Verification of precipitation forecasts from two limited area models and ECMWF over Portugal using a multi-categorical technique

by

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4th Verification Workshop, Helsinki, 4-10 June 2009

Introduction

- In Winter, Portugal is mostly affected by large-scale weather systems from the Atlantic, hence spatial variation of precipitation is not that much siginificant
- convective activities are more frequent (late spring, summer).

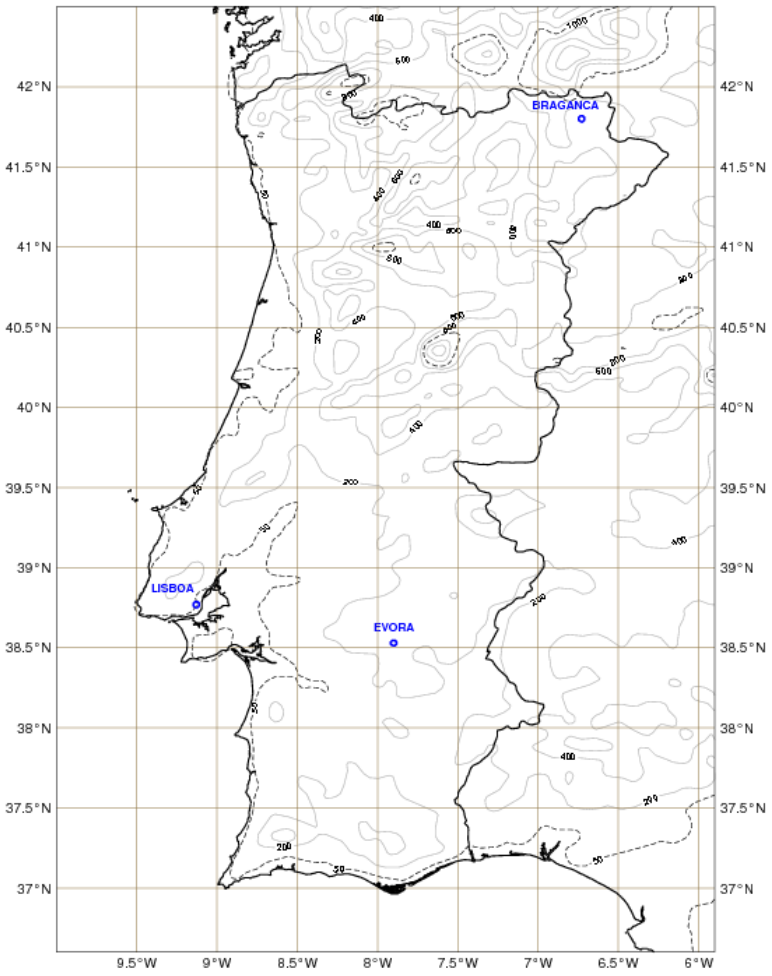
Introduction

- Predicting precipitation at exact location and time remains a problem
- The precipitation predicted by models varies from one model to the other in amount and spatial coverage.
- The aim of this study is to asses the quality of precipitation in winter and early spring in 3 cities

Model setup

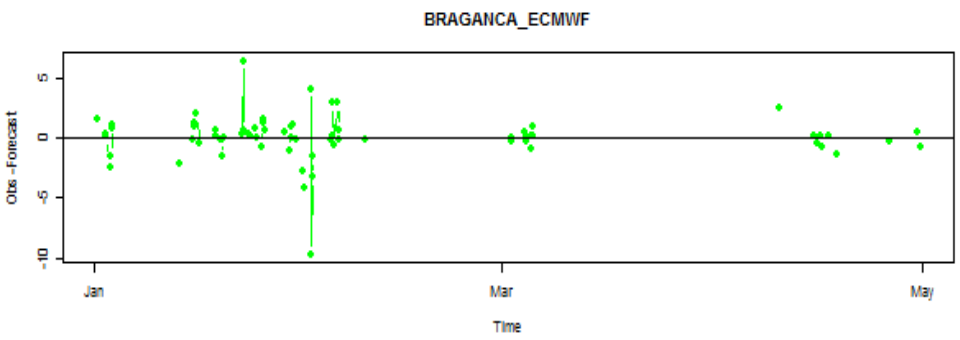
model	Hor. Res(km)	Ver. R(lev.)	Type of model
ECMWF	25	91	Global
Aladin	9	41	LAM
Hirlam	16	-	LAM

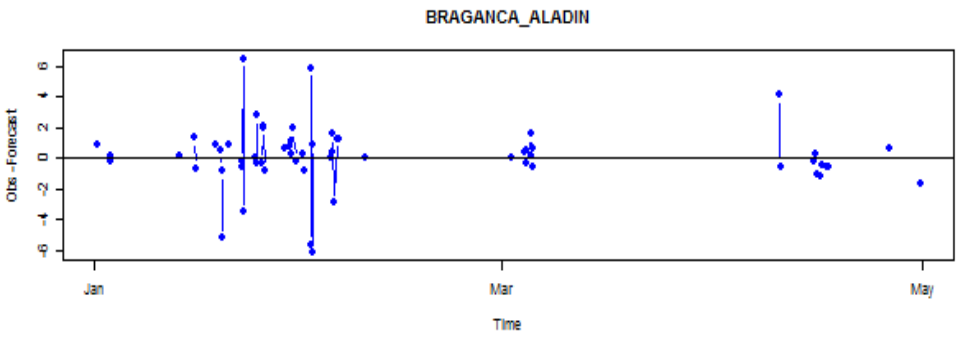
Data Set

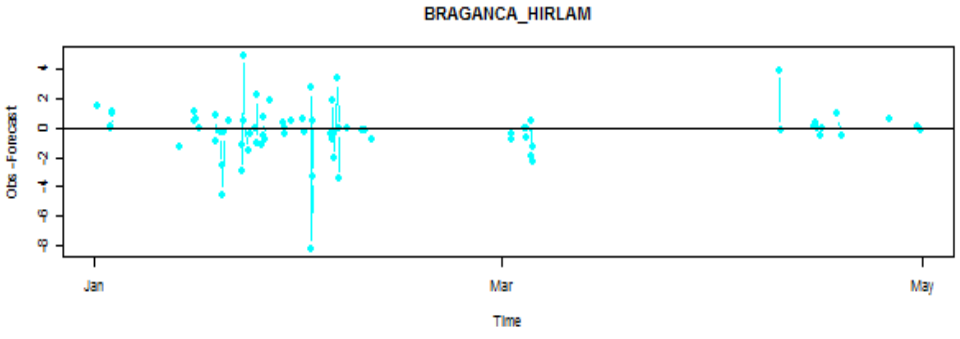


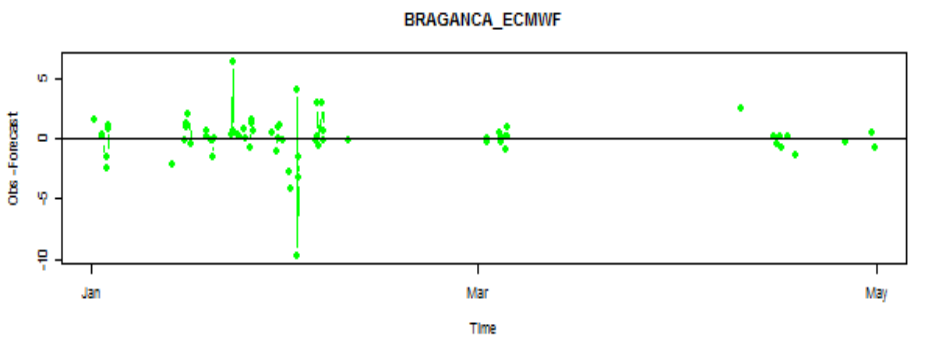
- 3 hours accumulated precipitation data of three cities for first 24 hours that spans from Jan 1- April 30, 2009 for both observations and forecasts
- the data set is break down into two, the first 12 hours and the second 12 hours

