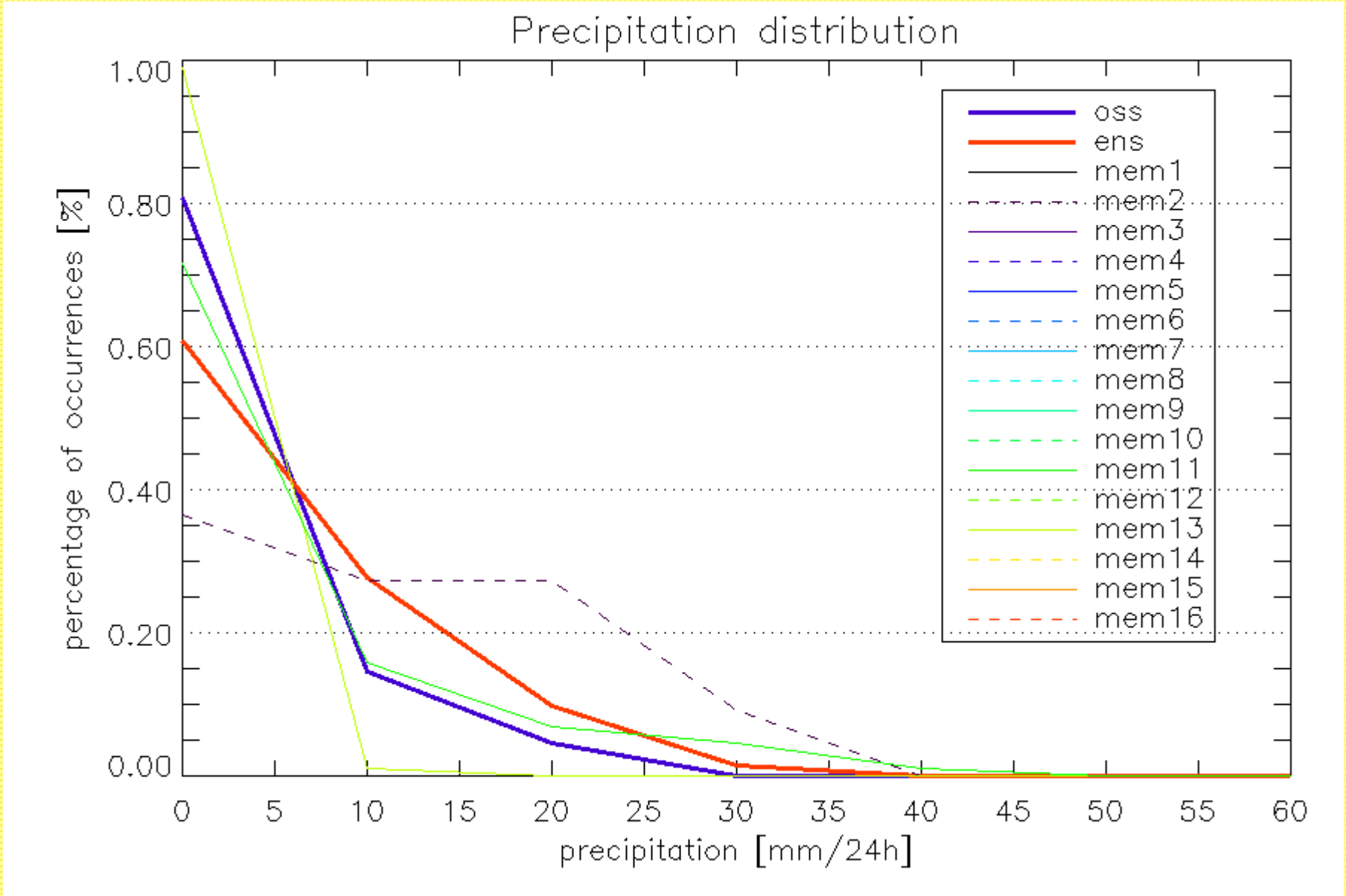
npre=88



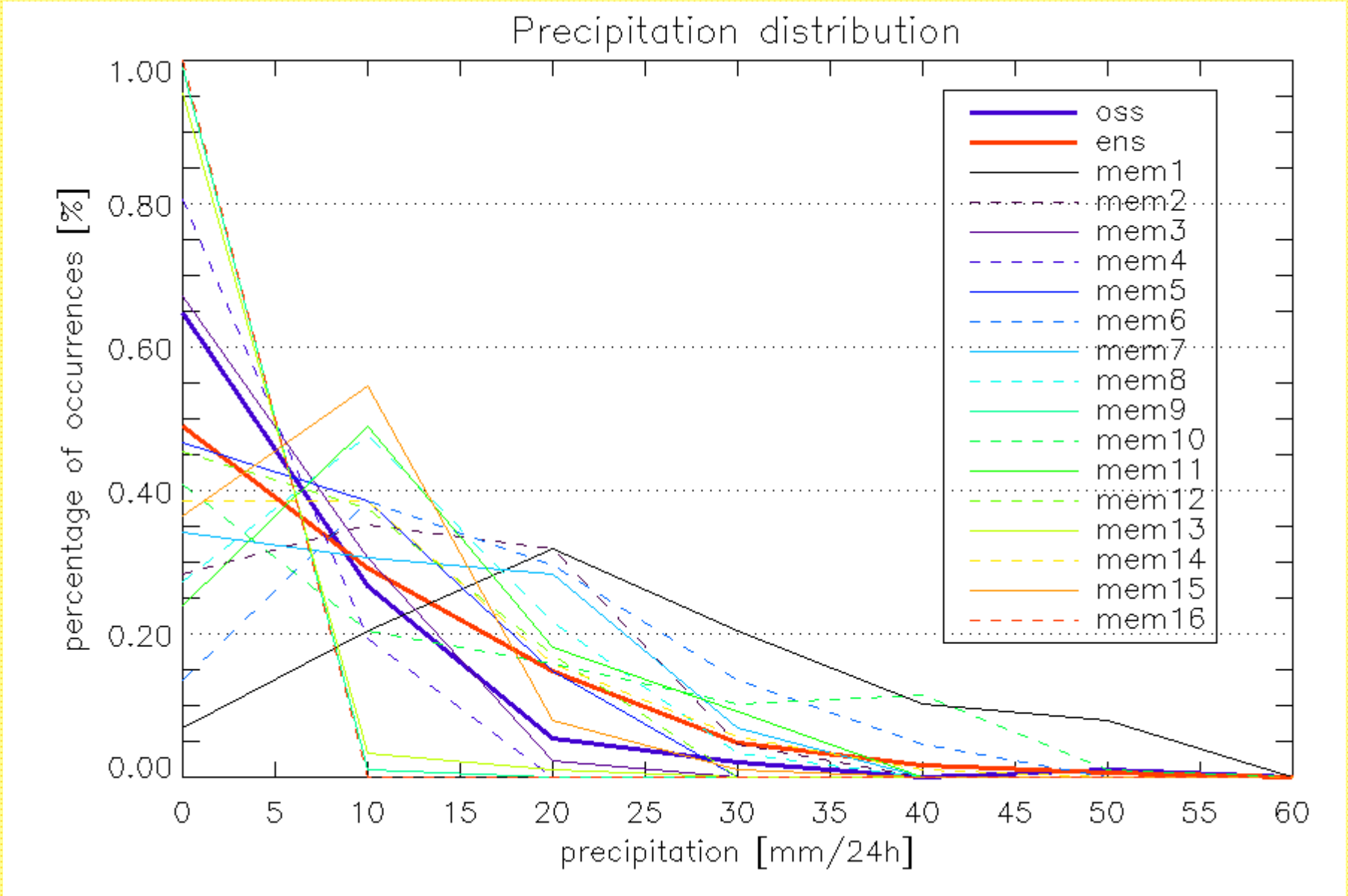
27 April - box 9



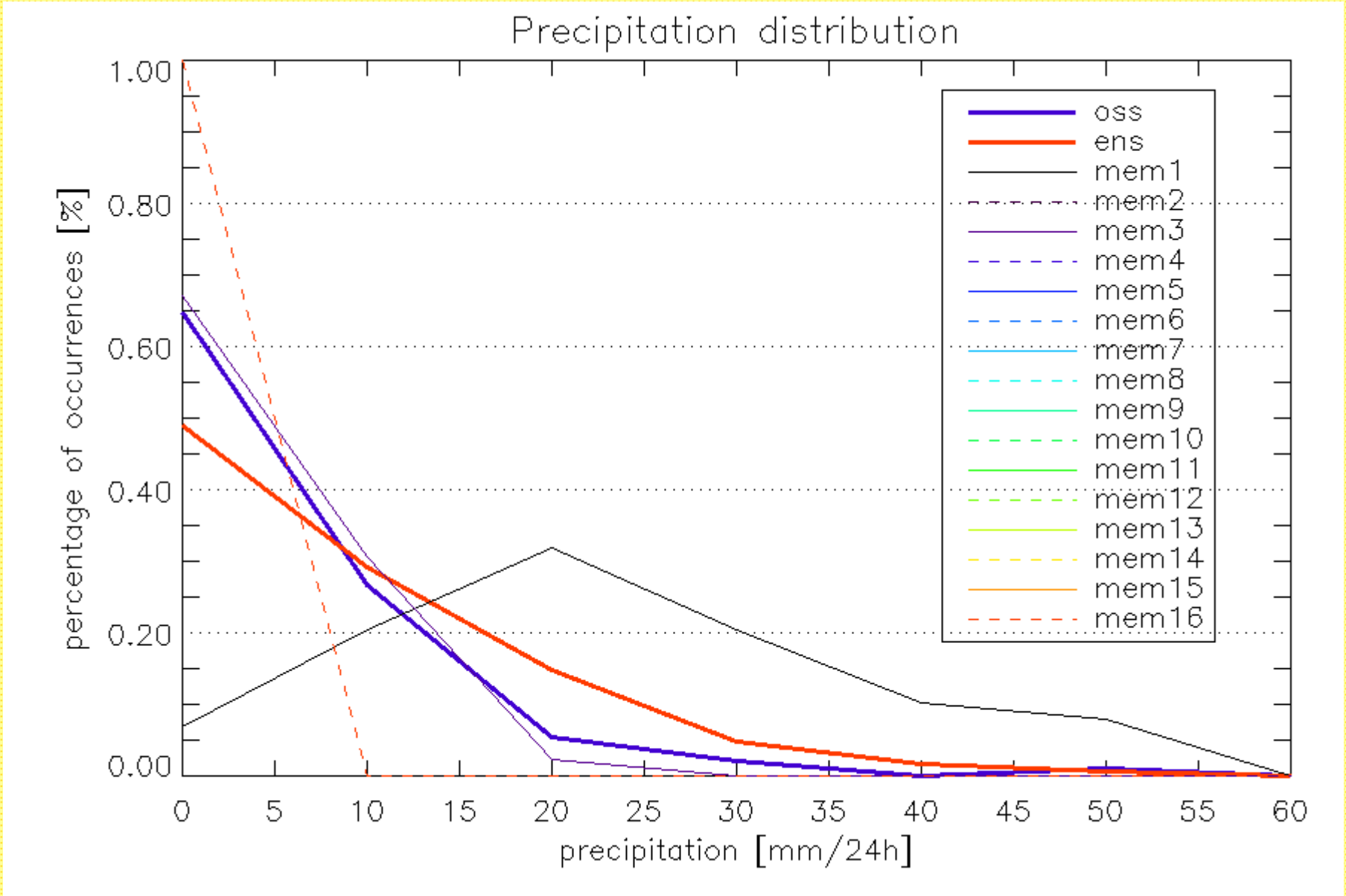
27 April - box 9



27 April - box 10



27 April - box 10



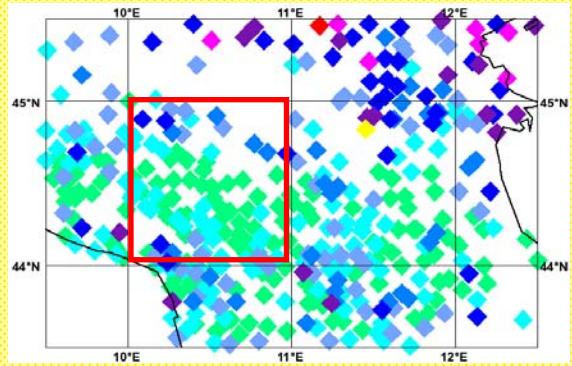
box 9

ossmed=6.7

ossmax=28.0

ossdst50=4.8

ossdst90=14.6



11

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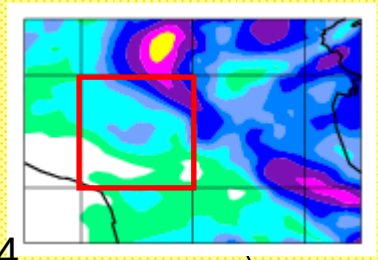
dst90=23.4



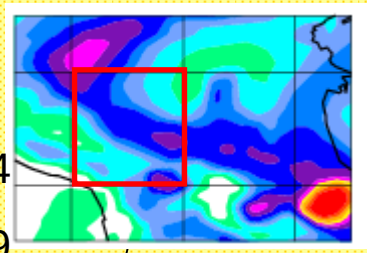
2

med=15.8

max=38.4

dst50=13.4

dst90=28.9



