Precipitation verification: Different methods and approaches

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Cosmo General Meeting 2013 – Sibiu (Romania)

CONSORTIUM FOR SMALL SCALE MODELING
COSMO

1

•Common area → Italy
•Dataset → high res raingauges
•Method → 24h/6h averaged cumulated precipitation or maximum values (both observed and forecasted) over 90 meteo-hydrological basins

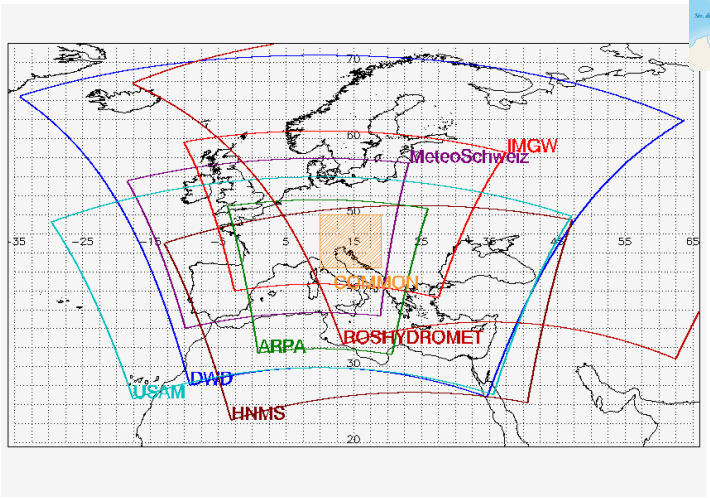
3 methods

3

Various domains → each countries dataset → synop stations
Method → 24h/6h averaged cumulated forecasted precipitation values over 15 km radius, 24h/6h cumulated observed precipitation values over station point

2

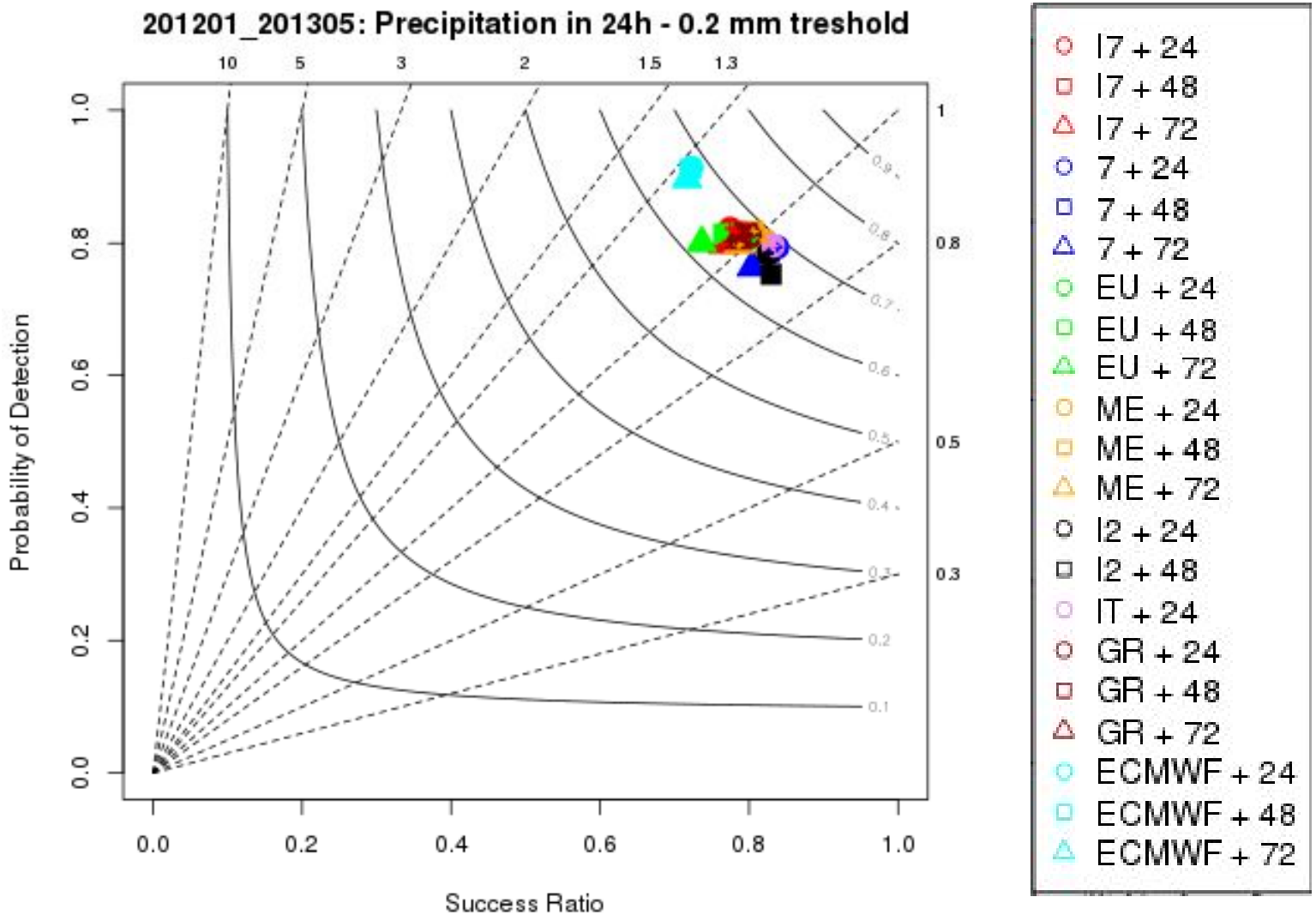
•Common area → decided in Lugano
•Dataset → synop stations
•Method → 24h/6h averaged cumulated forecasted precipitation values over 15 km radius, 24h/6h cumulated observed precipitation values over station point