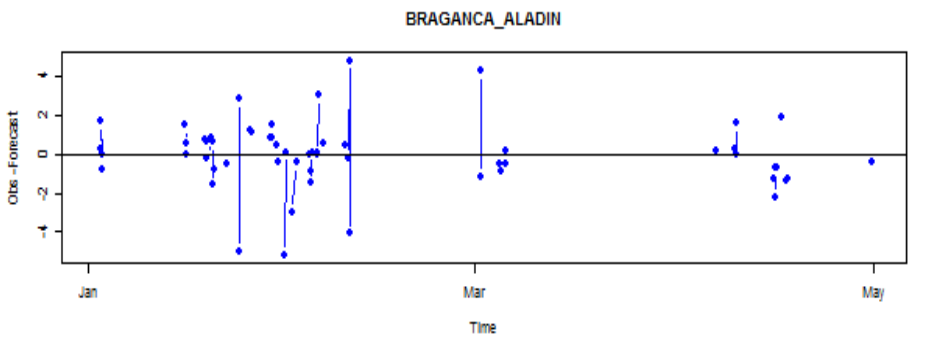
Precipitation anomaly plot

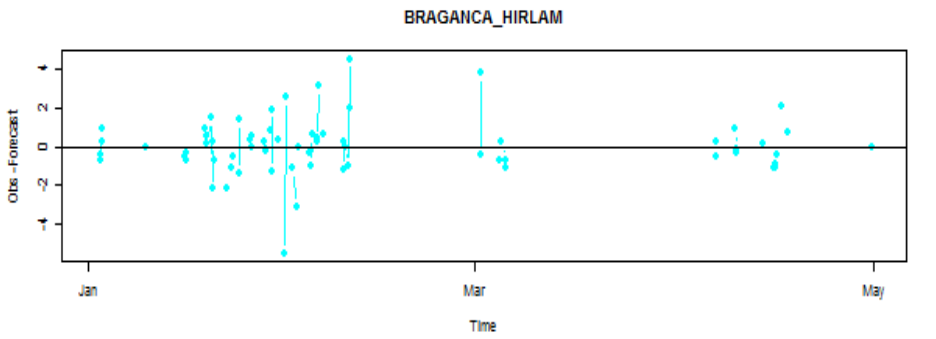








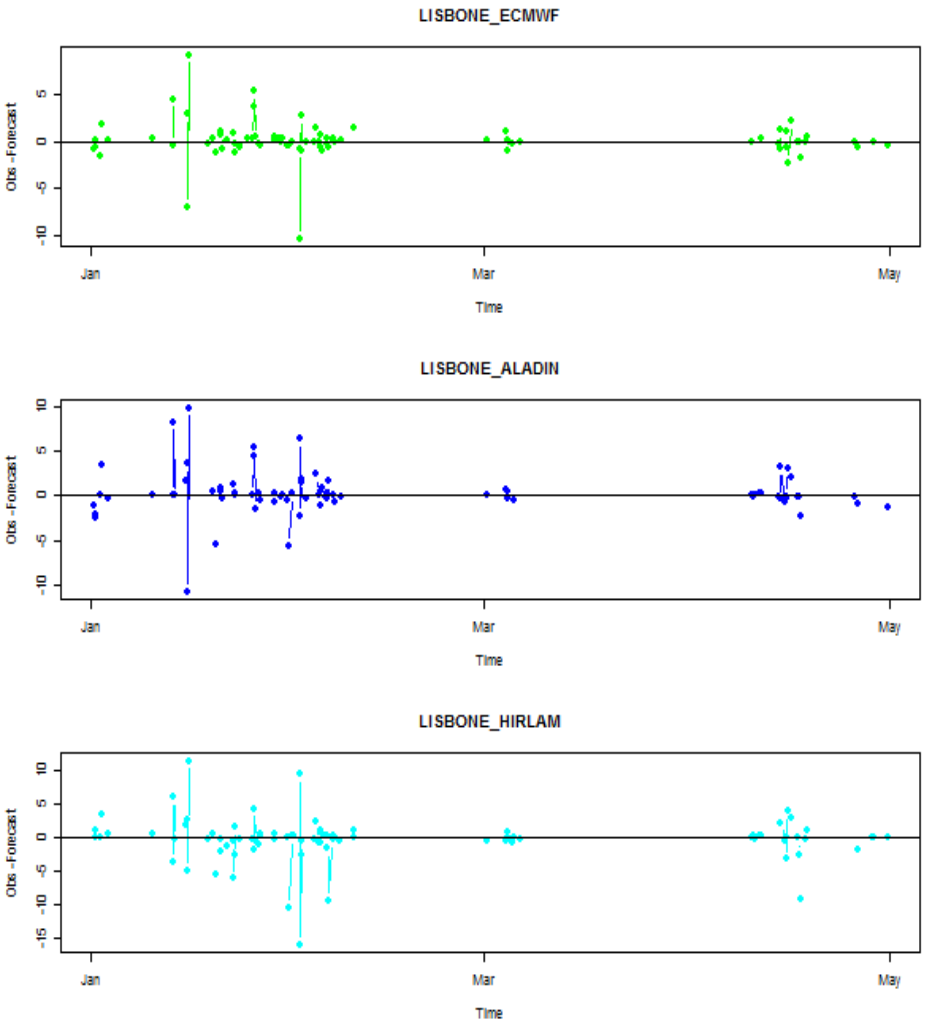


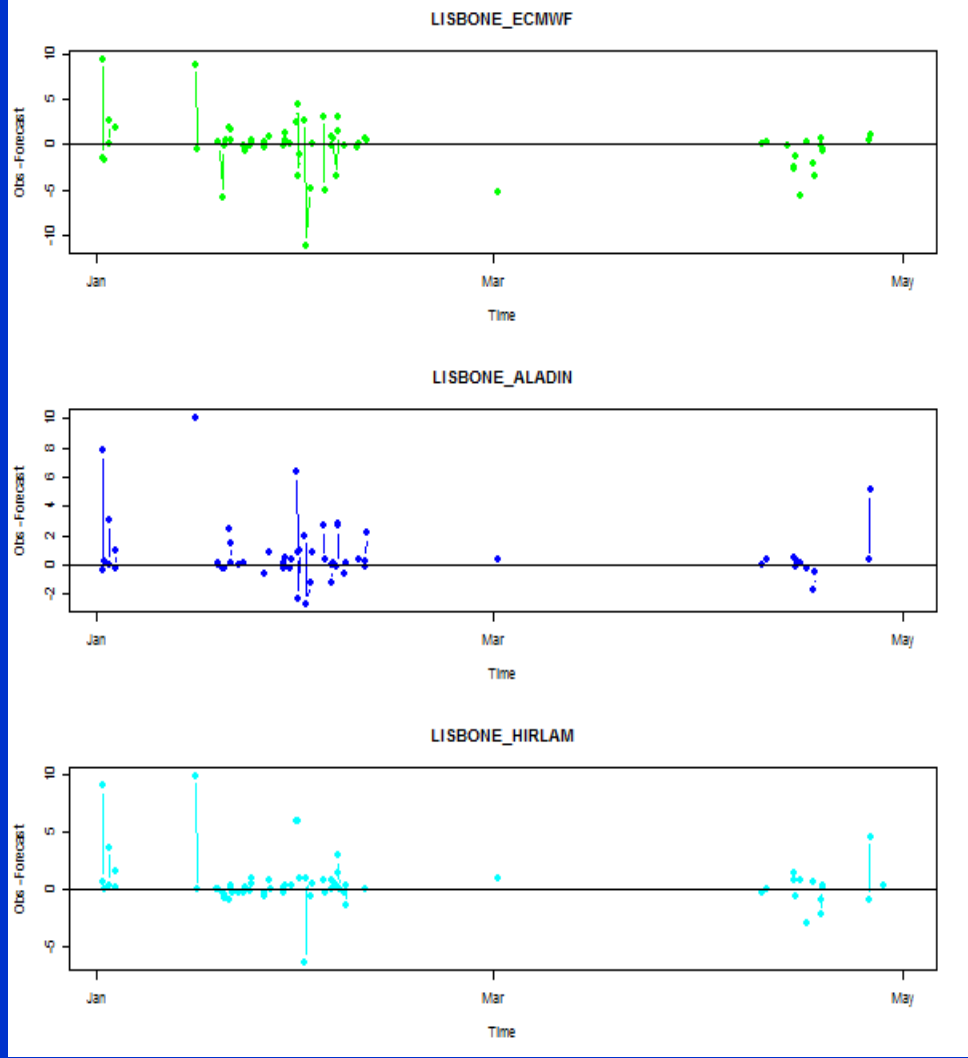


3-12 hours

15-24 hours

Precipitation anomaly plot

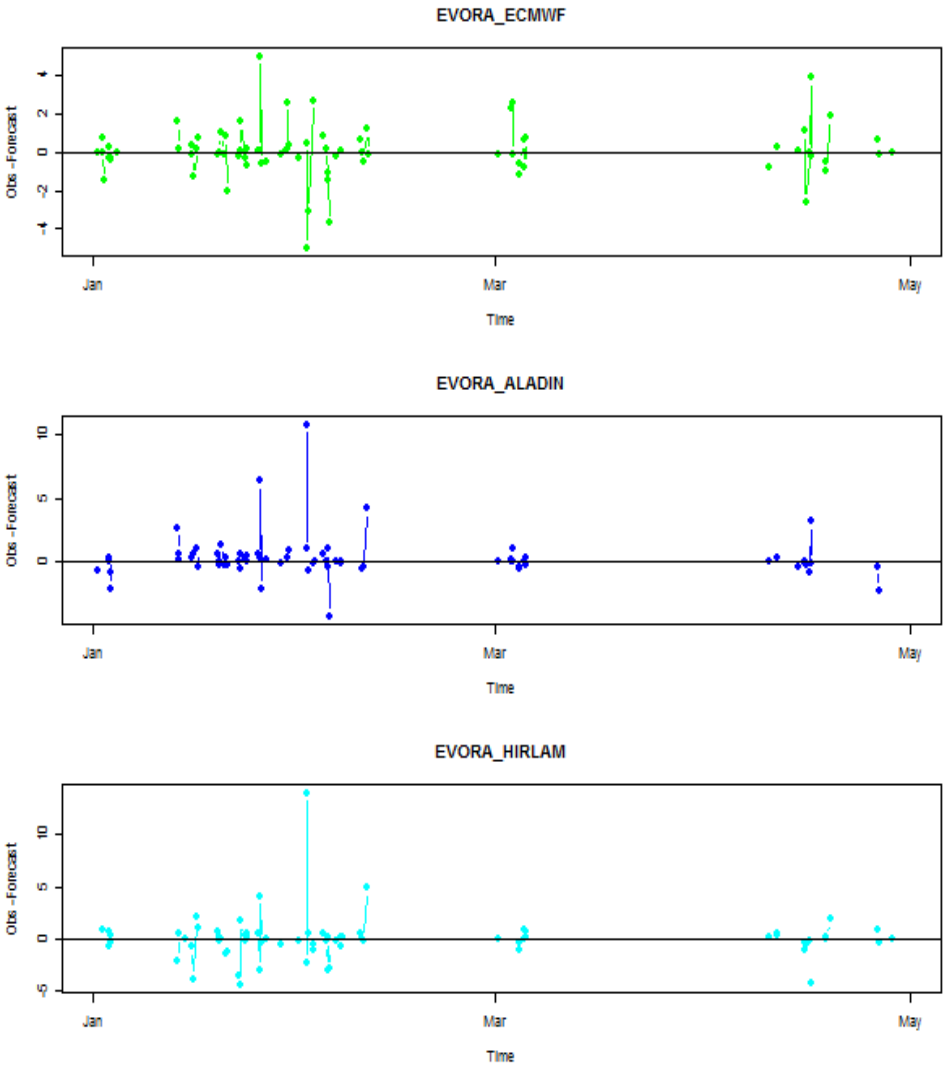