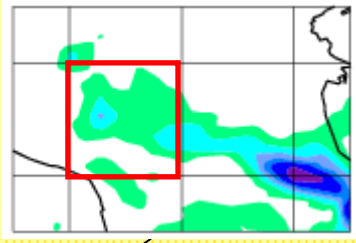
13

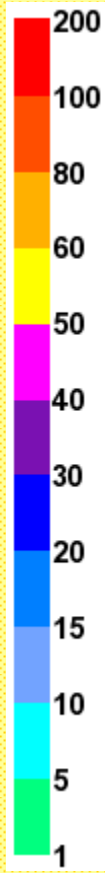
med=1.9

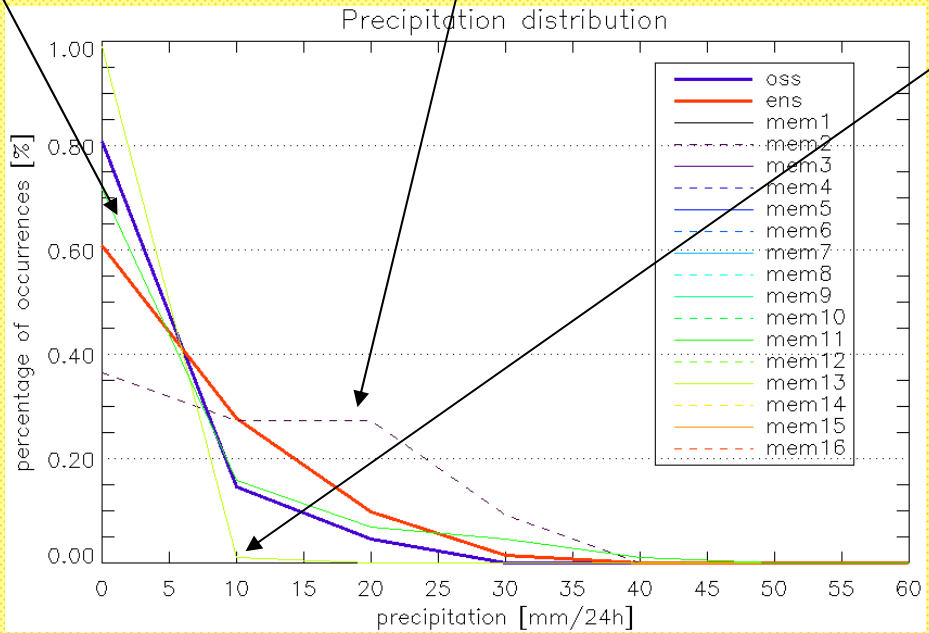
max=10.4

dst50=1.3

dst90=4.3







box 10

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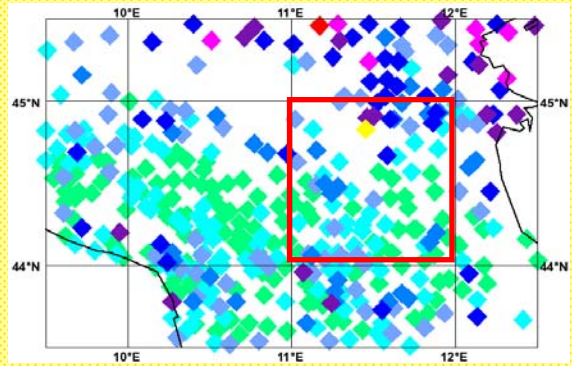

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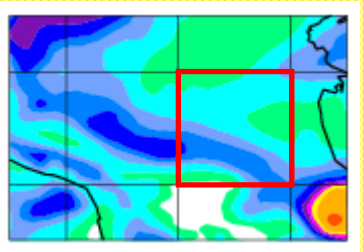
dst50=6.1

dst90=11.1



1

med=28.8

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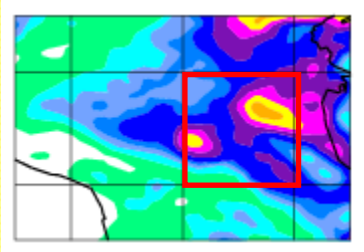
dst50=27.1