201201- 201305: Average over area > 0.2 mm/24h

1

Ecmwf → overestimation

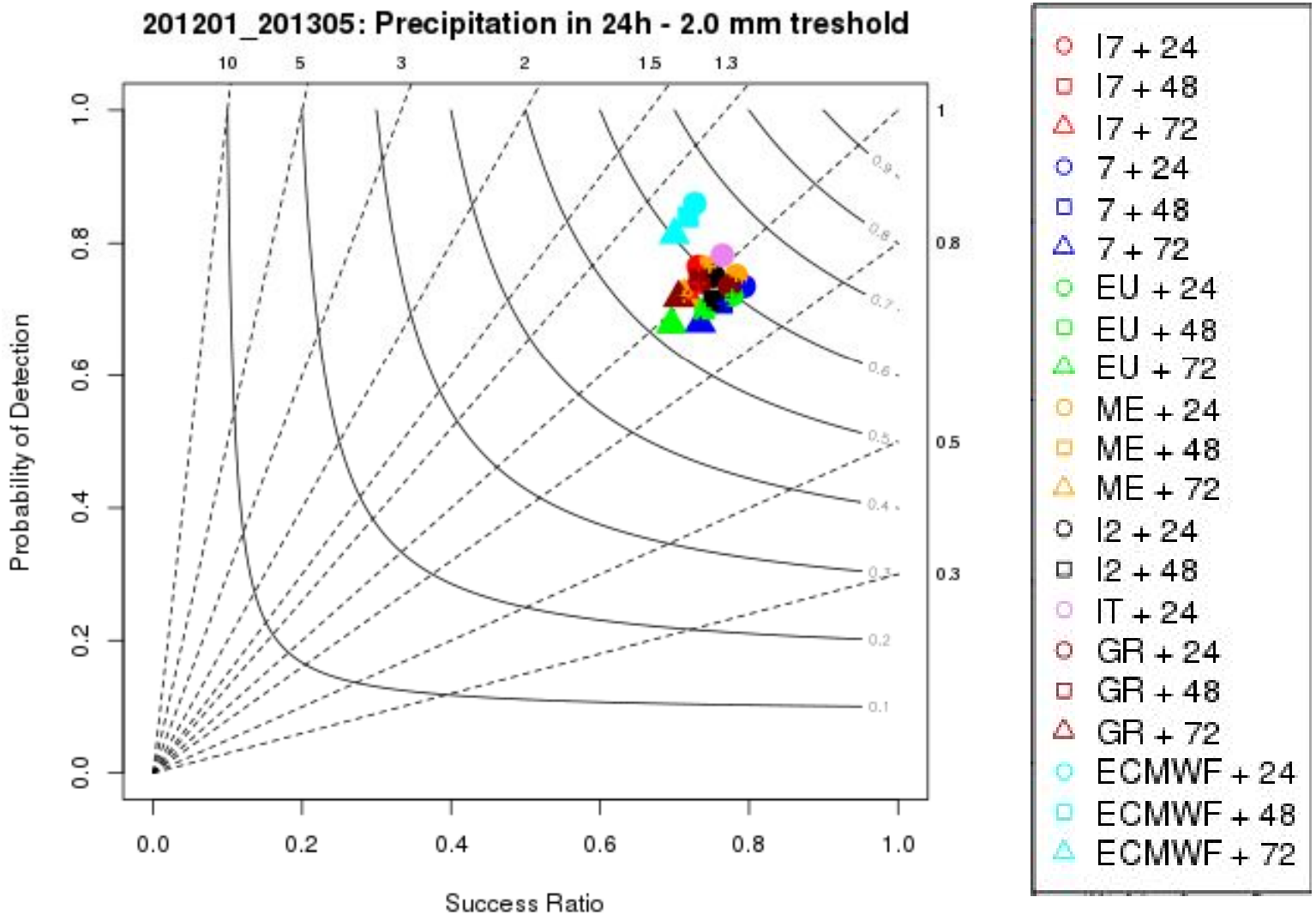


201201- 201305: Average over area > 2 mm/24h

1

Ecmwf → overestimation

IT, ME, I2, I7 → good



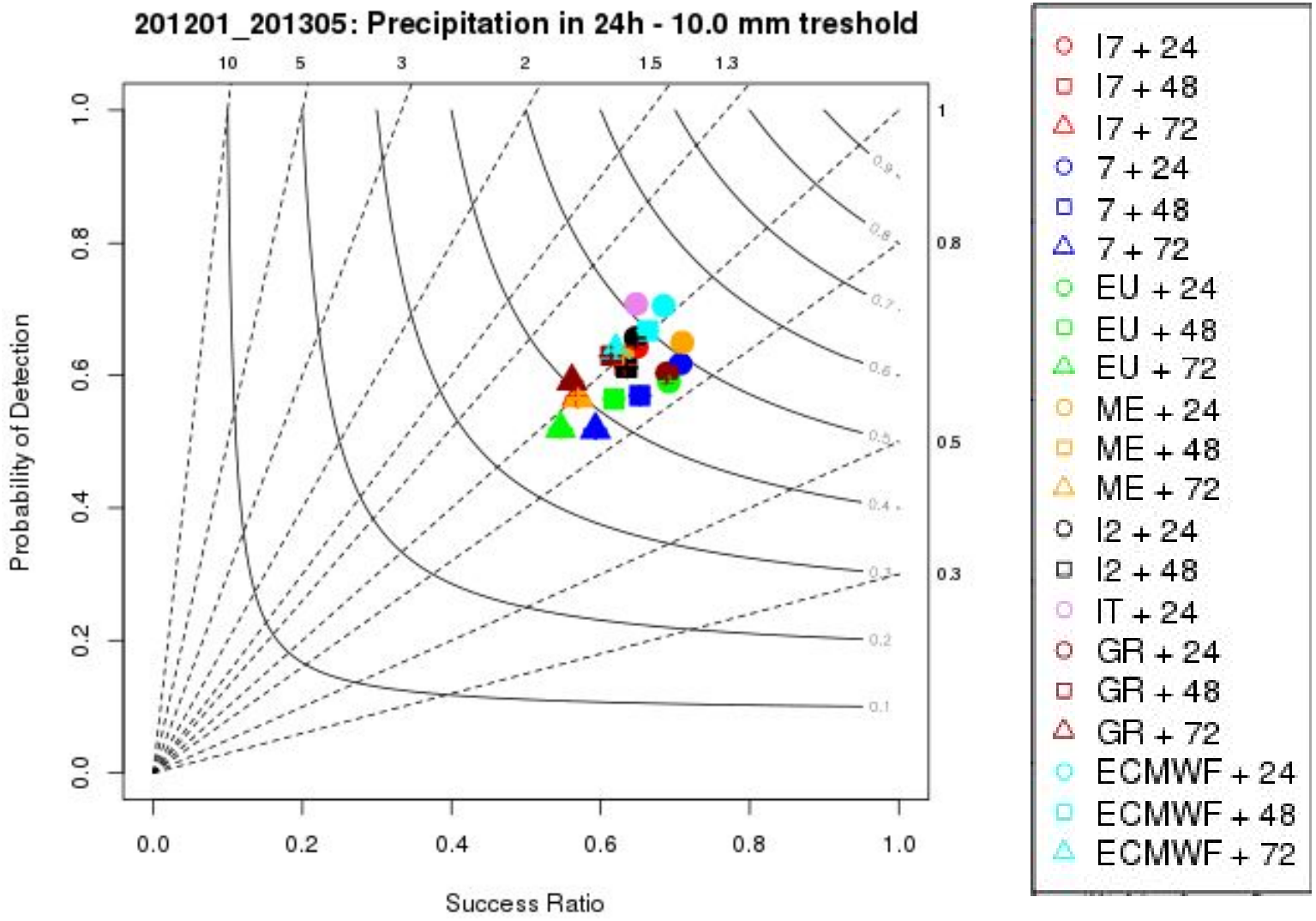
201201- 201305: Average over area > 10 mm/24h

1

Ecmwf → the best

ME, I2, I7 → good

7, EU → low skills

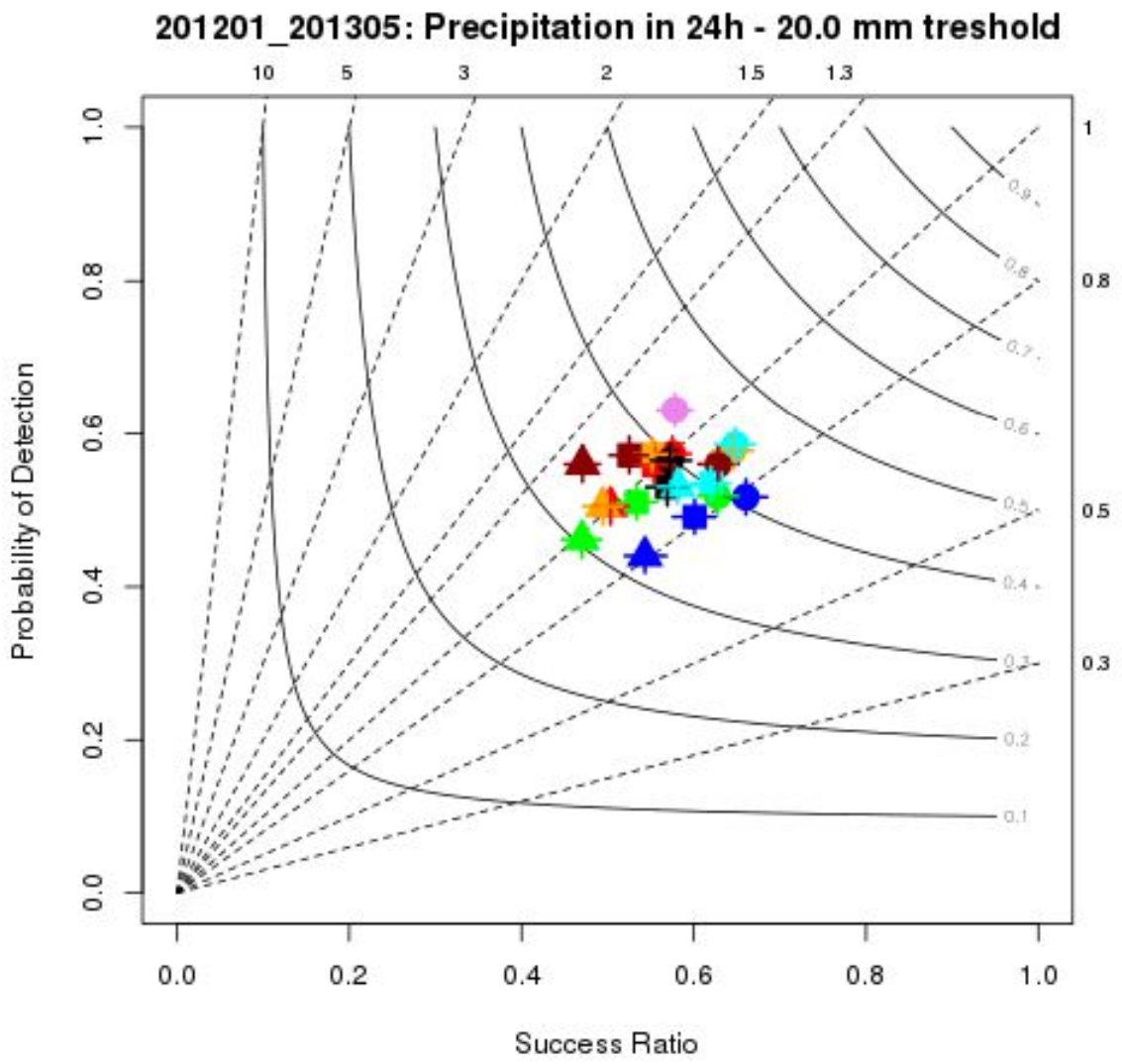


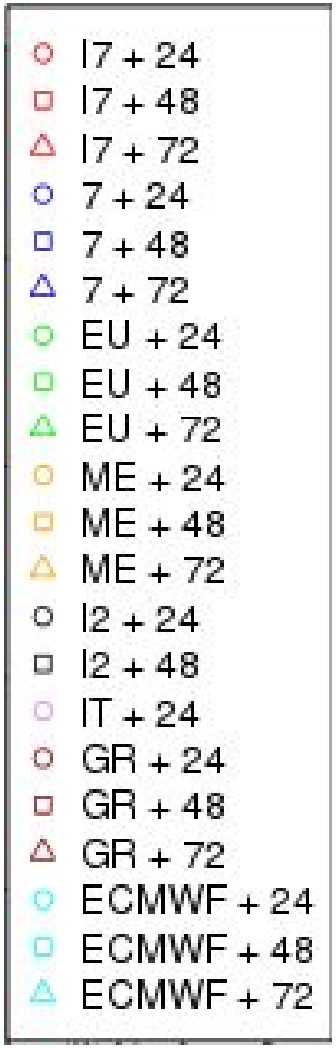
201201- 201305: Average over area > 20 mm/24h