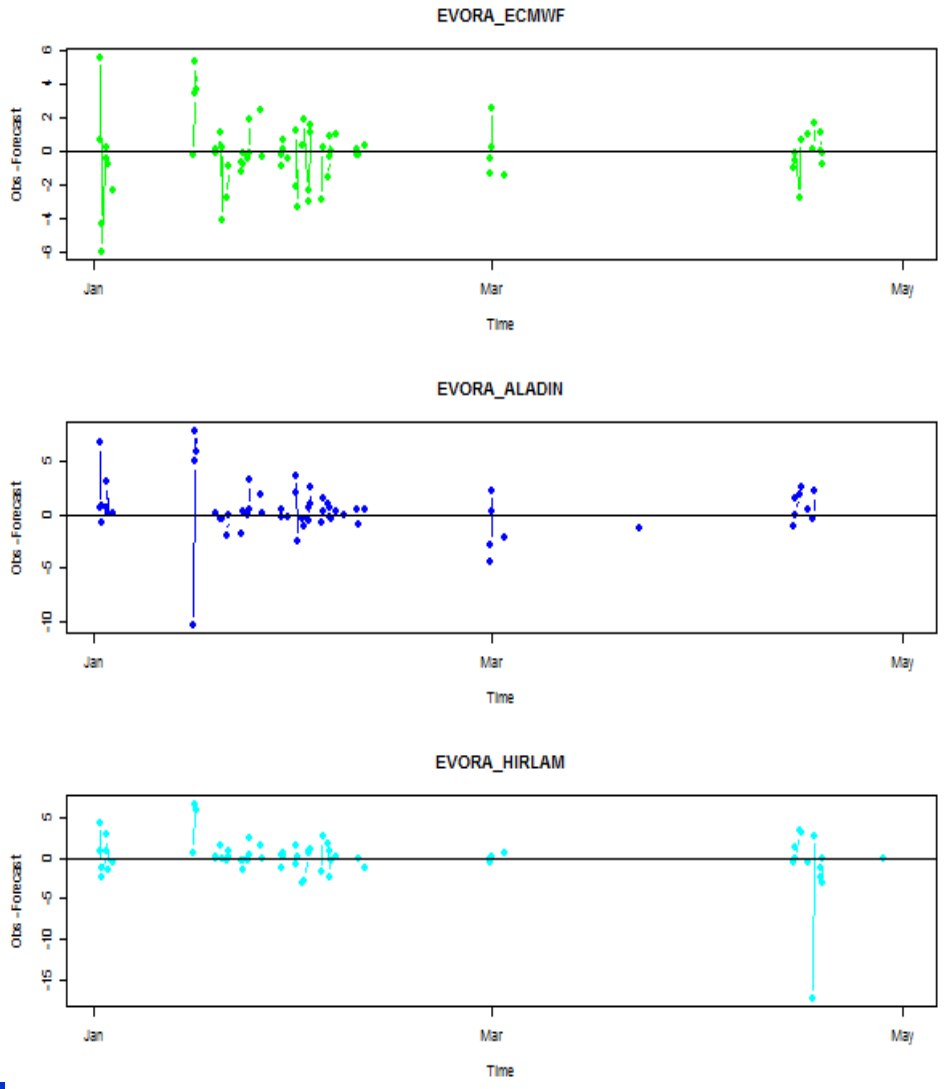


3-12 hours

15-24 hours

Precipitation anomaly plot





3-12 hours

15-24 hours

Methodology

The methodology used for this study is

- Multi-category contigency table
  - The samples are not large

LISBON(3-12h)

ECMWF