dst90=49.0



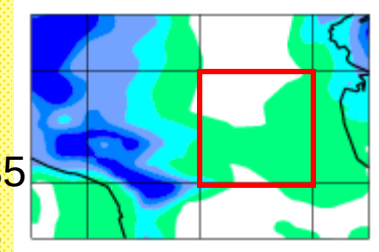
16

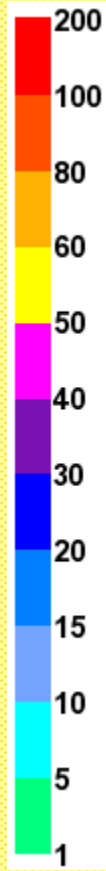
med=1.5

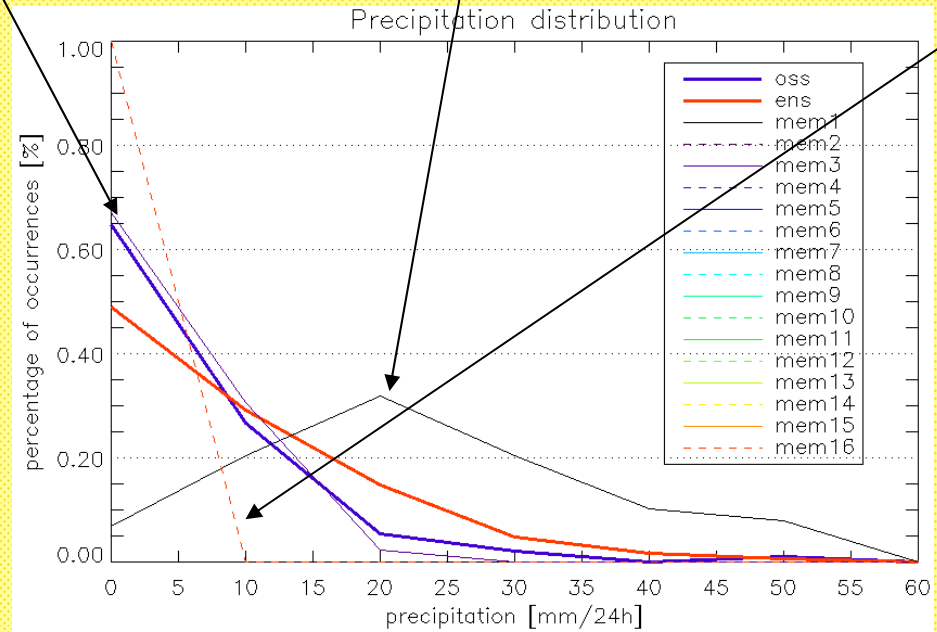
max=4.8

dst50=1.35

dst90=2.8







ave - 1mm/24h

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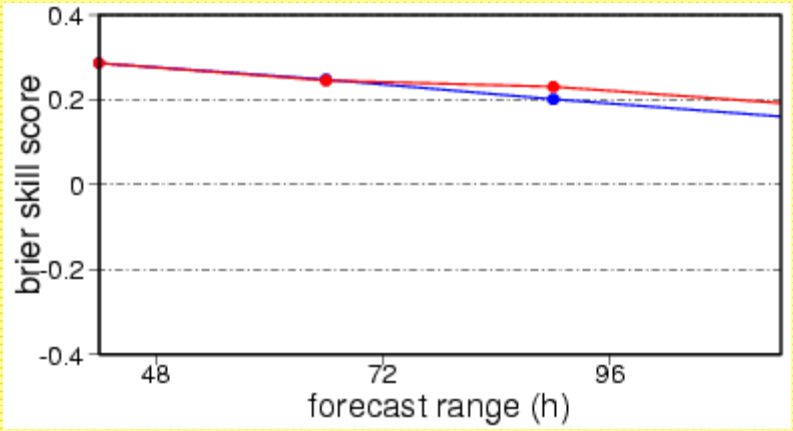
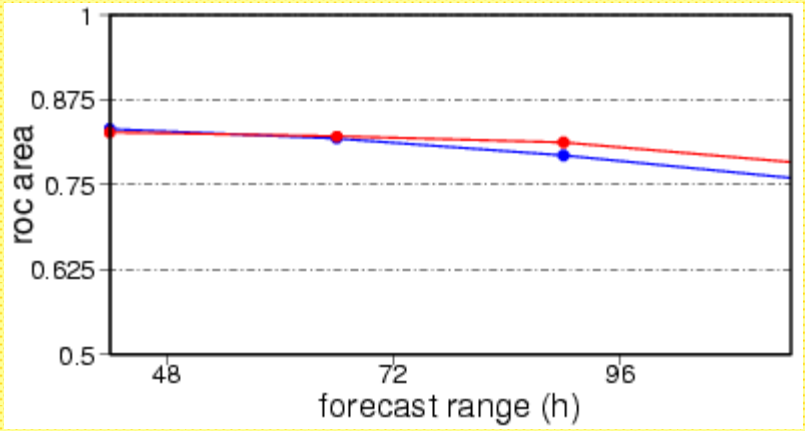
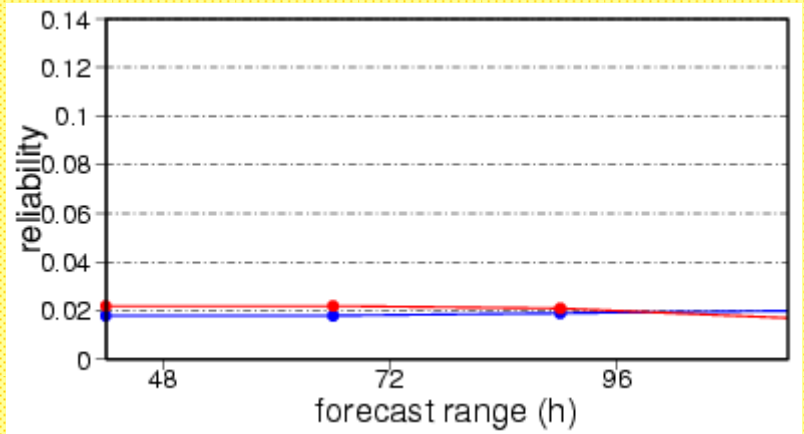
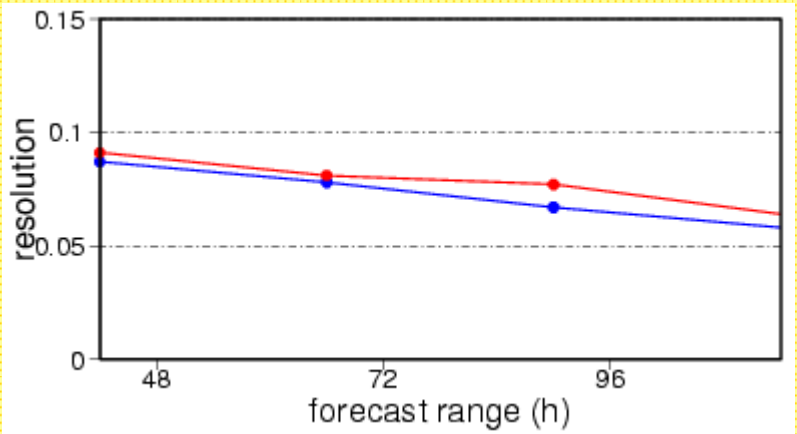