1

ME, I2, I7 → good

7, EU, ecmwf→ low skills/underestimation



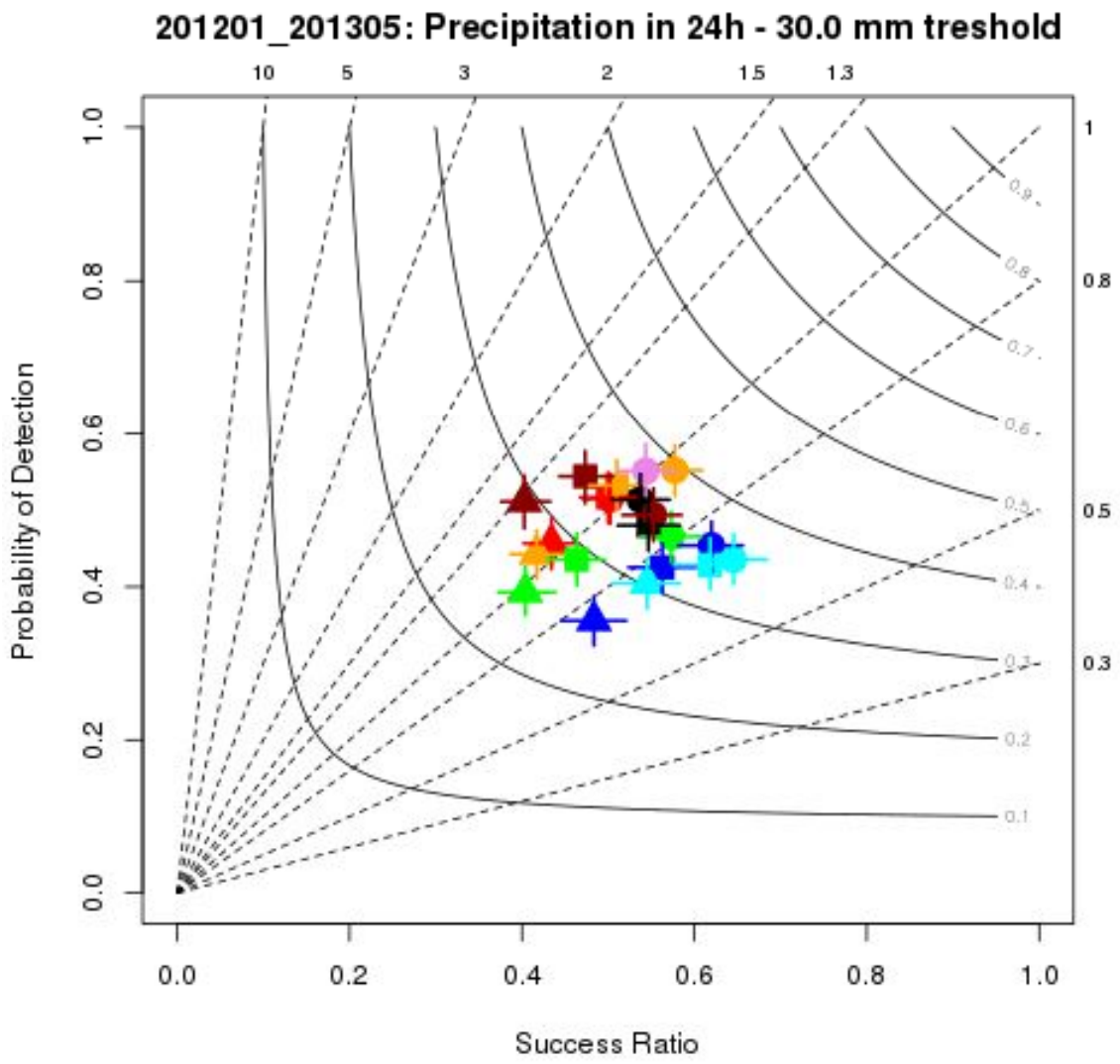


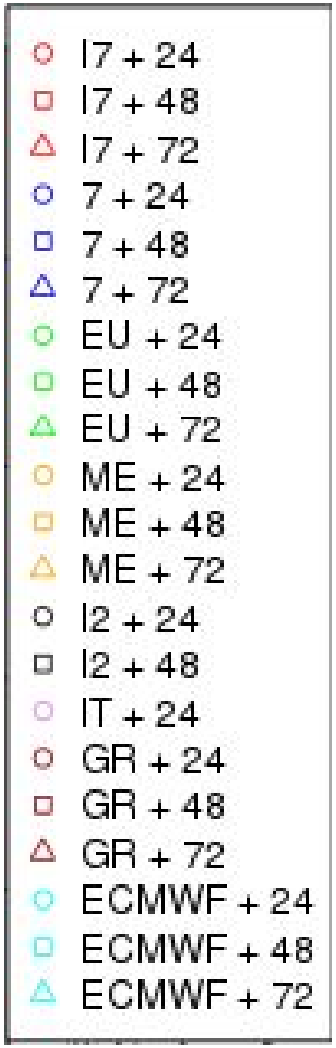
201201- 201305: Average over area > 30 mm/24h