F \ O	[0,0.1]	(0.1,2]	(2,5]	(5,30]
[0,0.1]	355	21	0	0
(0.1,2]	46	32	5	1
(2,5]	2	6	3	4
(5,30]	0	0	2	1

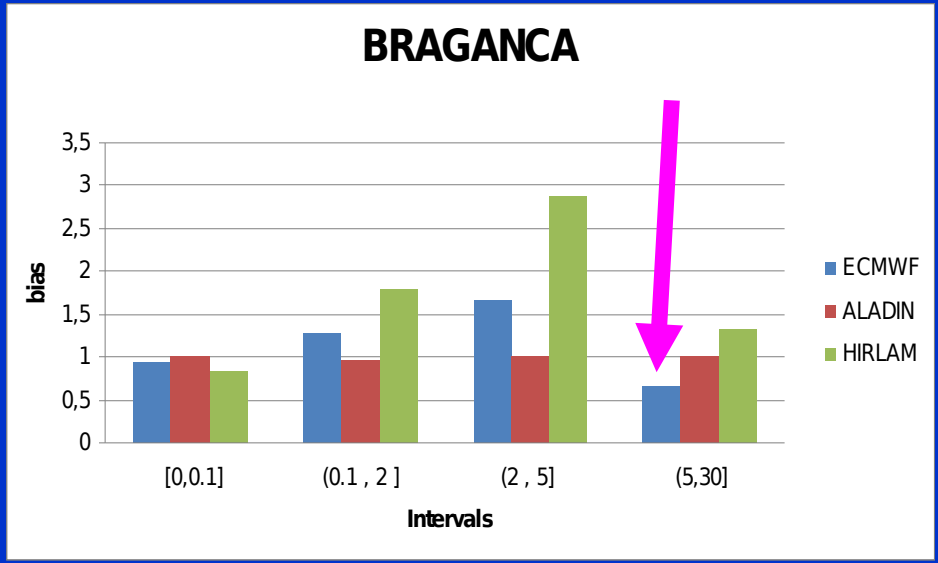
Aladin

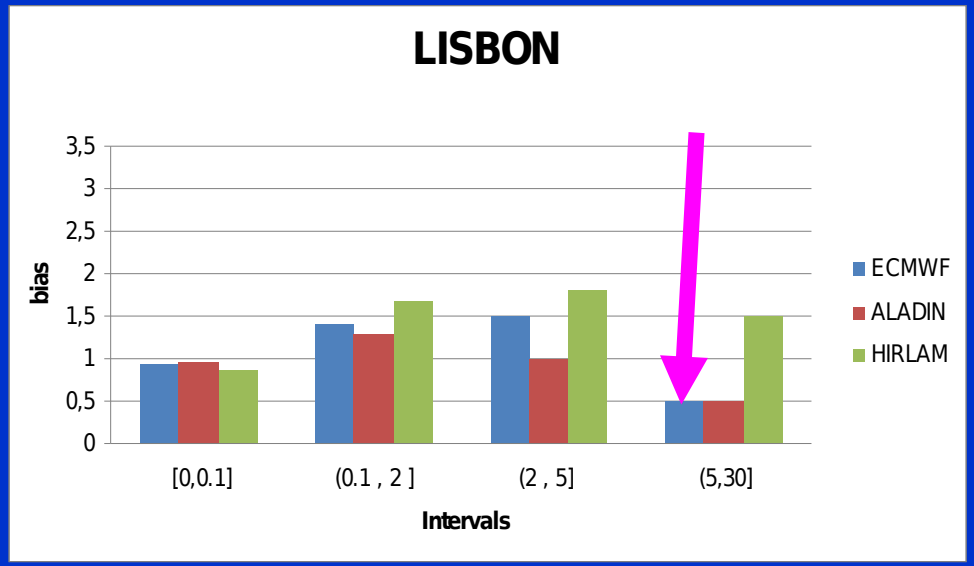
F \ O	[0,0.1]	(0.1,2]	(2,5]	(5,30]
[0,0.1]	365	21	1	0
(0.1,2]	34	31	6	4
(2,5]	2	4	2	2
(5,30]	0	2	1	0