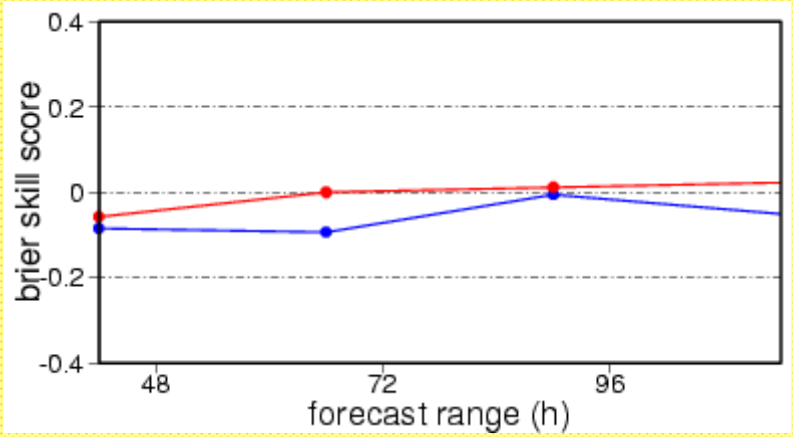


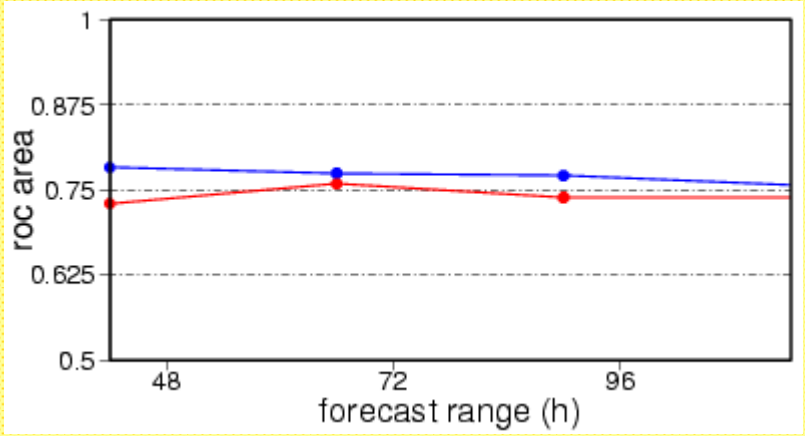
COSMO-LEPS

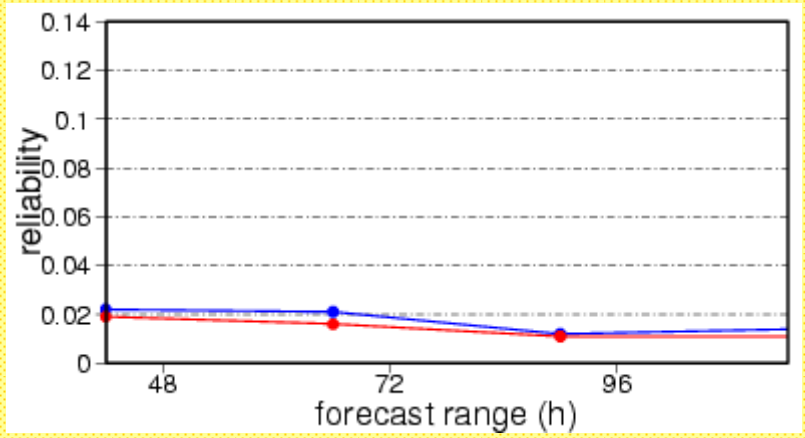
16-MEMBER EPS

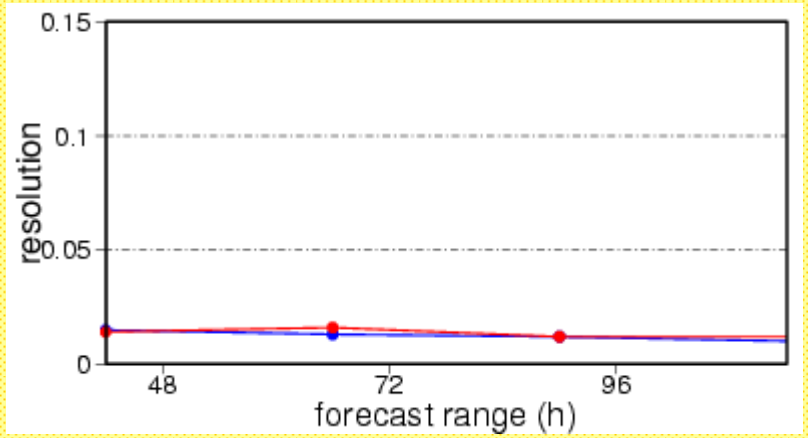
ave - 10mm/24h

noss=234







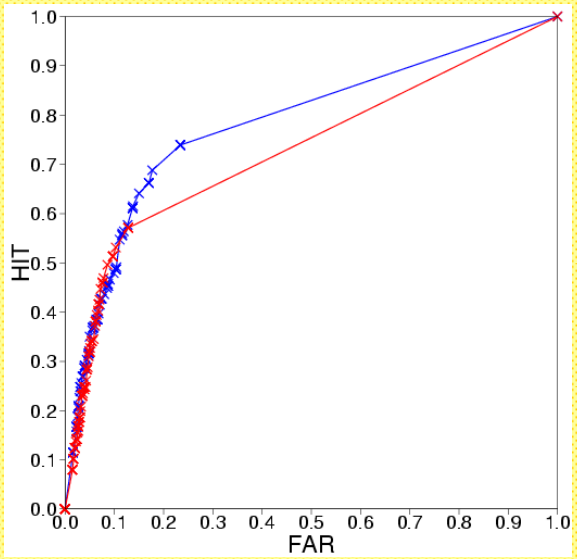


COSMO-LEPS

16-MEMBER EPS

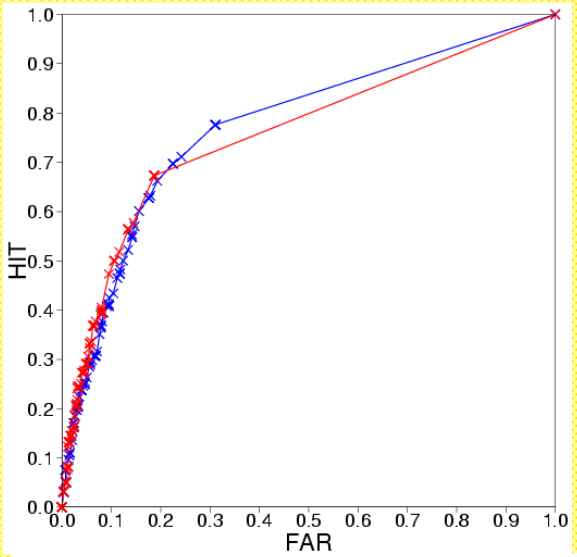
ave -10mm/24h

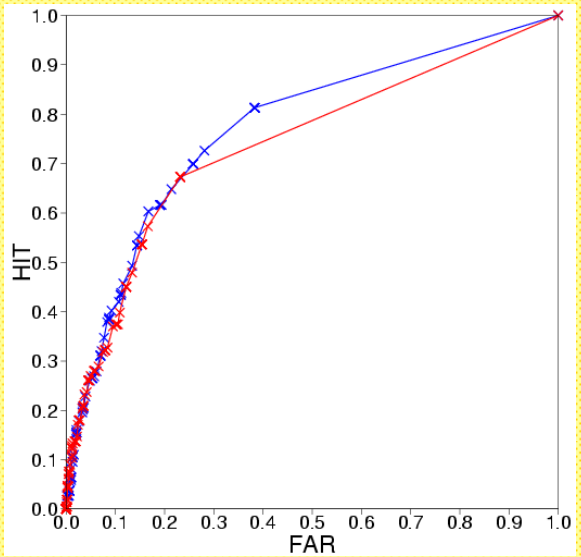
noss=234



+42

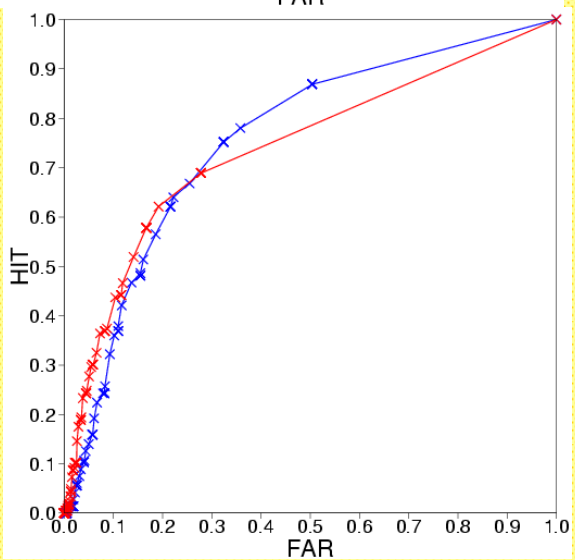
+66





+90

+114

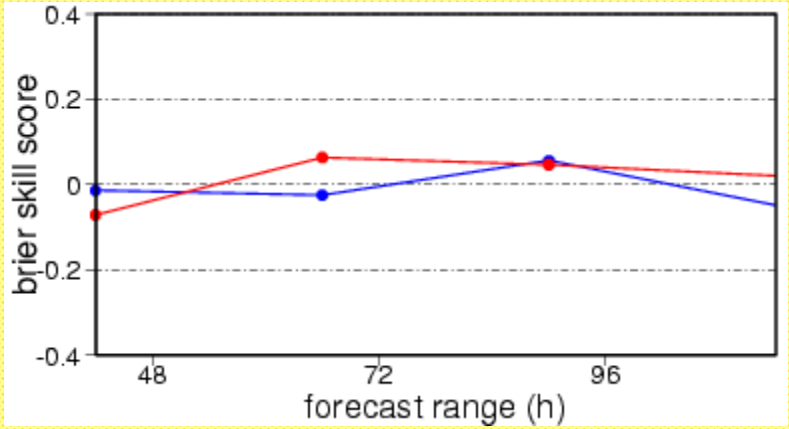


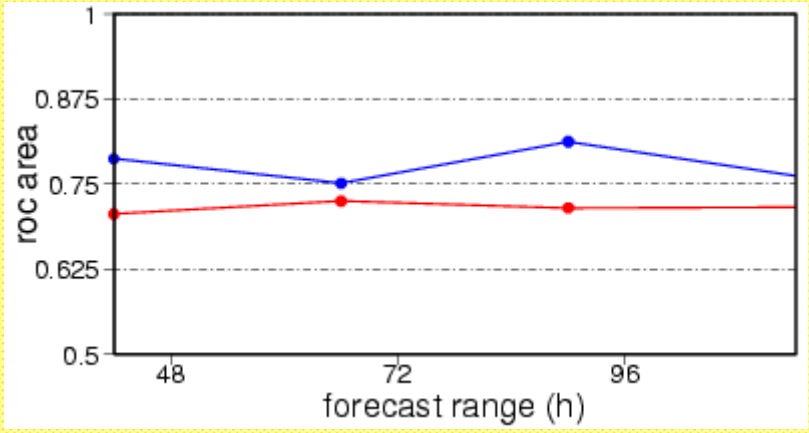
COSMO-LEPS

16-MEMBER EPS

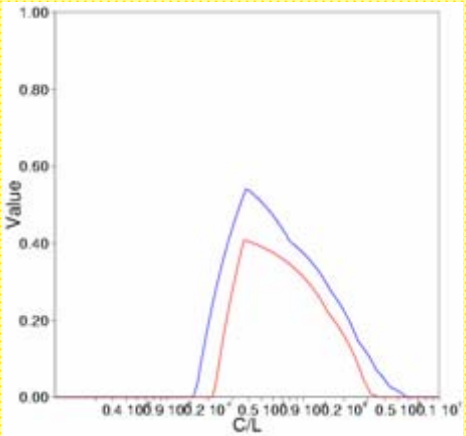
ave - 20mm/24h

noss=83

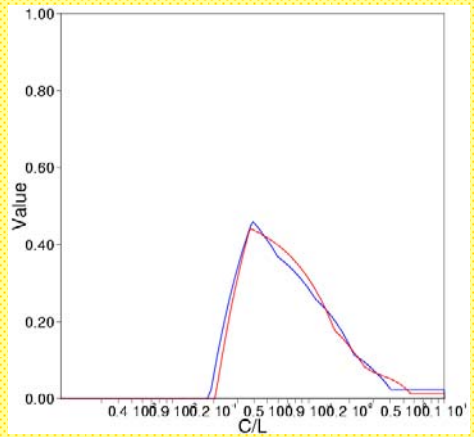




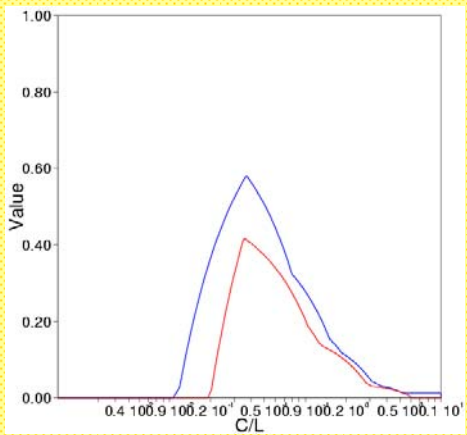
18-42h