1

ME, I2, IT → good

7, EU, ecmwf→ low skills/underestimation



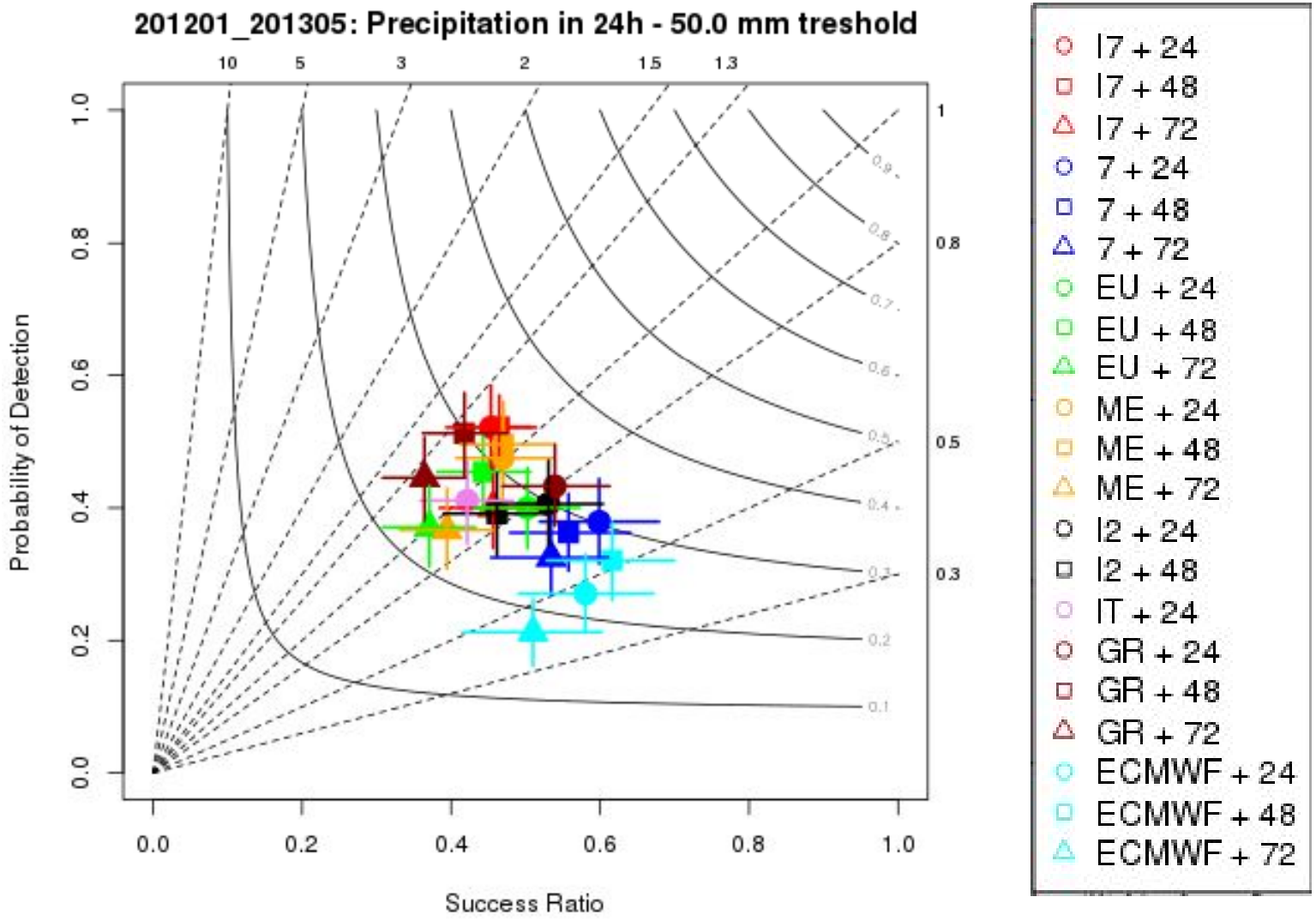


201201- 201305: Average over area > 50 mm/24h

1

ME, I7, EU → good

7, ecmwf→ low skills/underesti mation



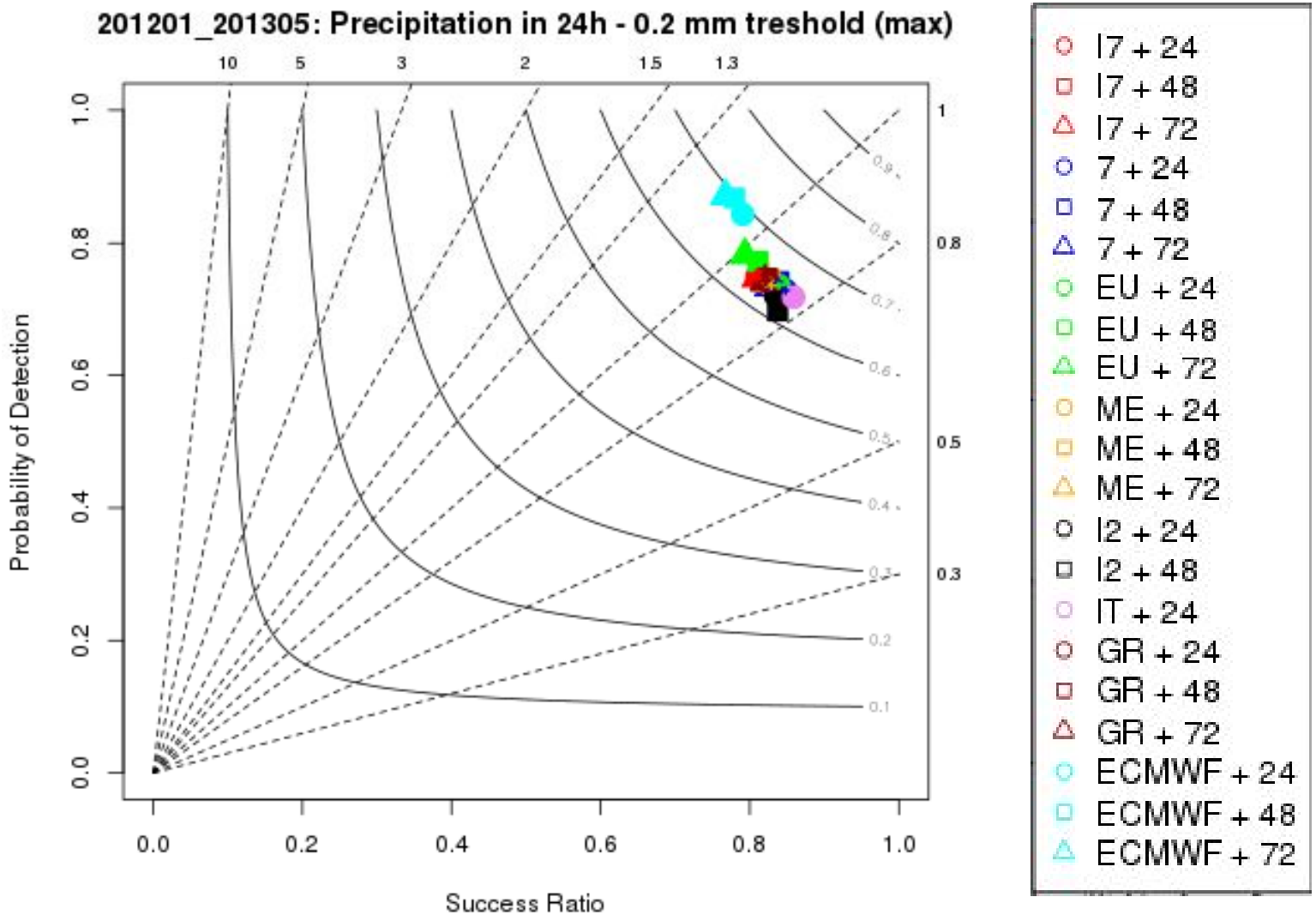
201201-201305: Maximum over area > 0.2 mm/24h

1

ecmwf→ overestimation

EU→ good

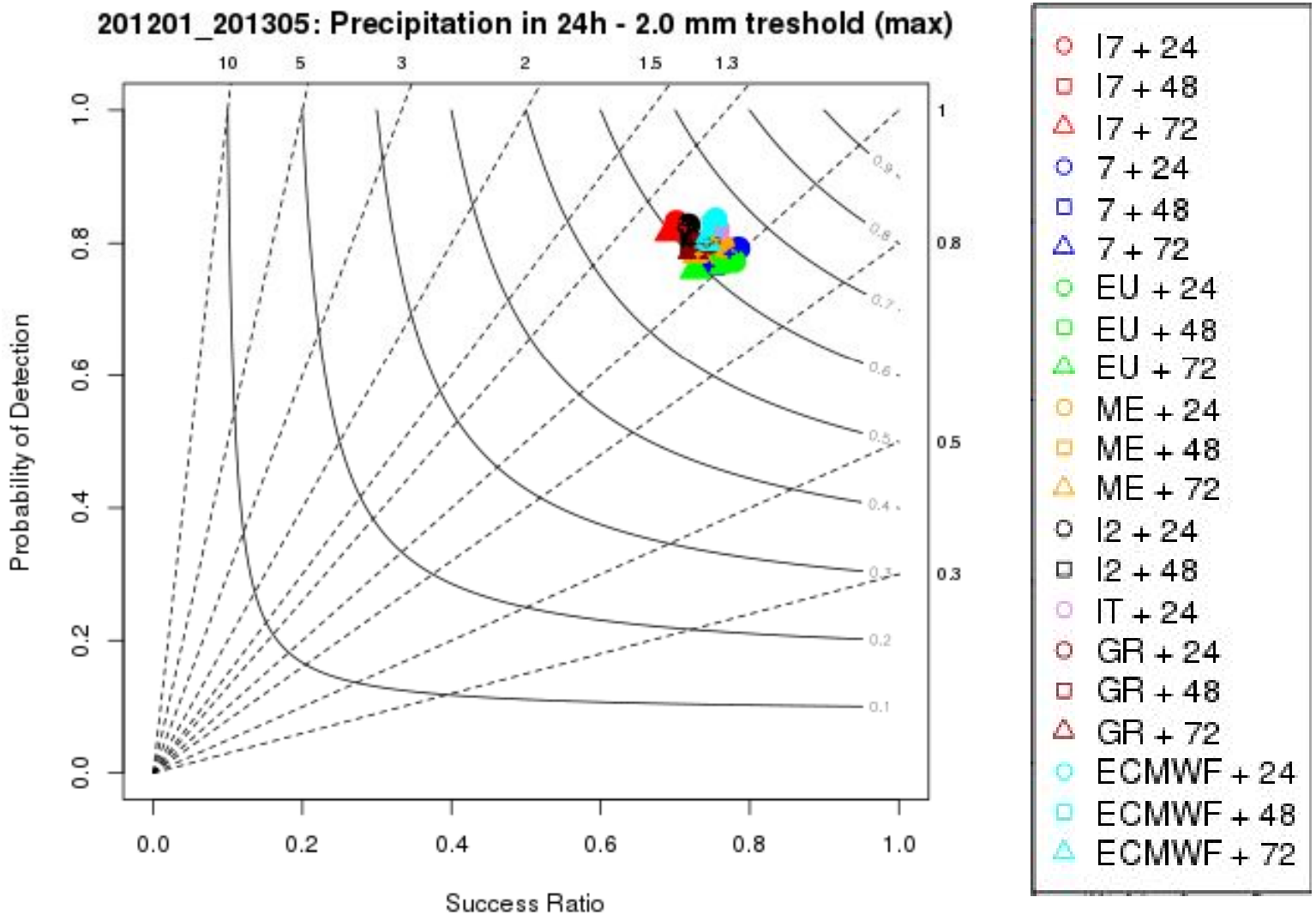
other→ underestimation/low skill



201201-201305: Maximum over area > 2 mm/24h

1

clusterized,
EU, 7 the best



201201-201305: Maximum over area > 10 mm/24h

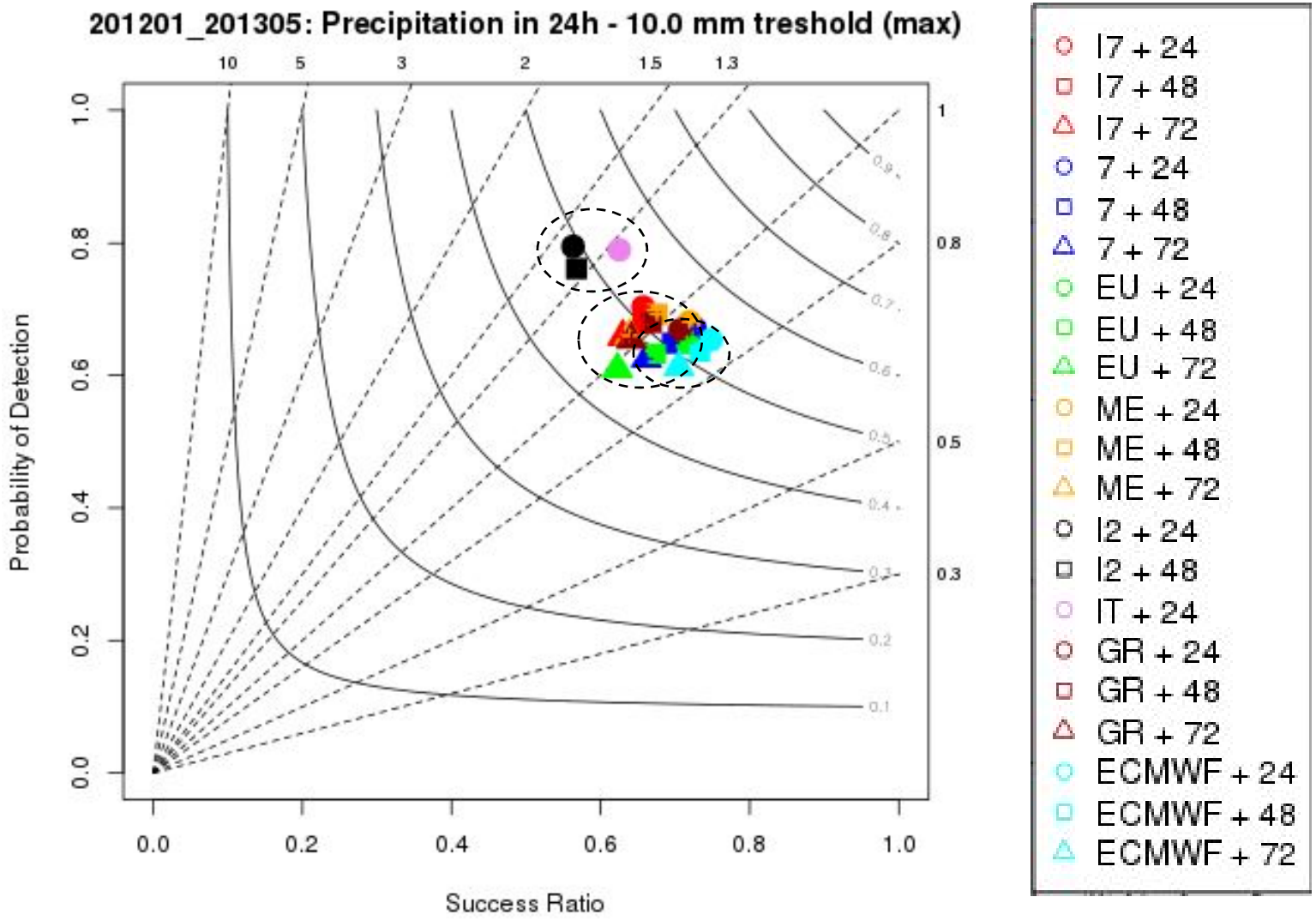
1

Splitted into 3 groups:

1) 2,8km overestimation

2) 7km around bisector

3) ecmwf underestimation



201201-201305: Maximum over area > 20 mm/24h

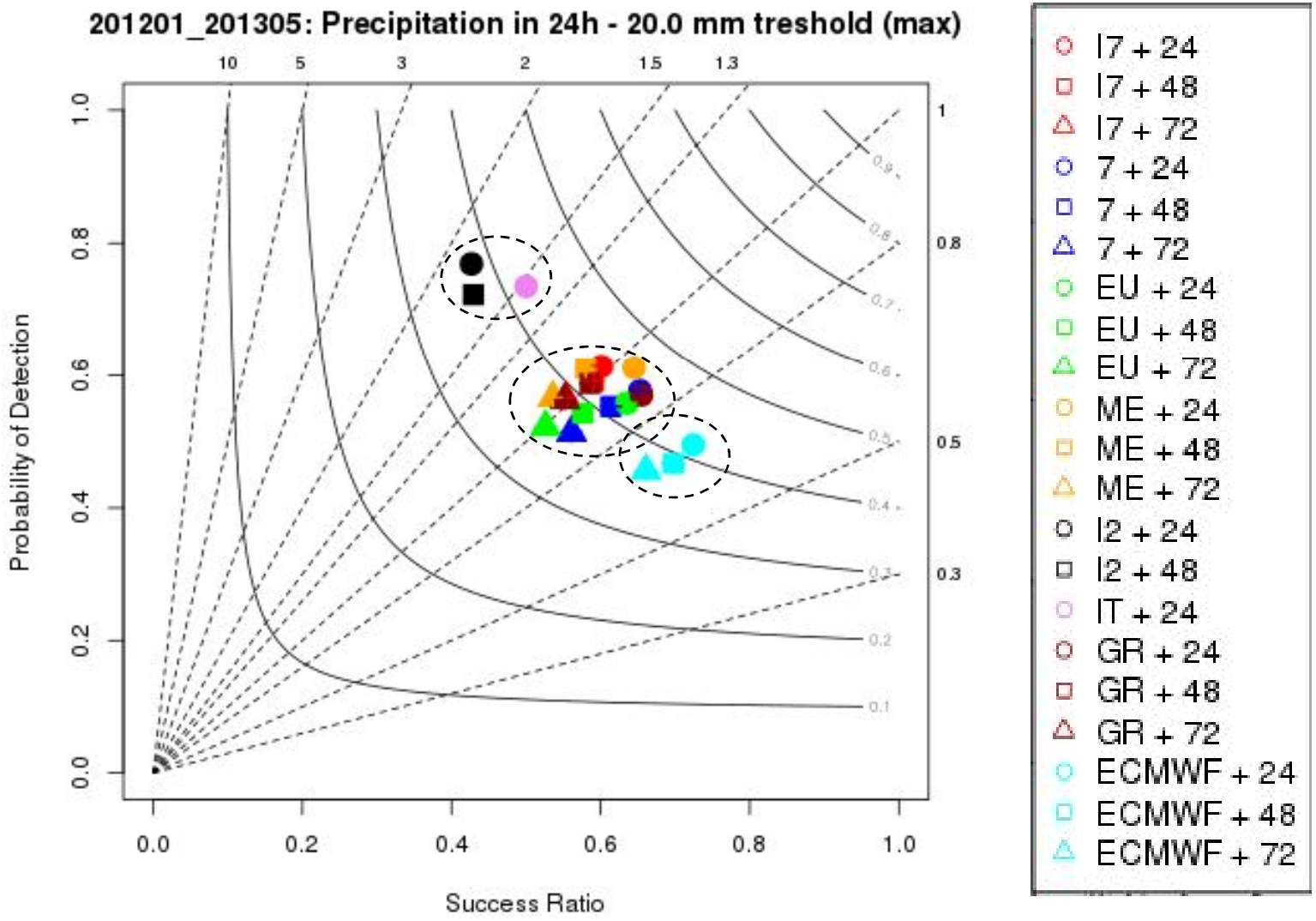
1

Splitted into 3 groups:

1) 2,8km overestimation

2) 7km around bisector

3) ecmwf underestimation



201201-201305: Maximum over area > 30 mm/24h

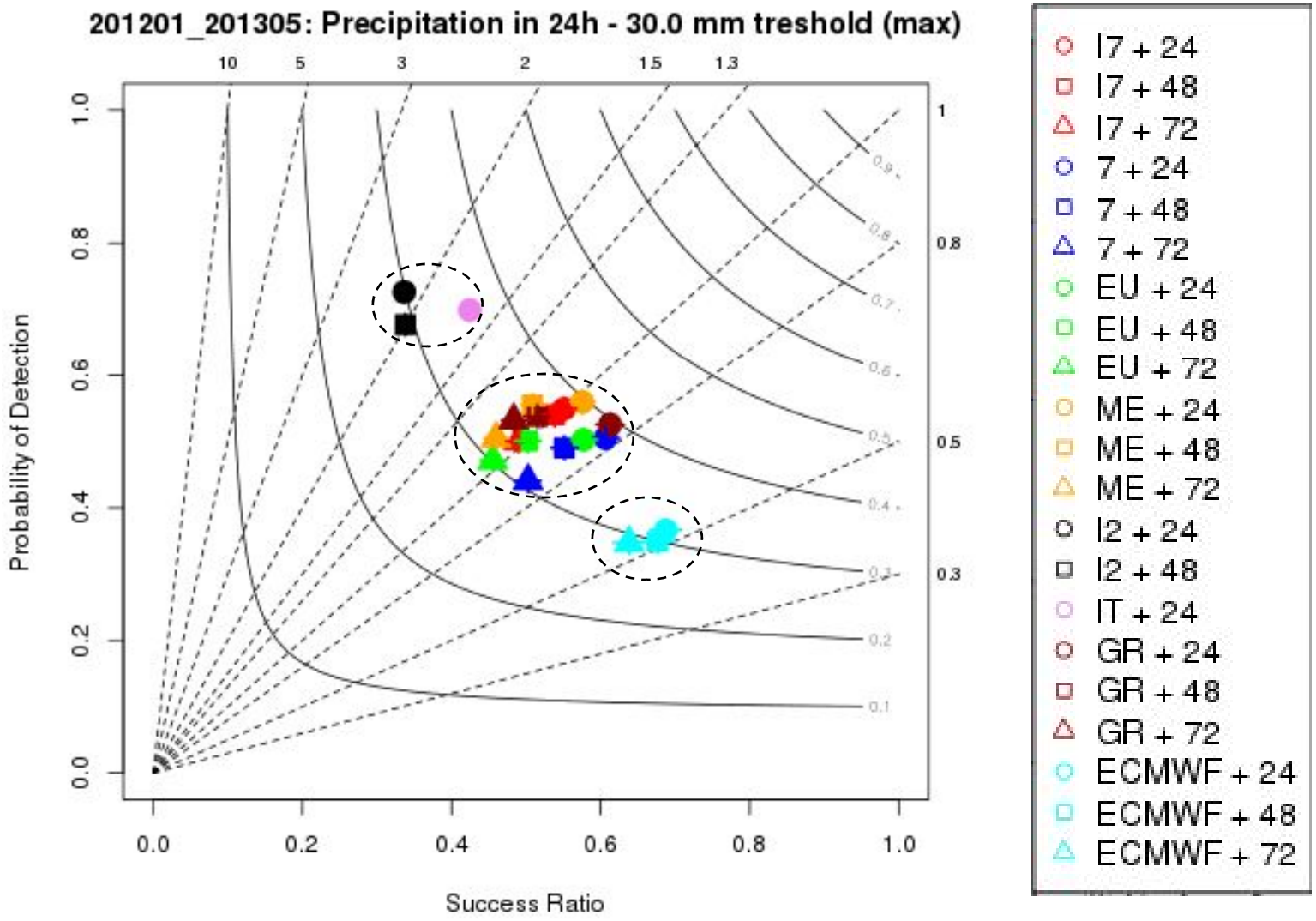
1

Splitted into 3 groups:

1) 2,8km overestimation

2) 7km around bisector

3) ecmwf underestimation



201201-201305: Maximum over area > 50 mm/24h

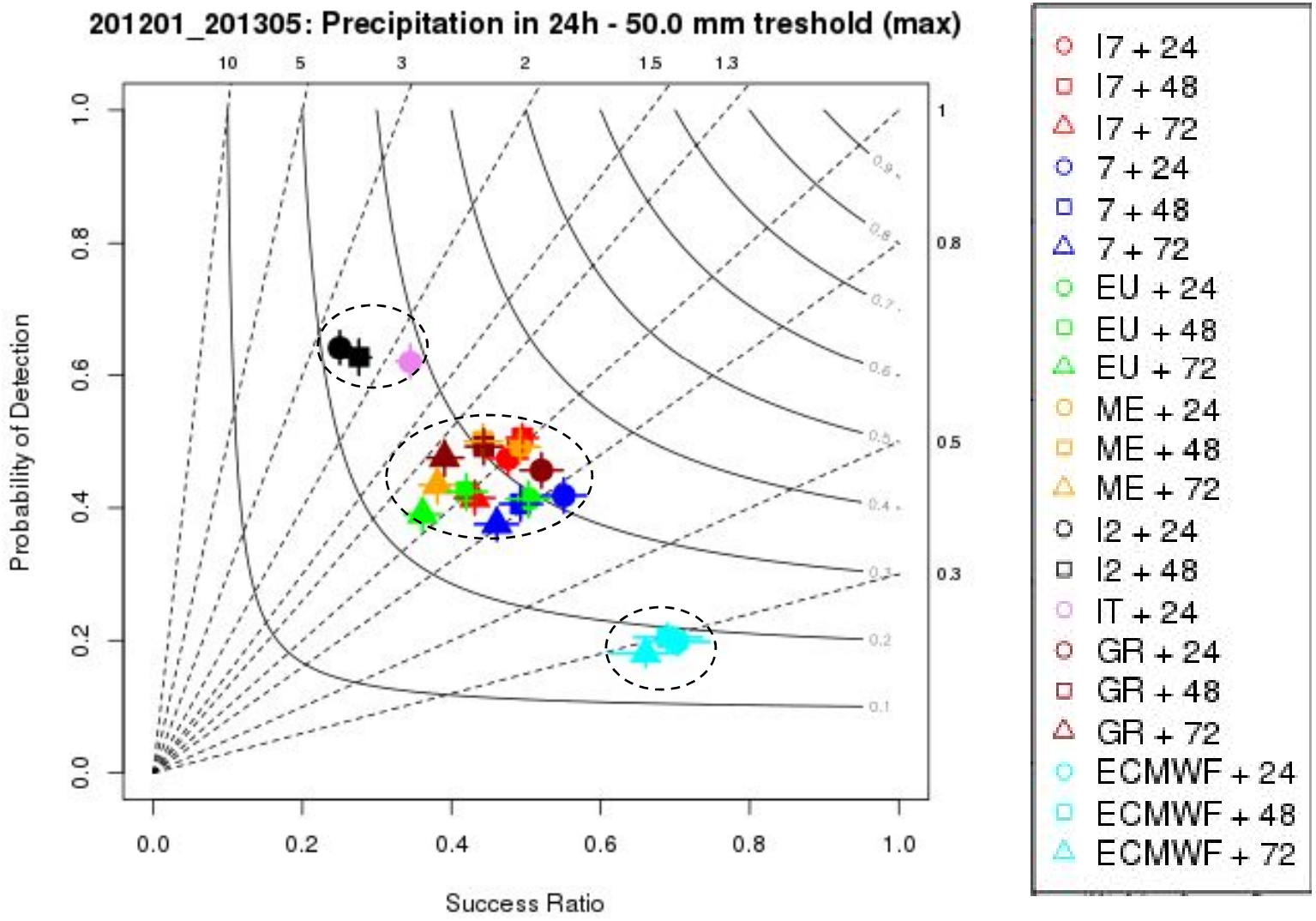
1

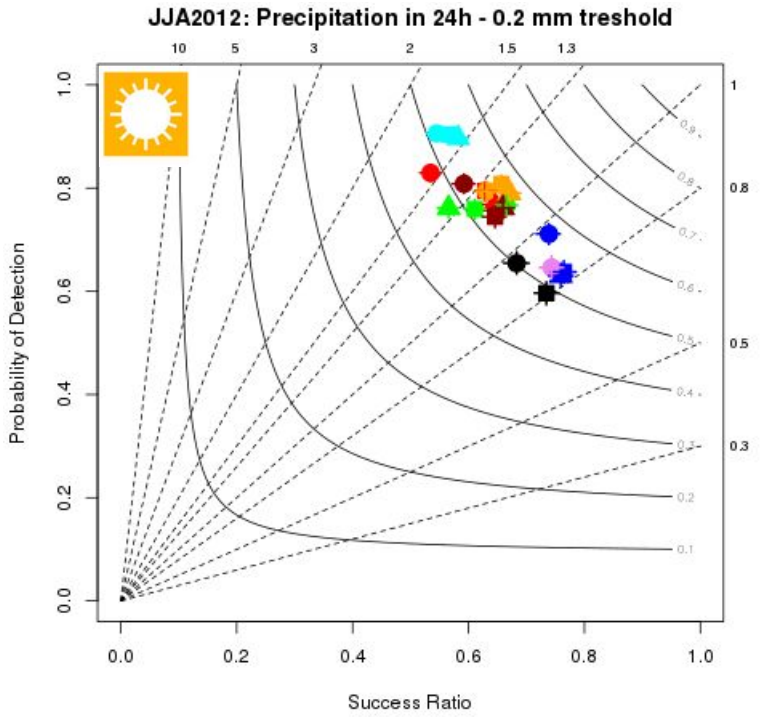
Splitted into 3 groups:

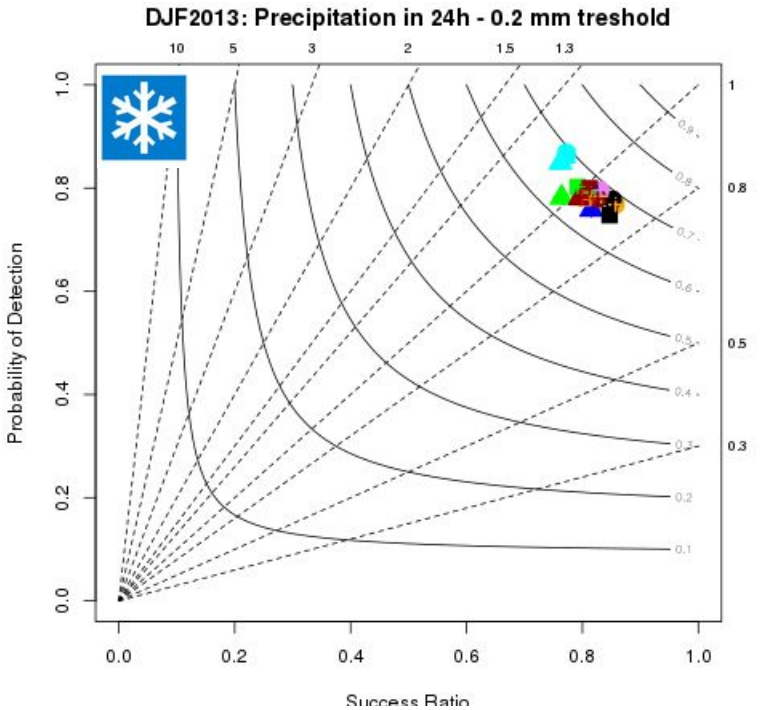
1) 2,8km overestimation

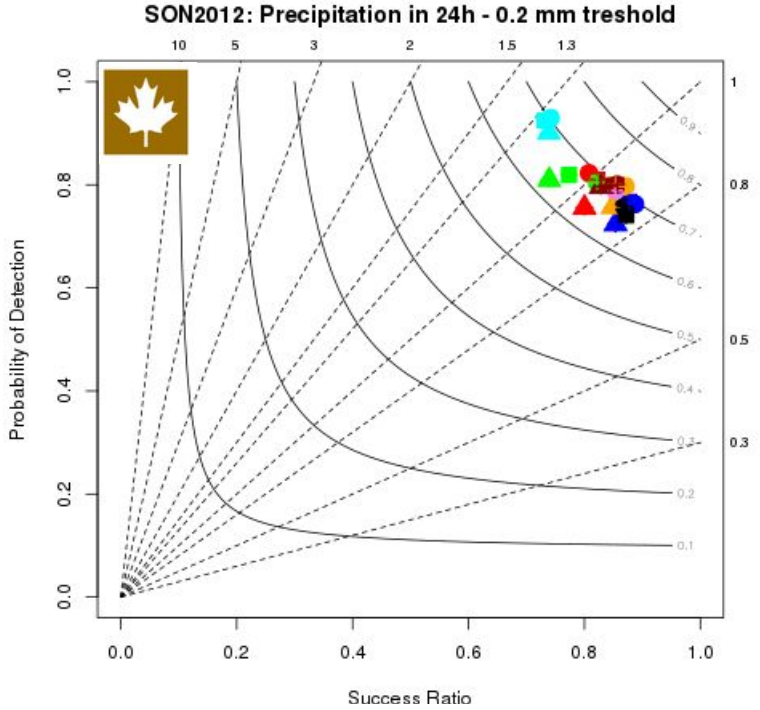
2) 7km around bisector

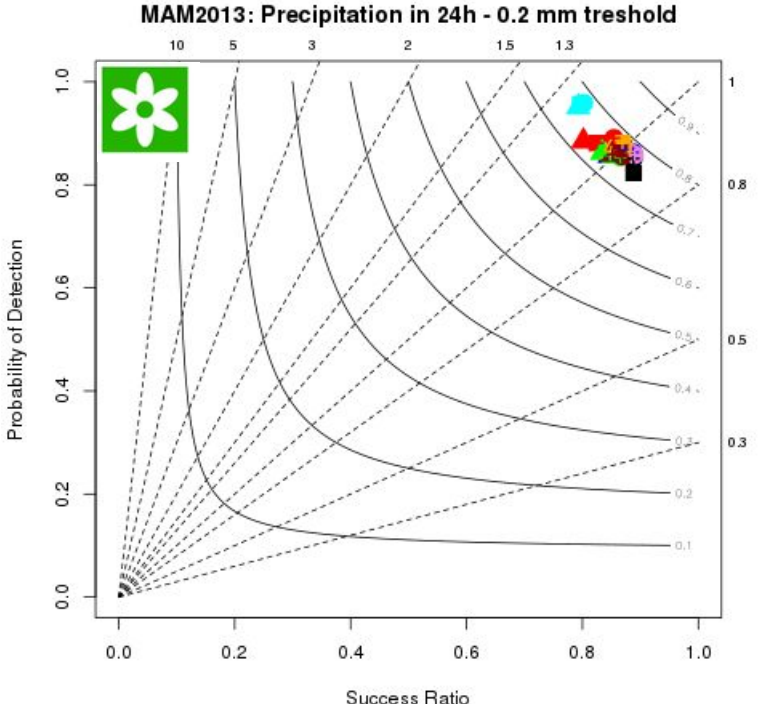
3) ecmwf underestimation







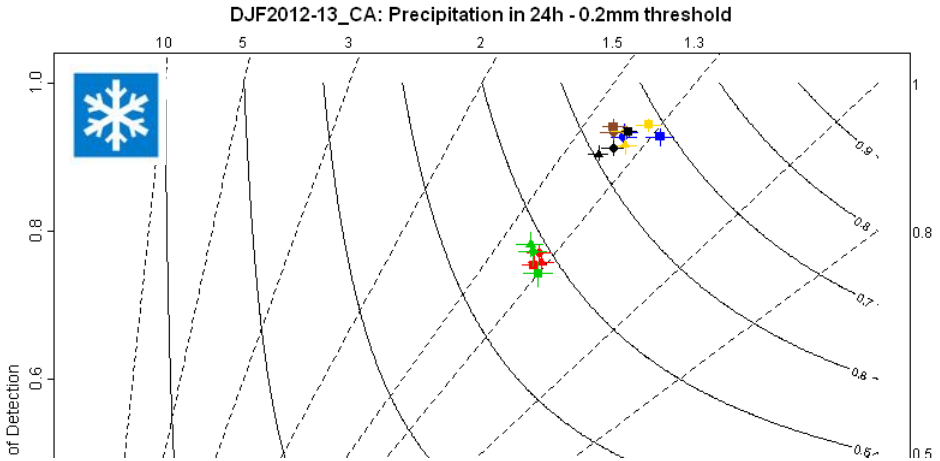


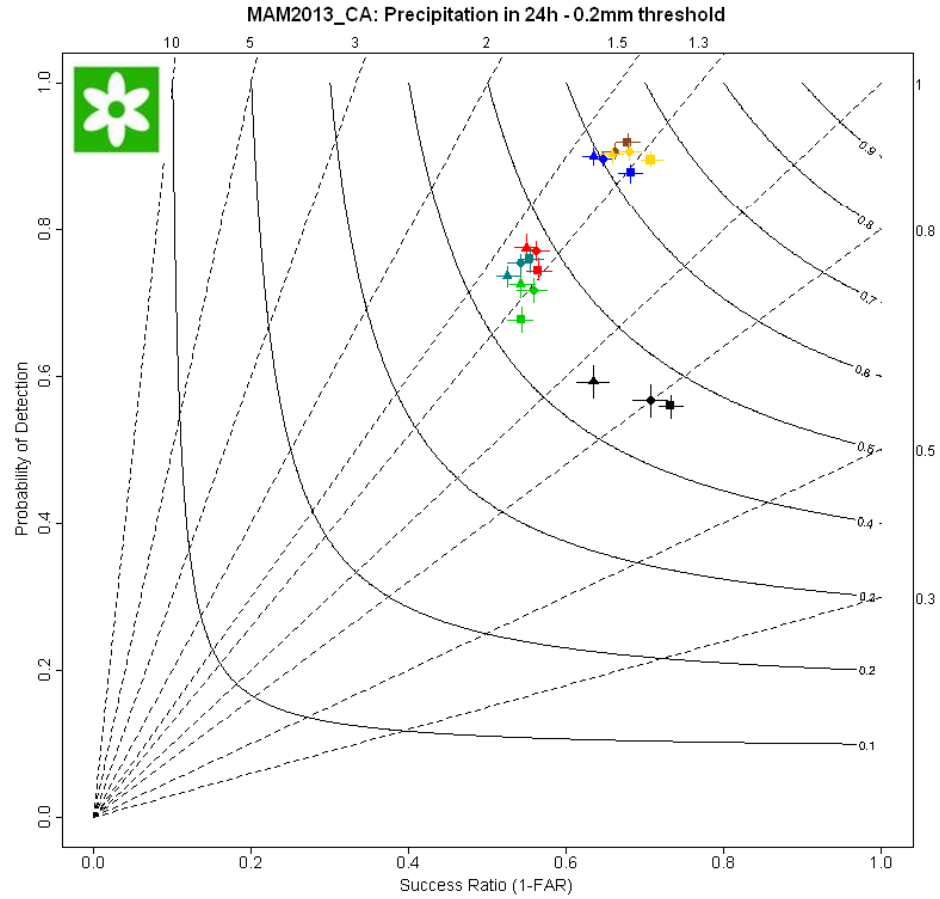


Average over area > 0.2 mm/24h

1

- I7 + 24
- I7 + 48
- I7 + 72
- 7 + 24
- 7 + 48
- 7 + 72
- EU + 24
- EU + 48
- EU + 72
- ME + 24
- ME + 48
- ME + 72
- I2 + 24
- I2 + 48
- IT + 24
- GR + 24
- GR + 48
- GR + 72
- ECMWF + 24
- ECMWF + 48
- ECMWF + 72