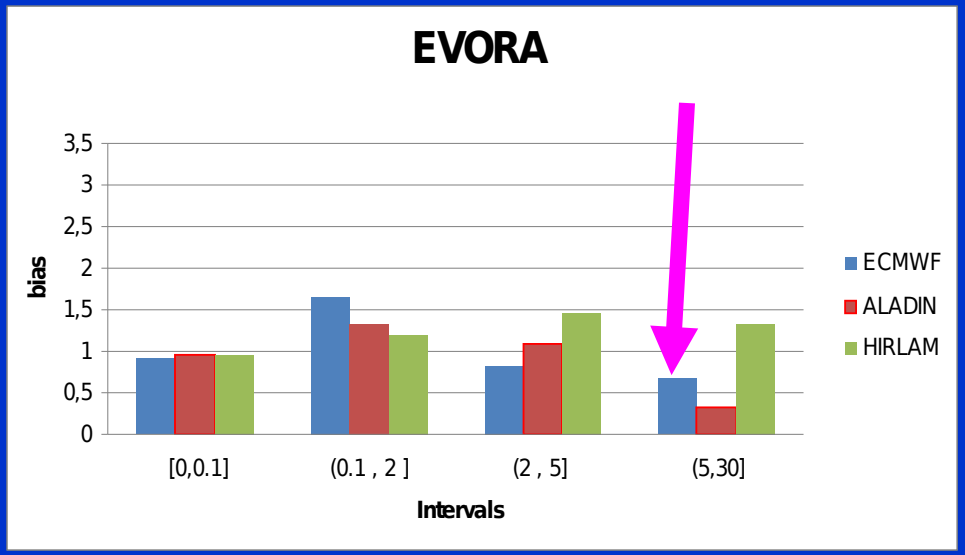
Hirlam

F \ O	[0,0.1]	(0.1,2]	(2,5]	(5,30]
[0,0.1]	339	15	1	0
(0.1,2]	58	31	3	2
(2,5]	5	5	5	3
(5,30]	2	5	1	1

Bias for the first 12 hours

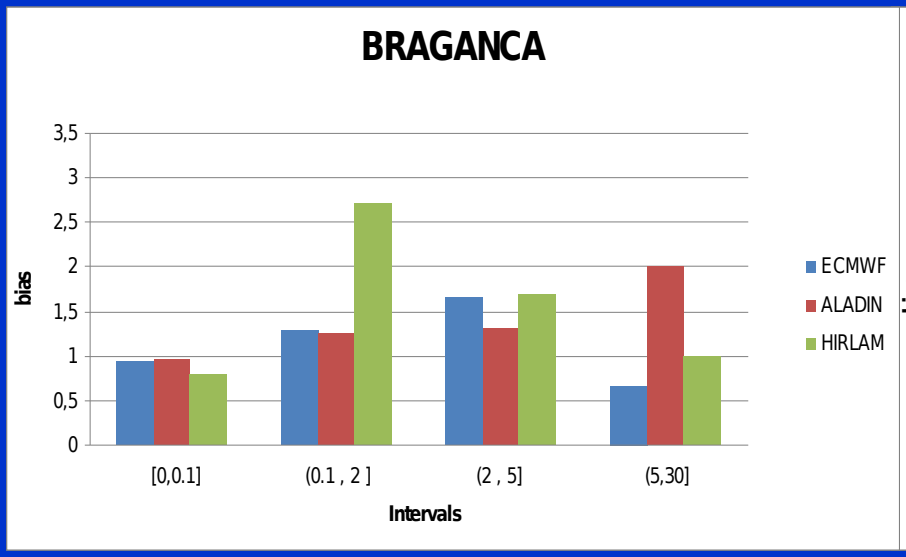


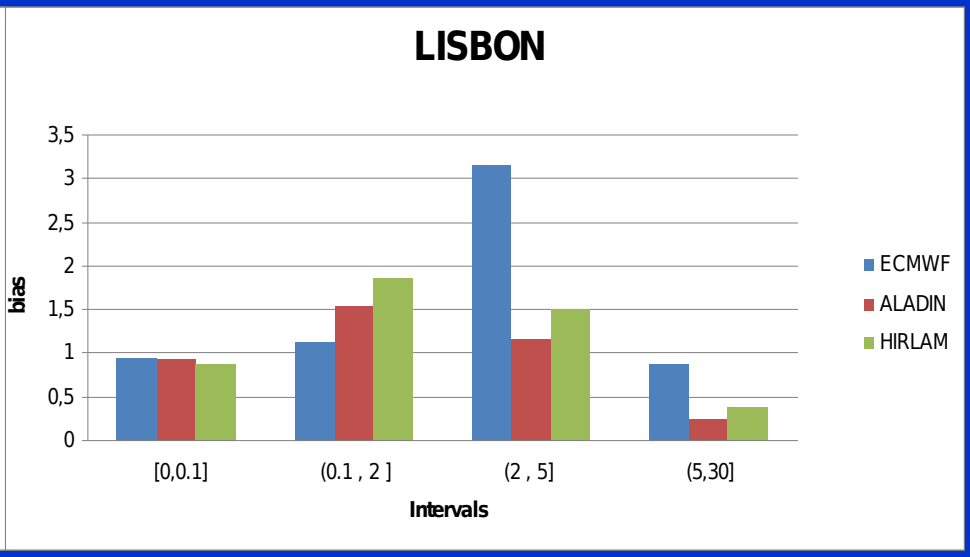


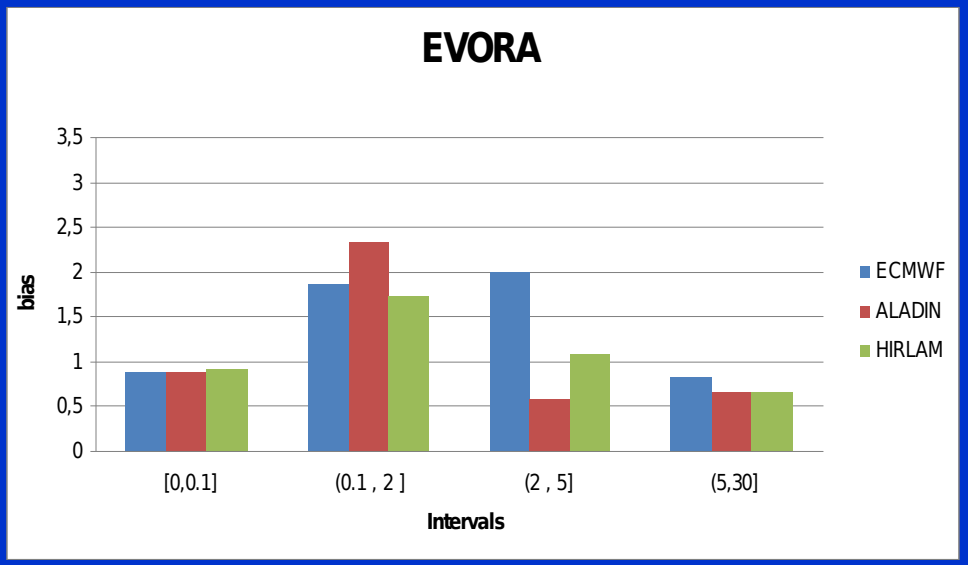


- ECMWF under-forecast a value greater than 5
- Hirlam over-forecast if there is rain