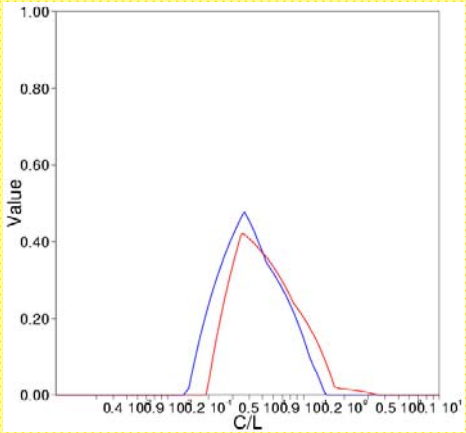
42-66h



66-90h



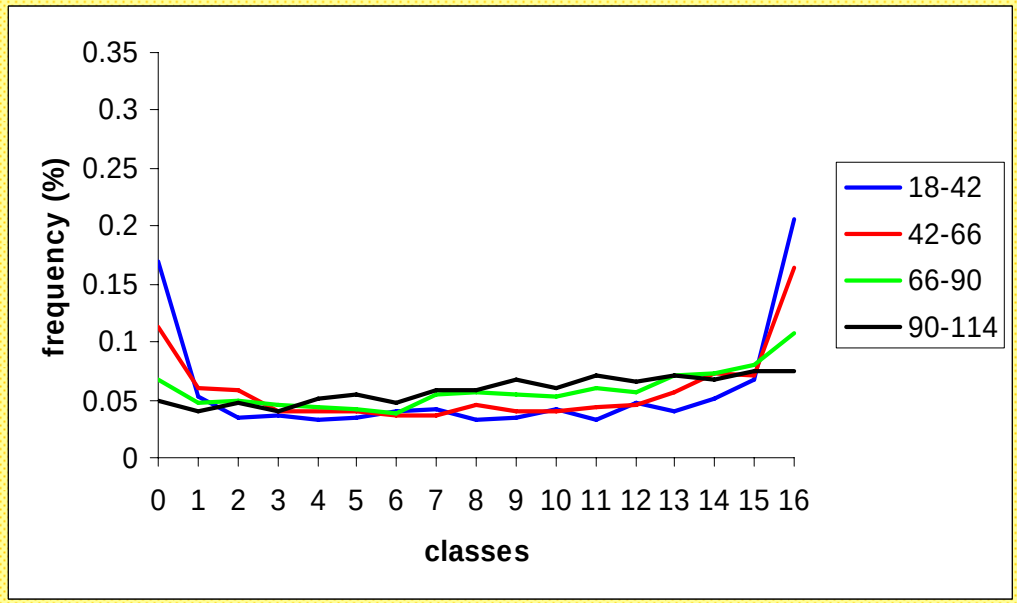
90-114h

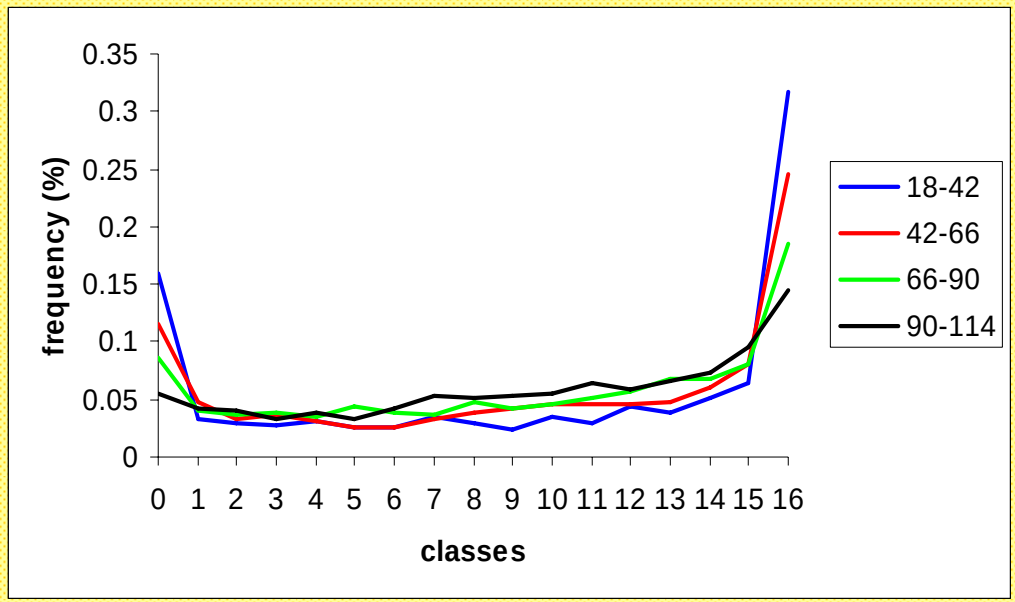


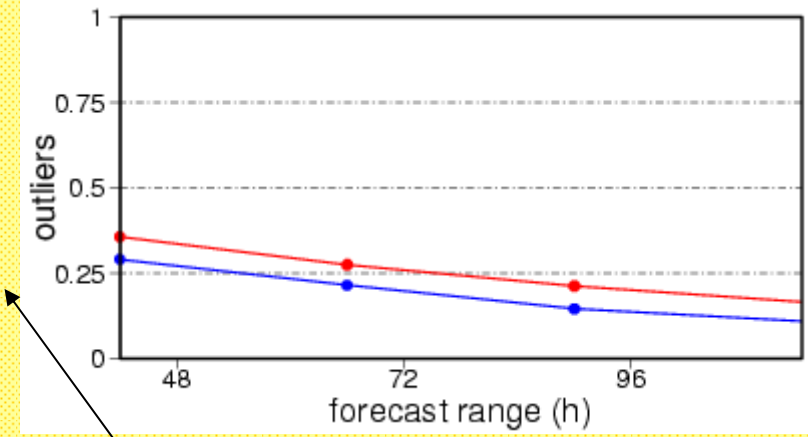
COSMO-LEPS

16-MEMBER EPS

ave





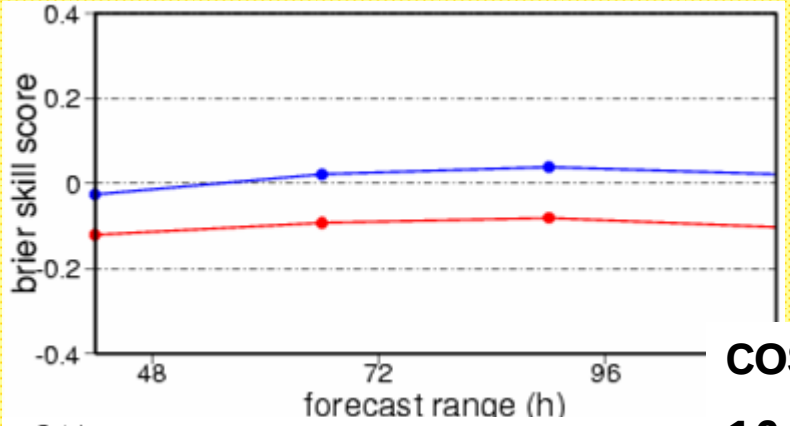


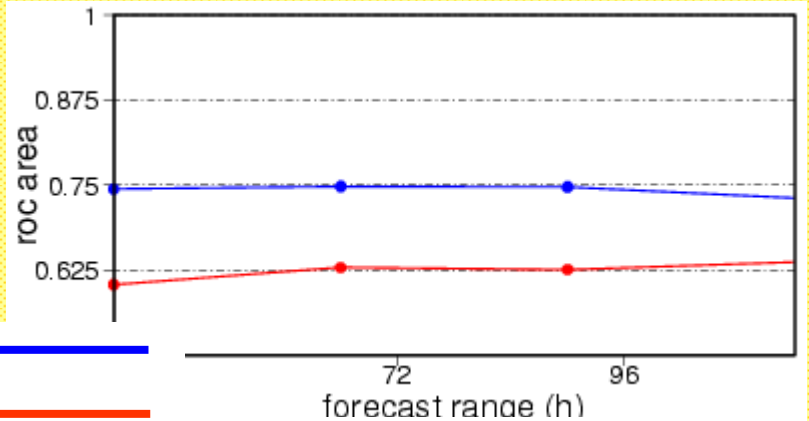
COSMO-LEPS

16-MEMBER EPS

max - 20mm/24h

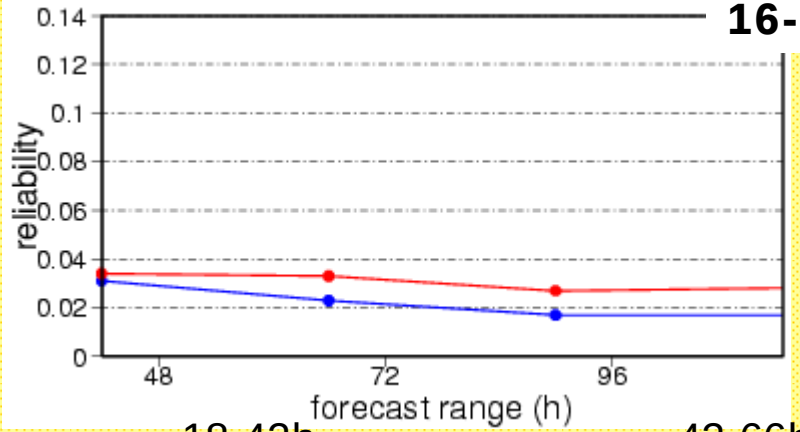
noss=469

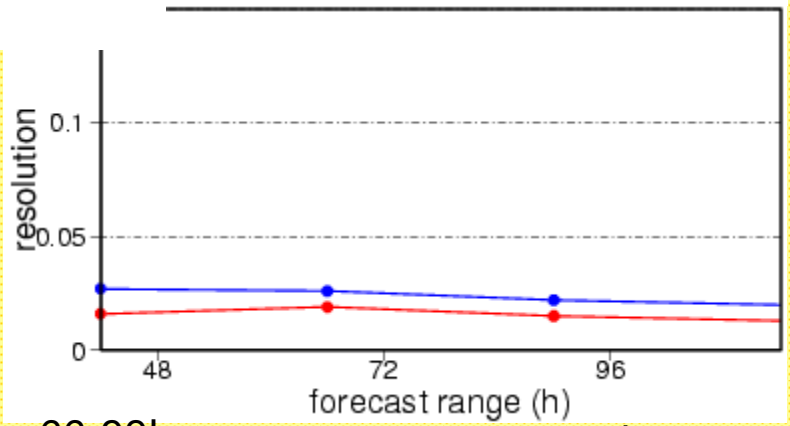




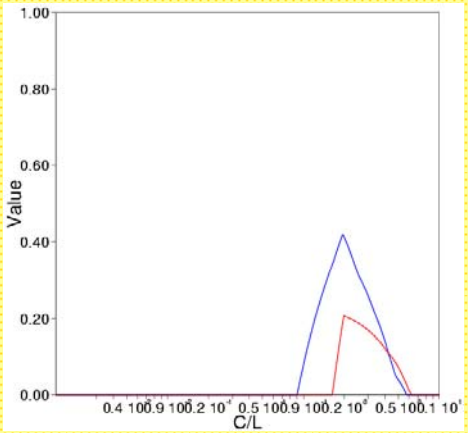
COSMO-LEPS

16-MEMBER EPS

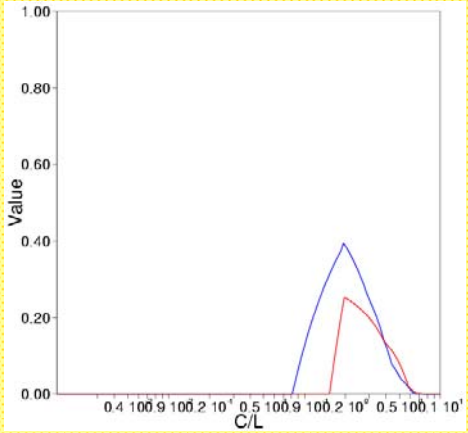




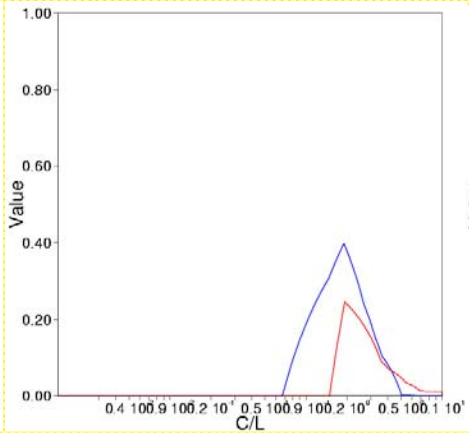
18-42h



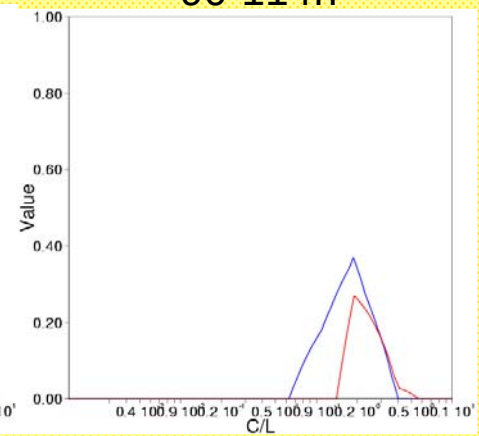
42-66h



66-90h

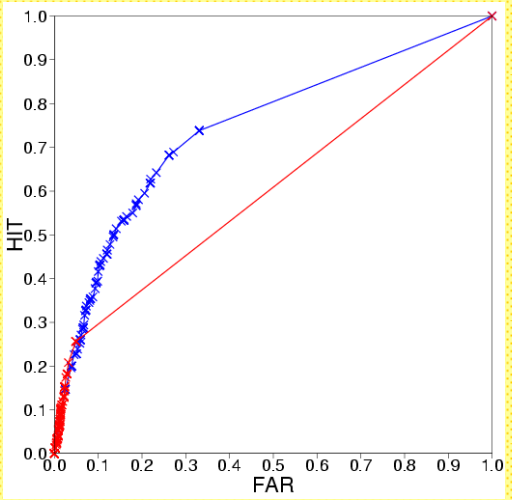


90-114h



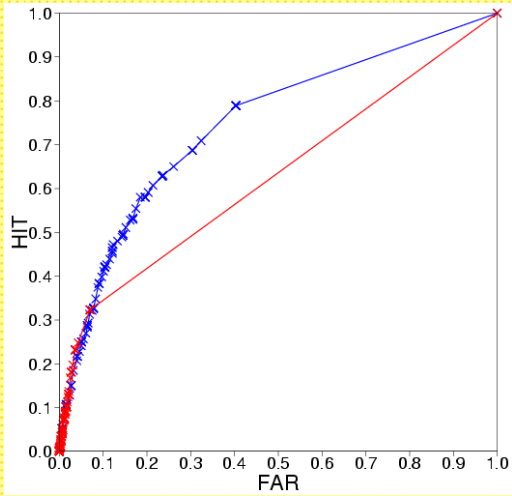