Bias for the second 12 hours

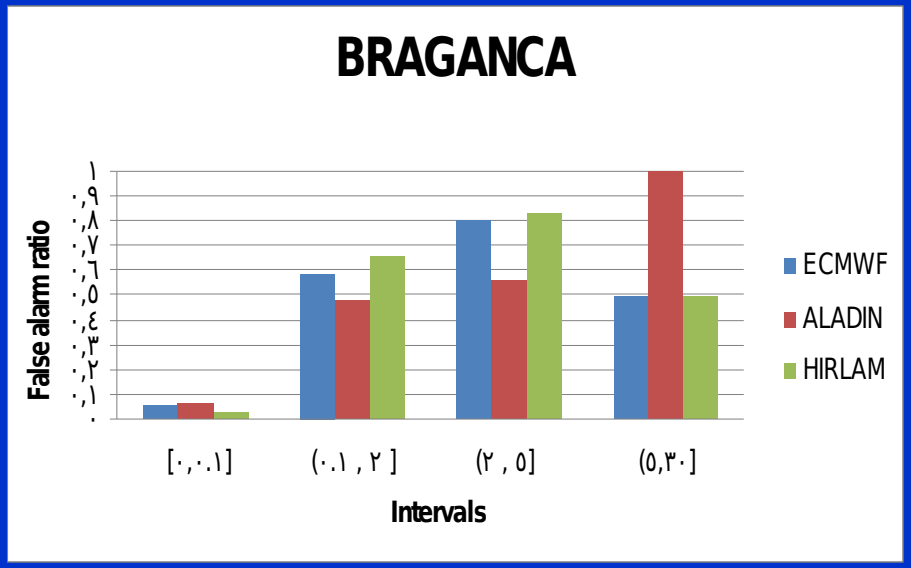


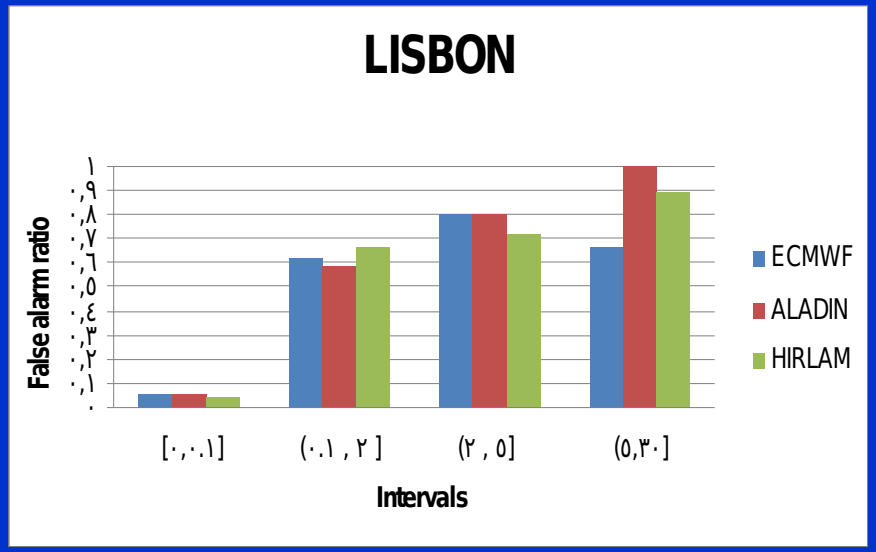


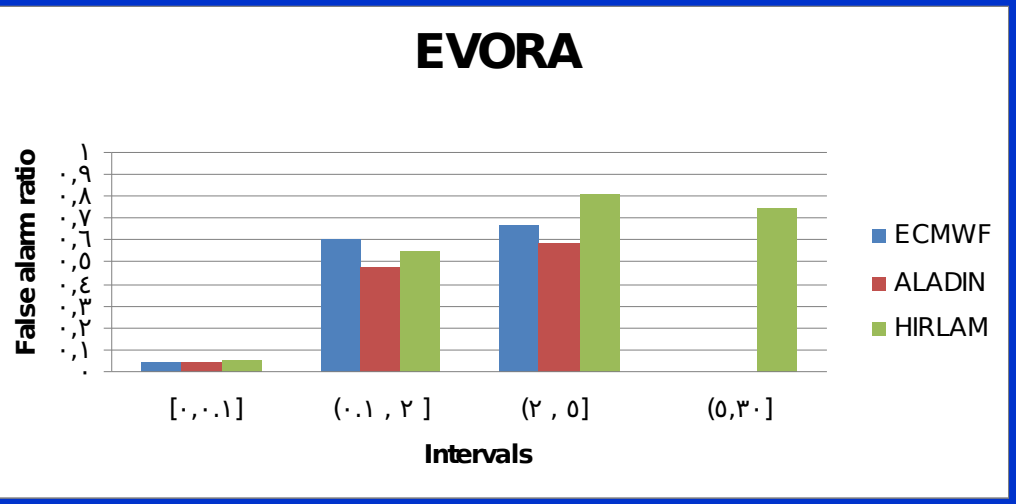


- Most of the models under-forecast for higher category

False alarm ratio for the first 12 hours

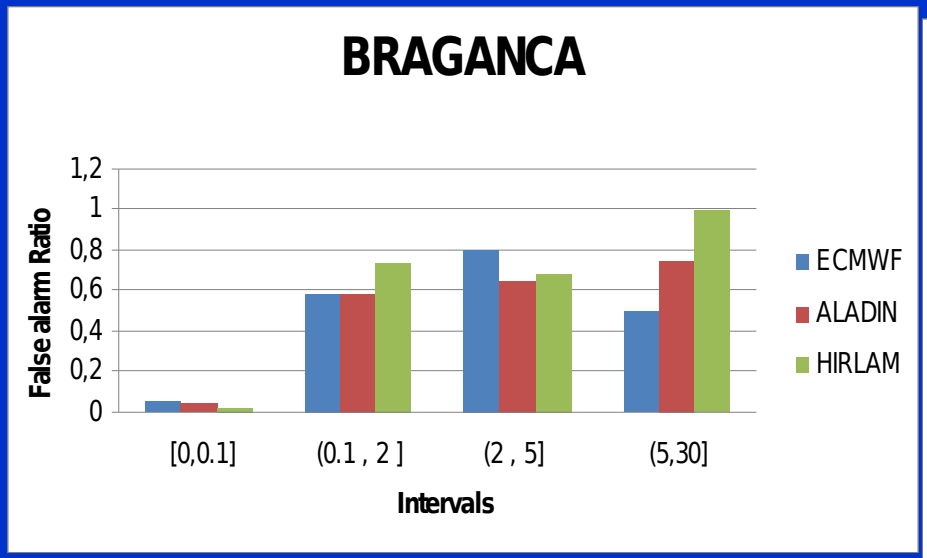


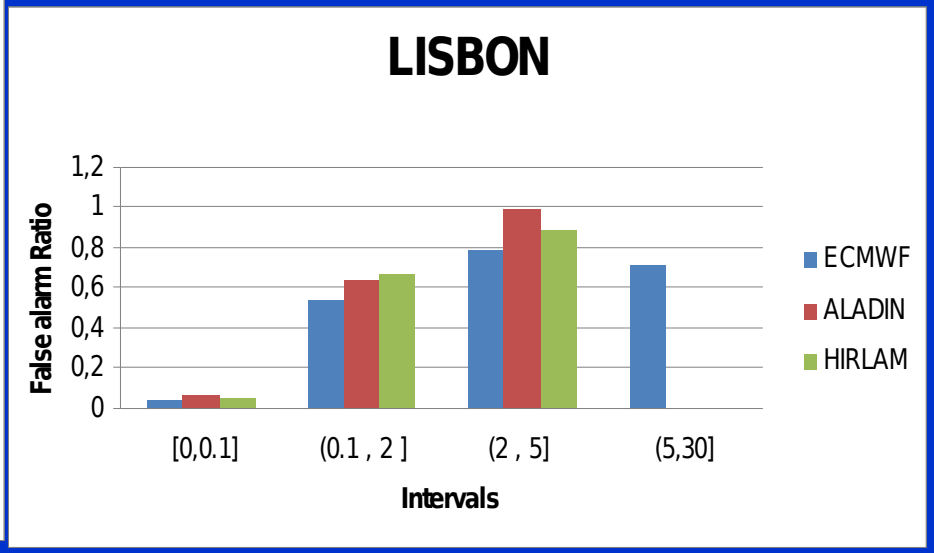


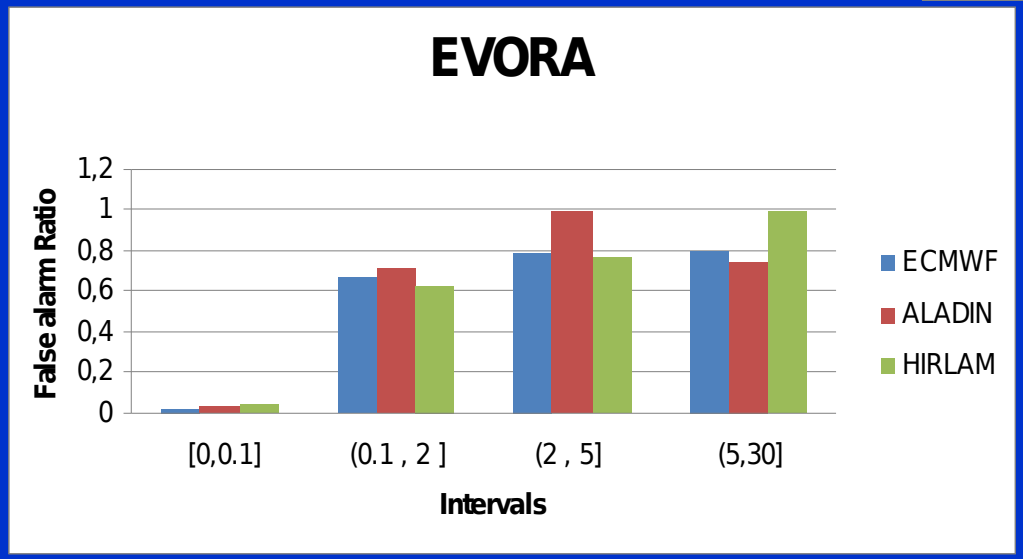


- Aladin and ECMF have no false alarm ratio at EVORA
- Almost all models over-forecast in precipitation event

False alarm ratio for the second 12 hours

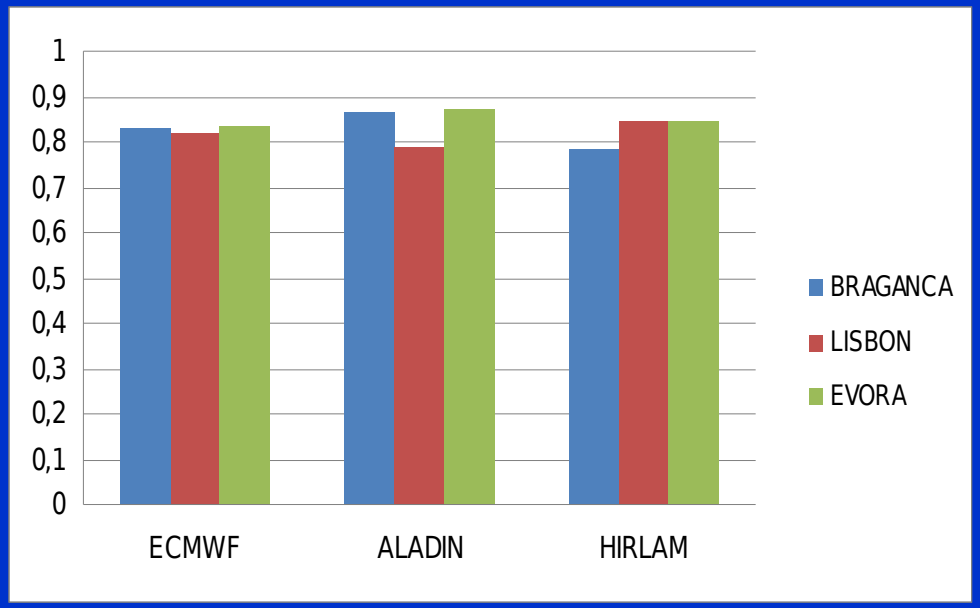




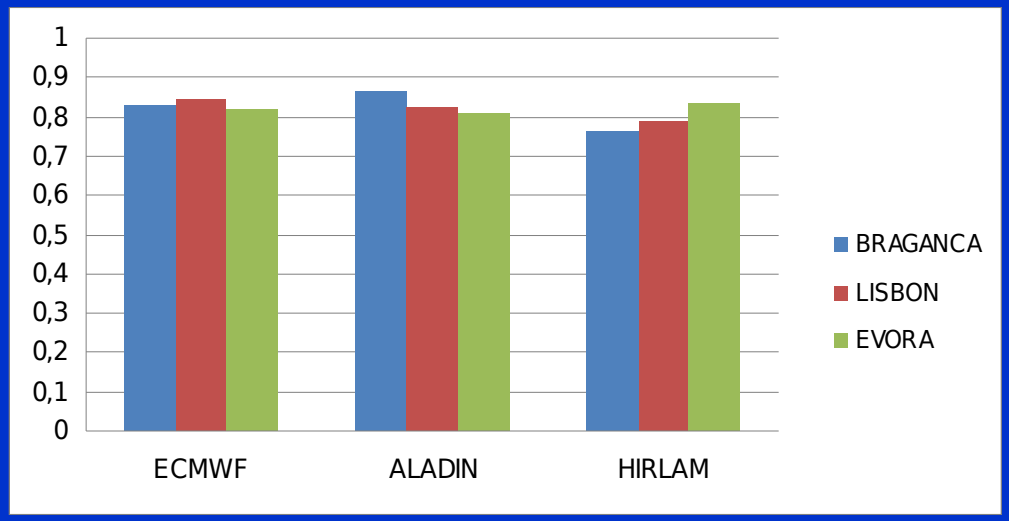


- All the models are not over-estimating for dry event
- Aladin and Hirlam have no false alarm ratio for coastal area for higher values (Lisbon)