max - 20mm/24h

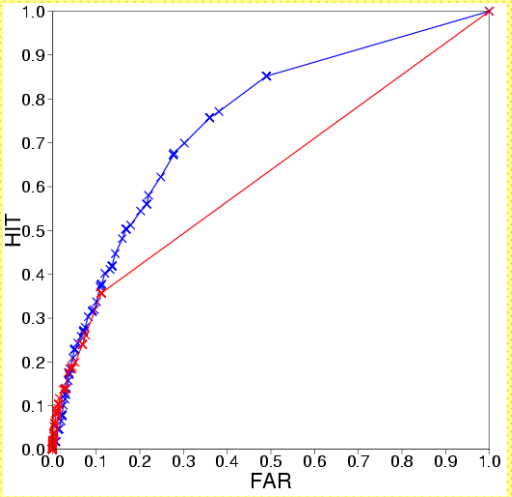
noss=469



+42

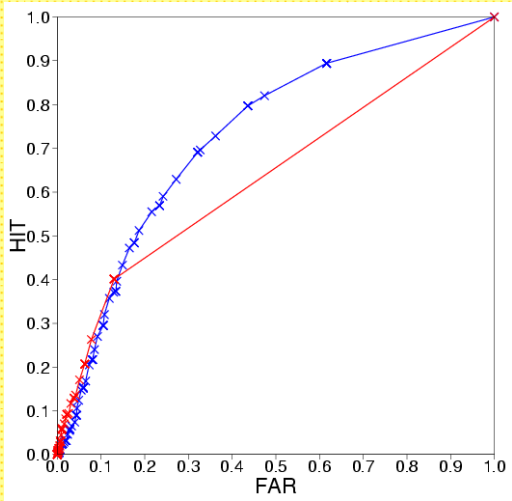
+66





+90

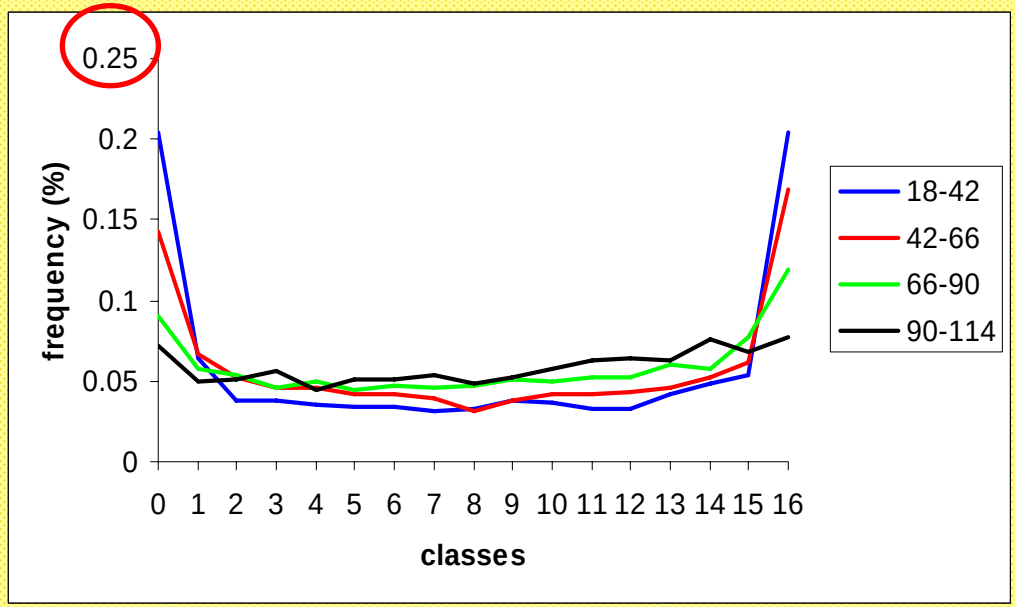
+114

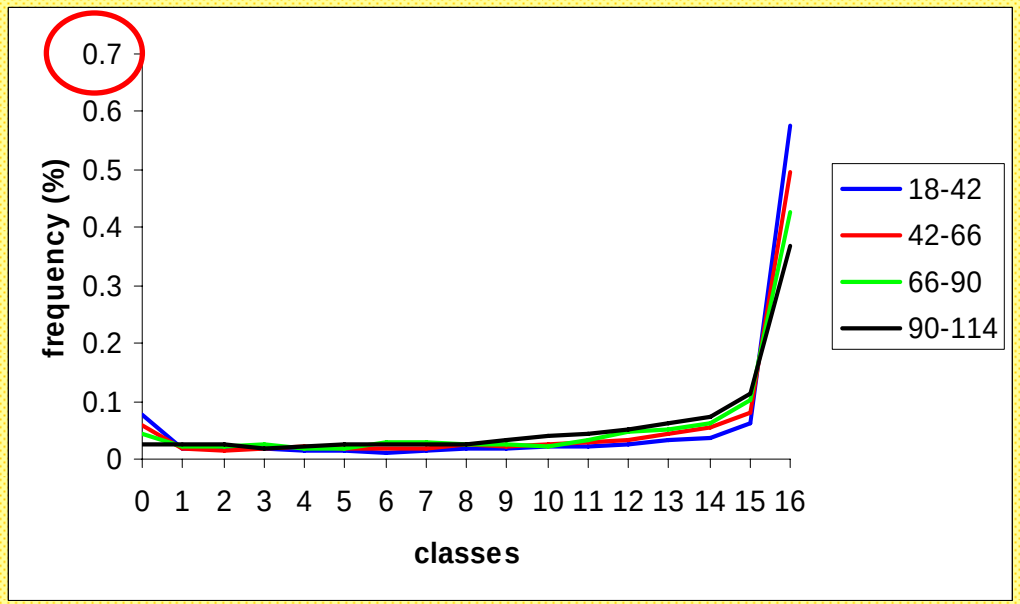


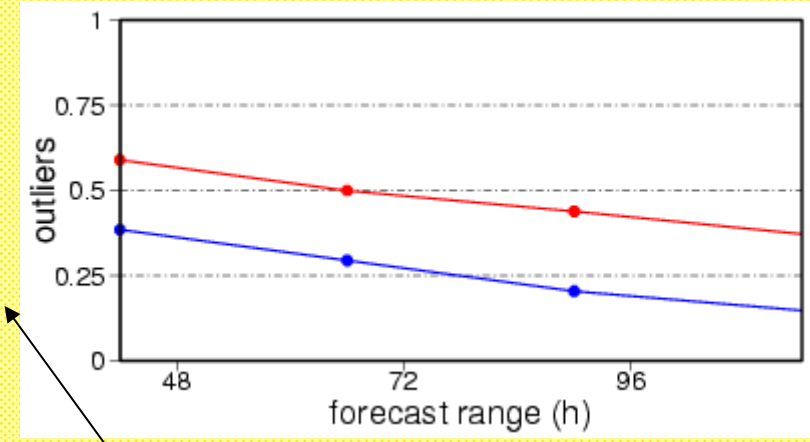
COSMO-LEPS

16-MEMBER EPS

max





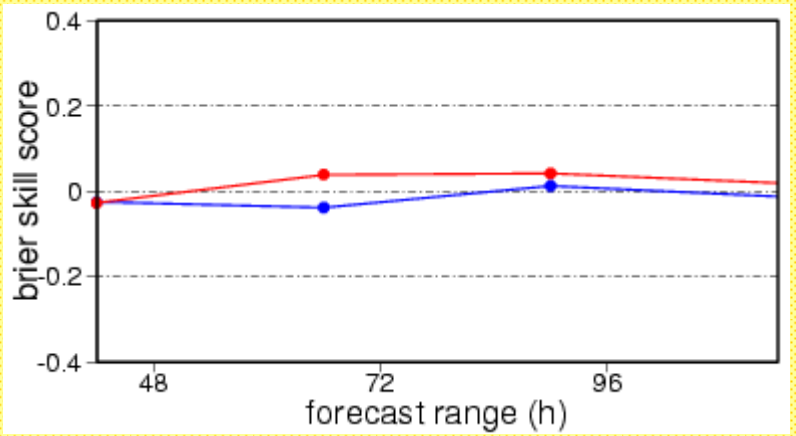


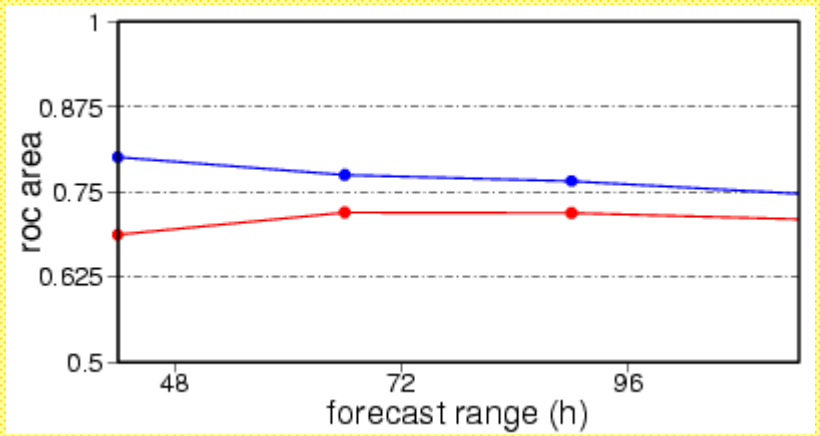
COSMO-LEPS

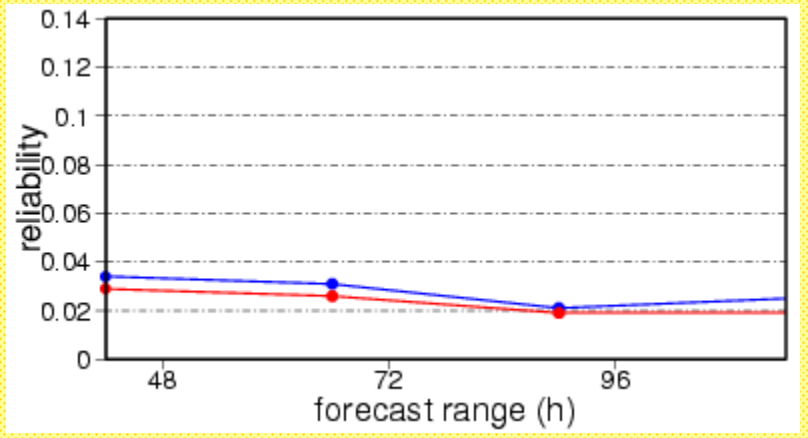
16-MEMBER EPS

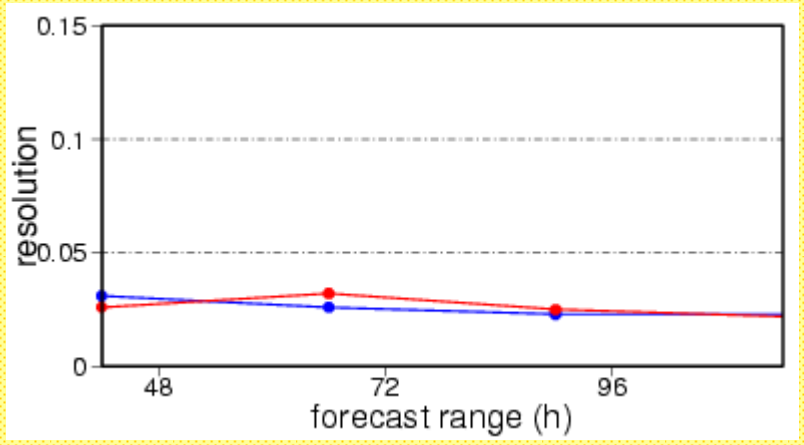
p90 - 10mm/24h

noss=443









COSMO-LEPS

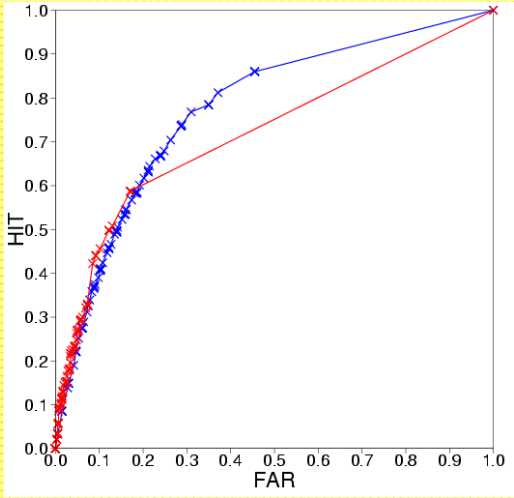
16-MEMBER EPS

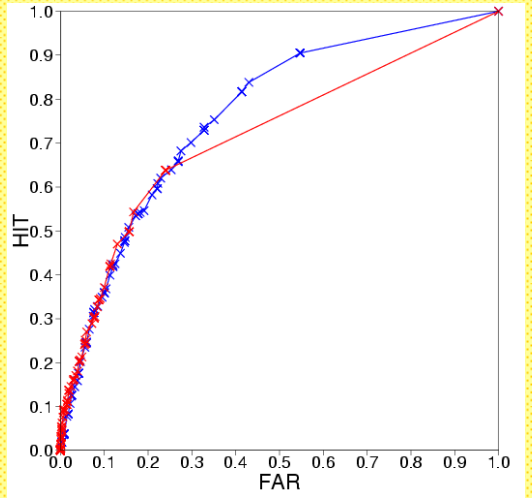
p90 - 10mm/24h

noss=443

+42

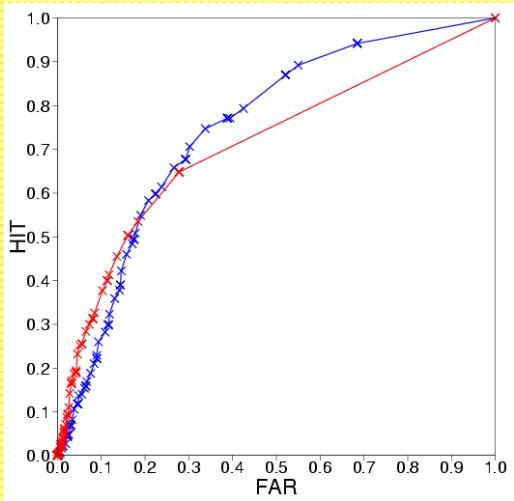
+66





+90

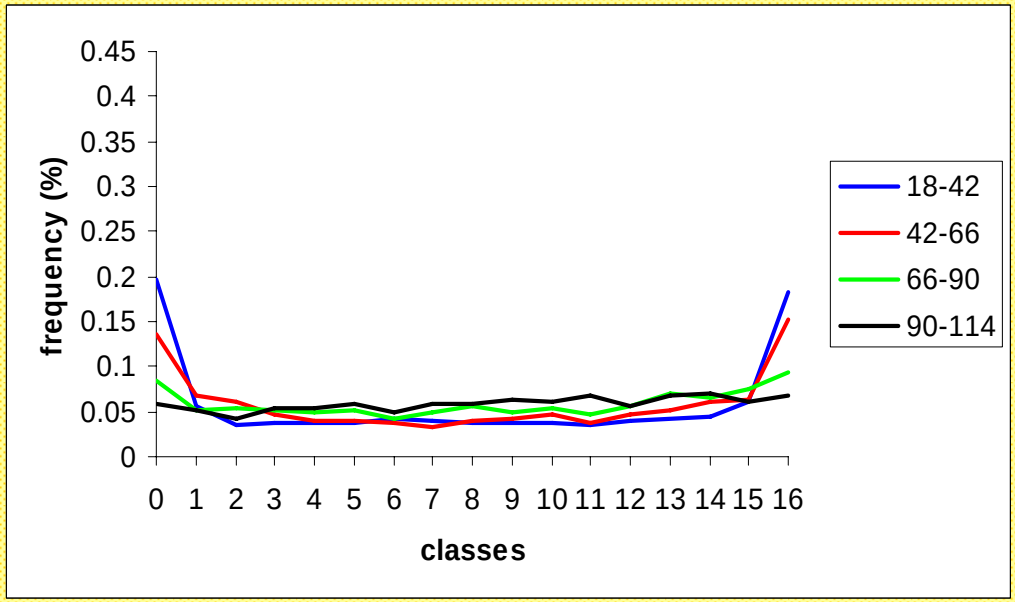
+114

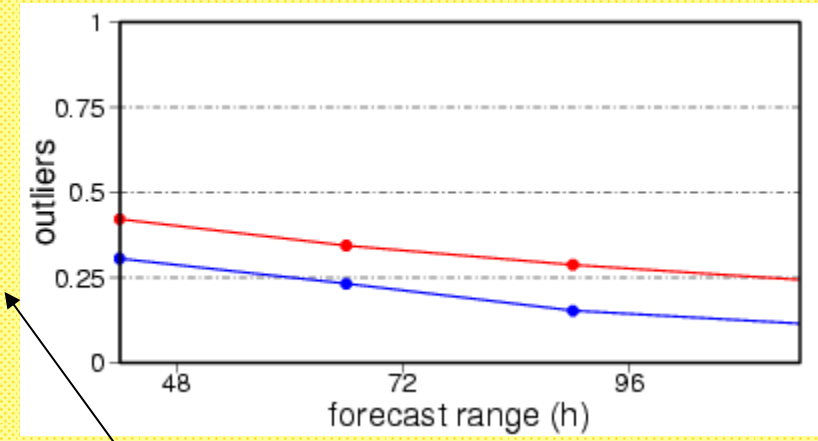


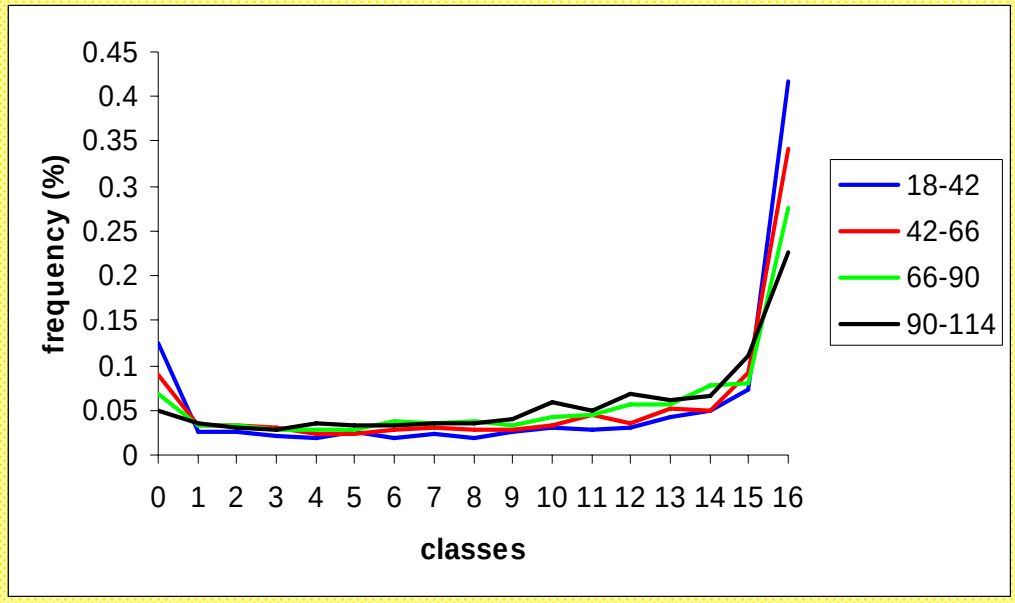
COSMO-LEPS

16-MEMBER EPS

p90

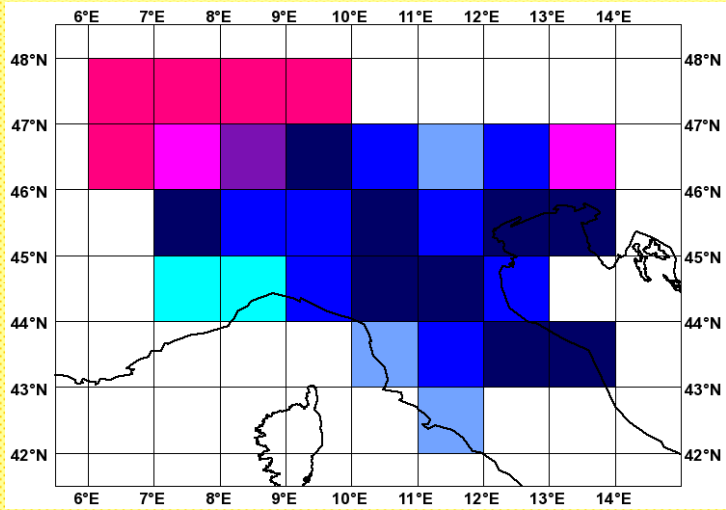

0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
frequency (%)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
classes
18-42
42-66
66-90
90-114


1
0.75
0.5
0.25
0
outliers
48
72
96
forecast range (h)
COSMO-LEPS
16-MEMBER EPS

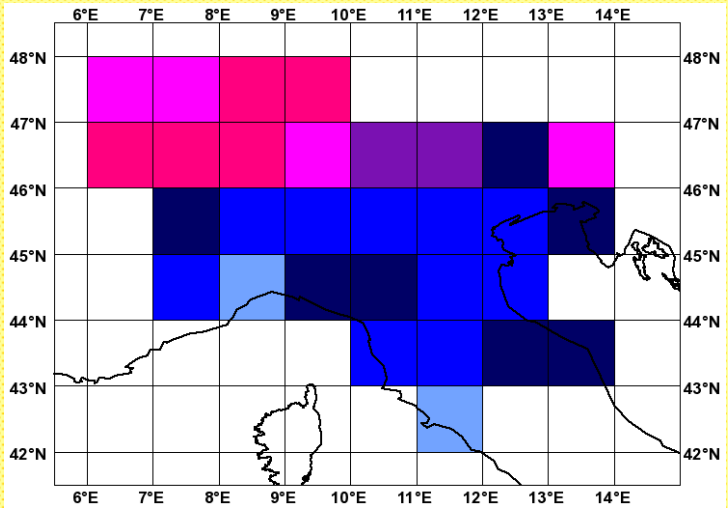

0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
frequency (%)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
classes
18-42
42-66
66-90
90-114

accumulated precipitation - ave

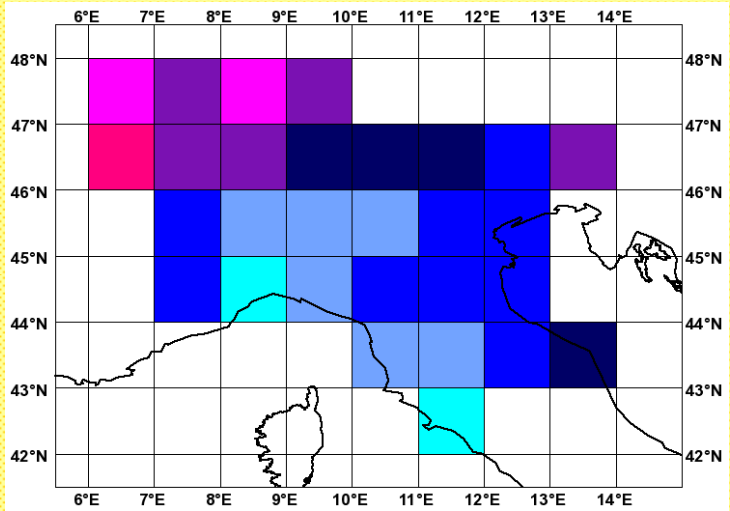
OBS



COSMO-LEPS

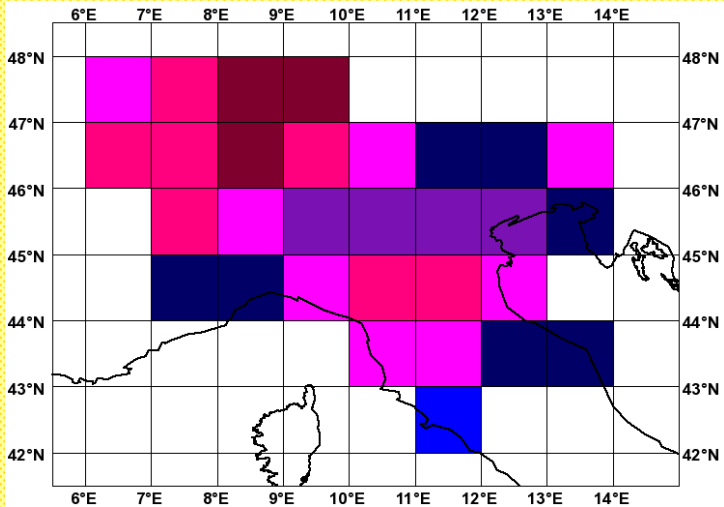