Portion correct

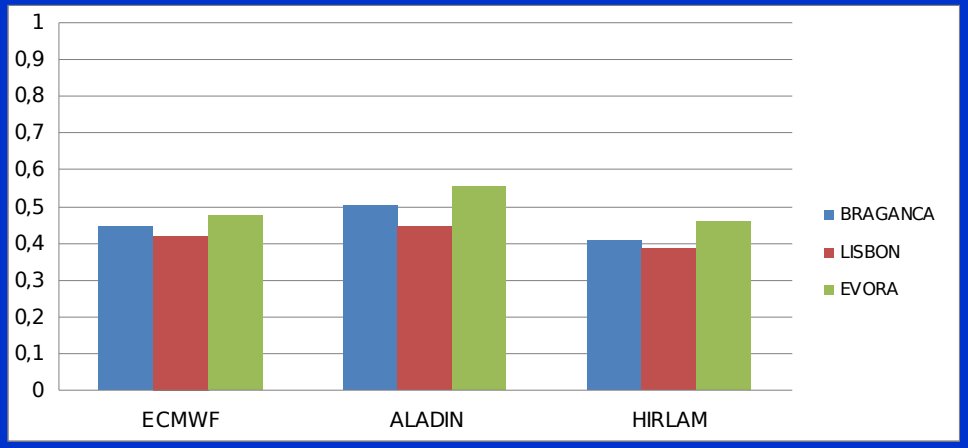


3-12h



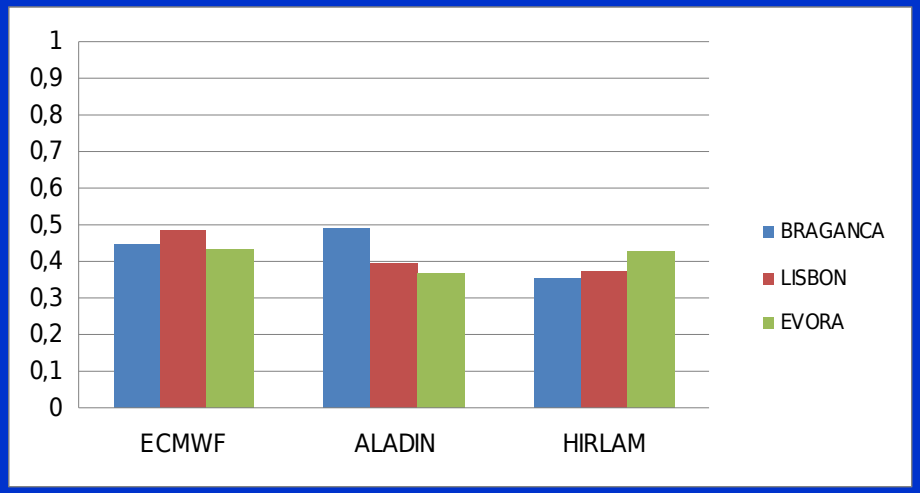
15-24h

HSS skill score



3-12h

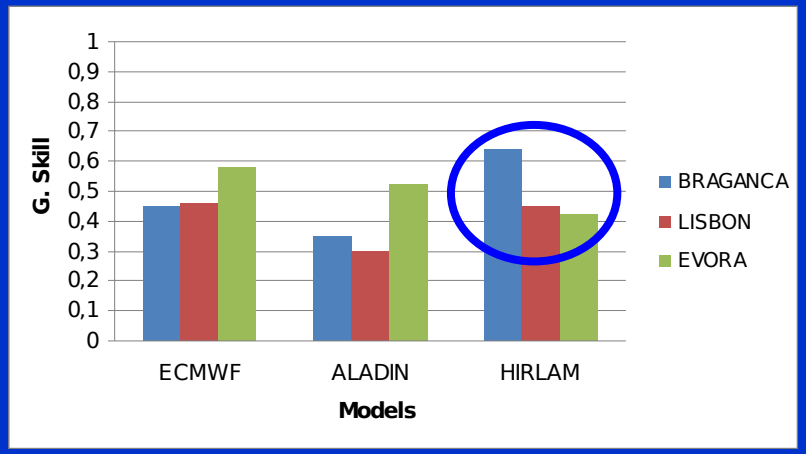
- The models have higher skill at Evora for the first 12 hours, this is not statistically significant



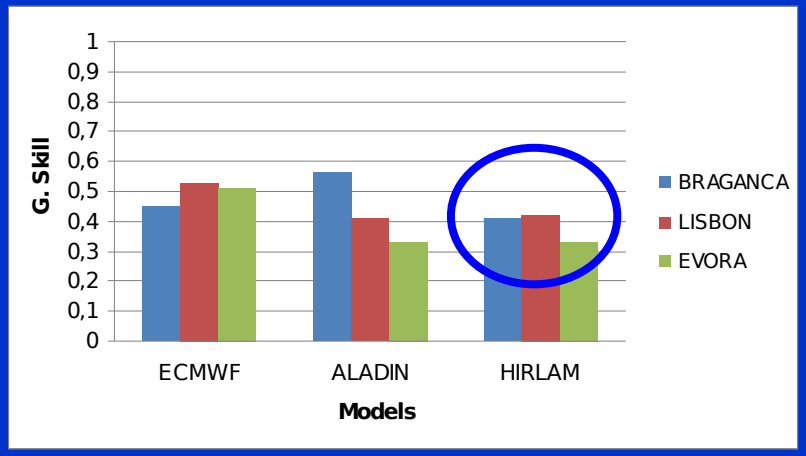
15-24h

Gerrity skill score

3-12h



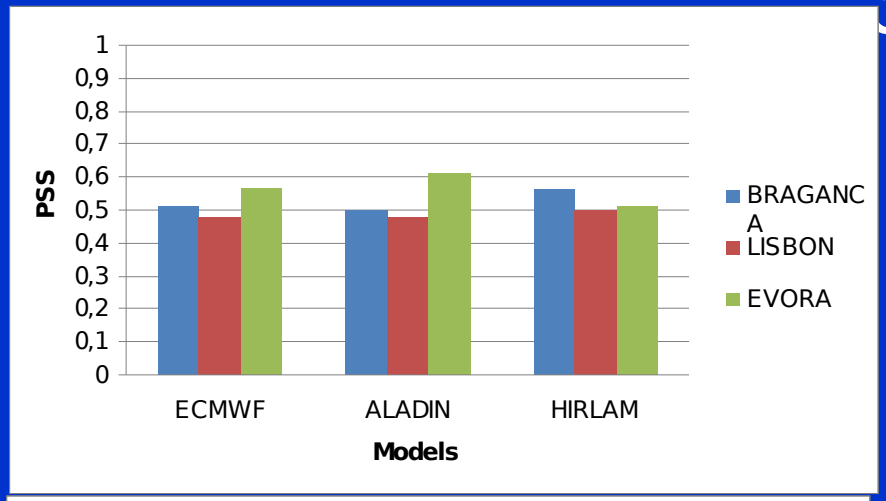
The skill of Hirlam decrease with time



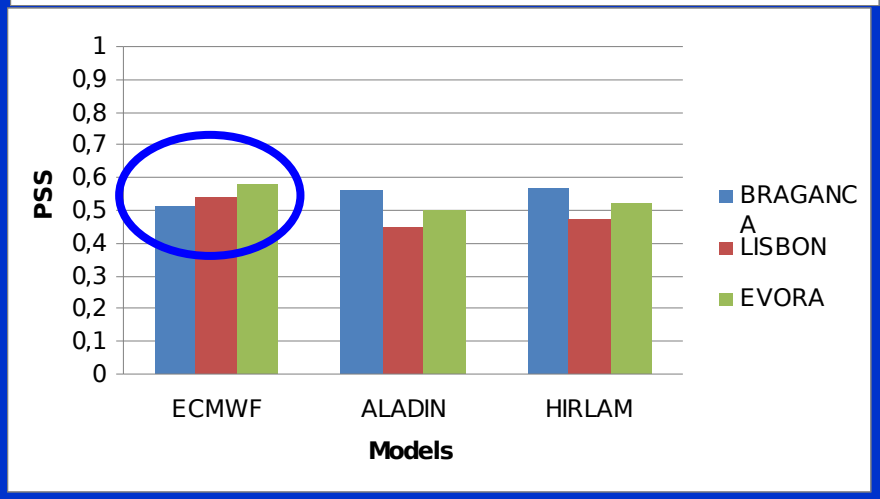
15-24h

PSS skill score

3-12h



ECMWF has a higher skill for the second 12 hours



15-24h

Conclusions

- We did not get any significant difference in the performance of three models as well as between the first 12 hours and the second 12 hours, this may be associated with sample size
- Three models captured very well the dry events
- PSS showed a higher skill for three models
- ECMWF has higher skill for the second 12 hours