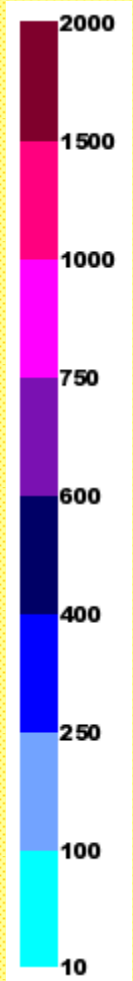
16 RM EPS



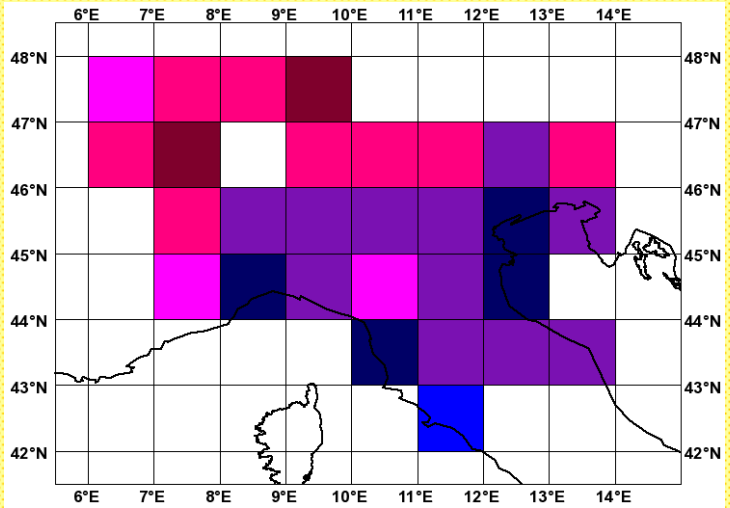
accumulated precipitation - max

OBS





COSMO-LEPS



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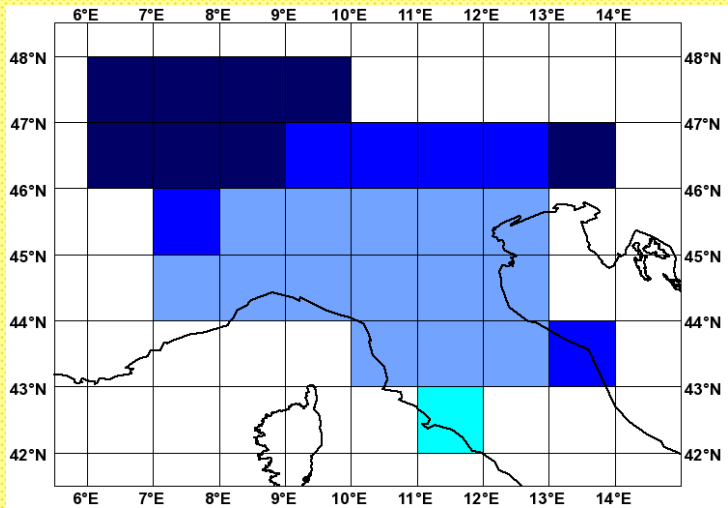

Conclusions

- a verification is applied trying to assess the quality of the distribution of the precipitation forecast by COSMO-LEPS
- prediction of average values: better ROC area for high precipitation thresholds
- COSMO-LEPS has skill in predicting precipitation maxima over a 1x1 degree box for any threshold
- higher ROC area value for the prediction of the 90^{th} percentile
- importance of considering different scores
- importance of considering different parameters of the distribution