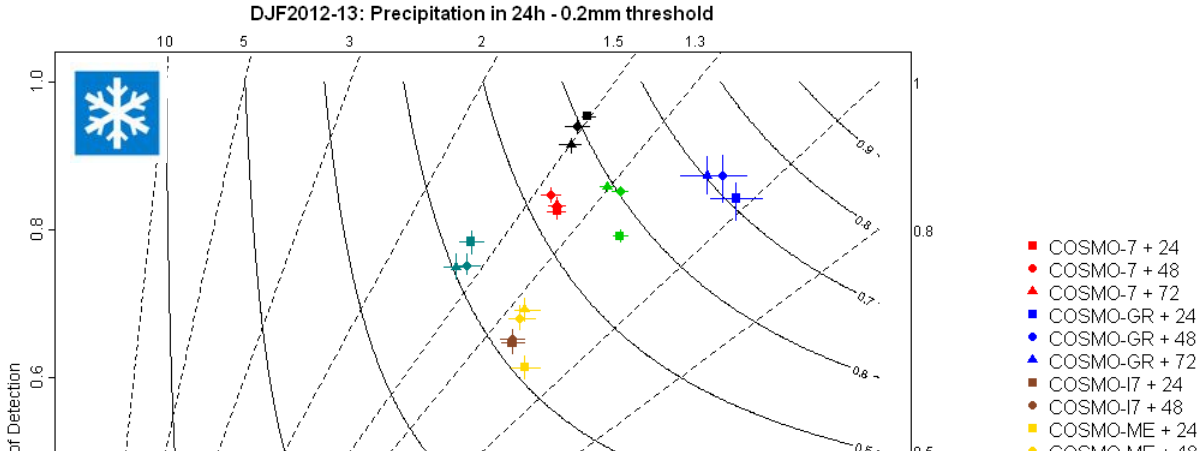


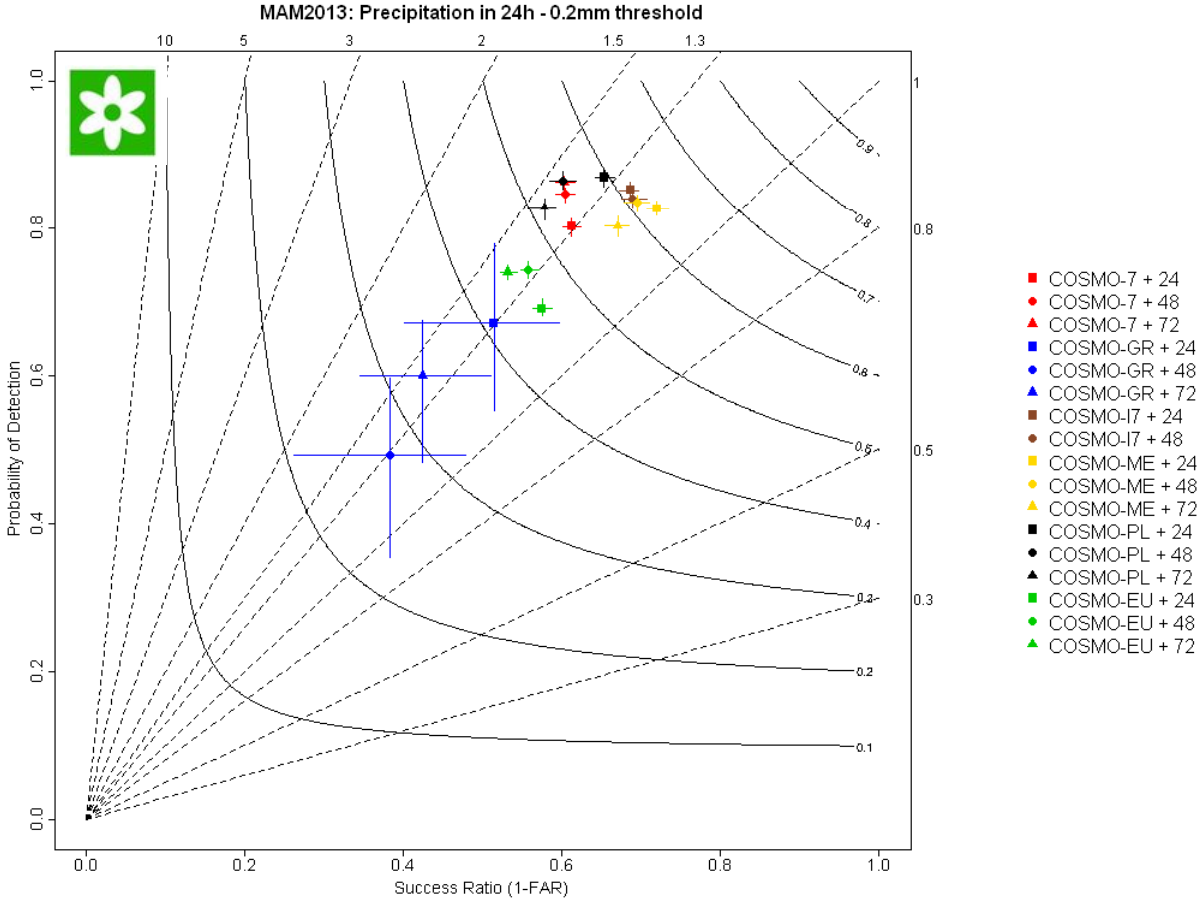


- COSMO-7 + 24
- COSMO-7 + 48
- COSMO-7 + 72
- COSMO-GR + 24
- COSMO-GR + 48
- COSMO-GR + 72
- COSMO-I7 + 24
- COSMO-I7 + 48
- COSMO-ME + 24
- COSMO-ME + 48
- COSMO-ME + 72
- COSMO-PL + 24
- COSMO-PL + 48
- COSMO-PL + 72
- COSMO-EU + 24
- COSMO-EU + 48
- COSMO-EU + 72
- COSMO-RU + 24
- COSMO-RU + 48
- COSMO-RU + 72

Average over area > 0.2 mm/24h

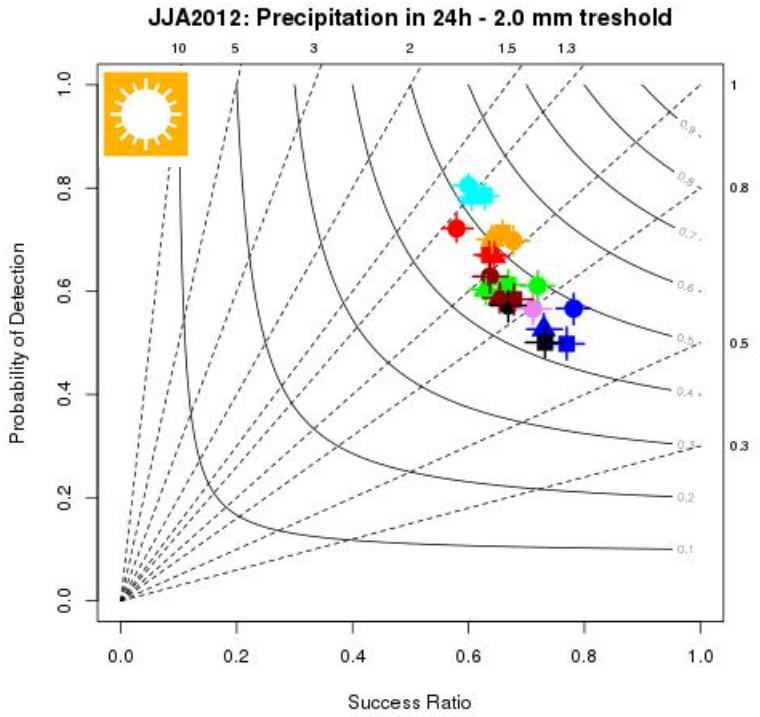
2

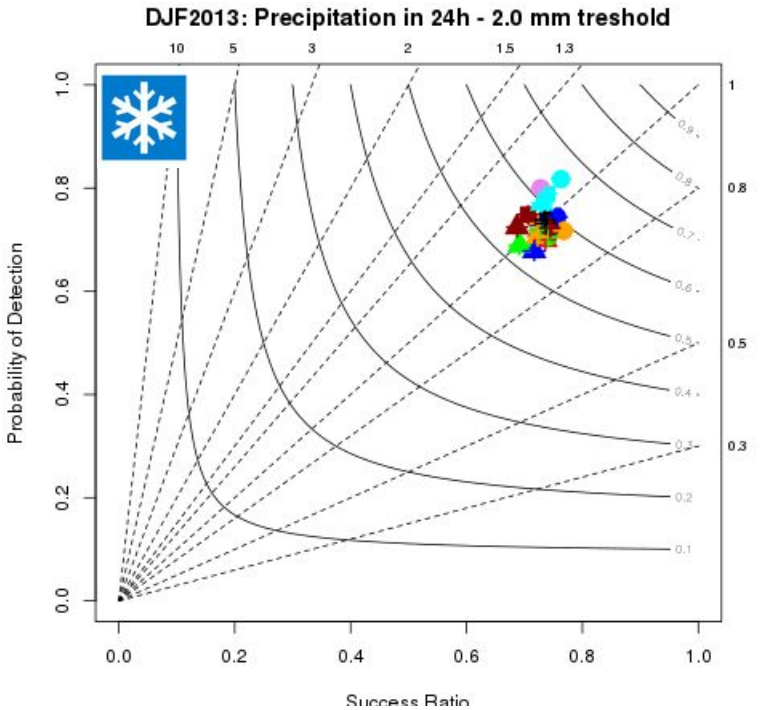


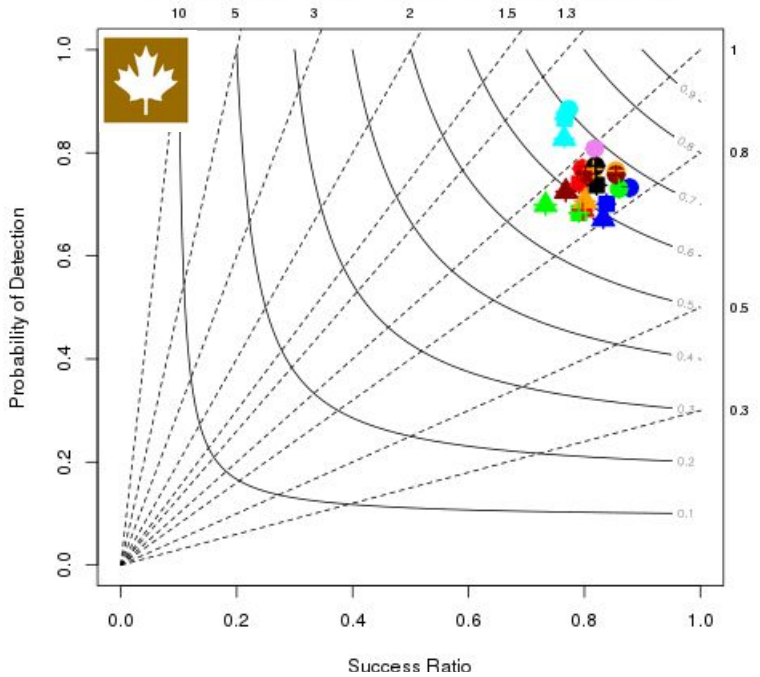


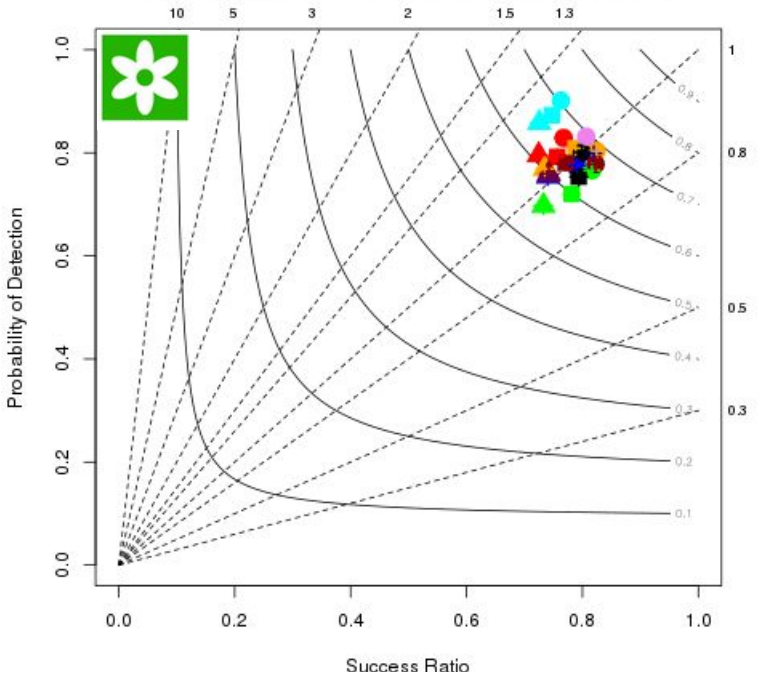
Average over area > 0.2 mm/24h

3





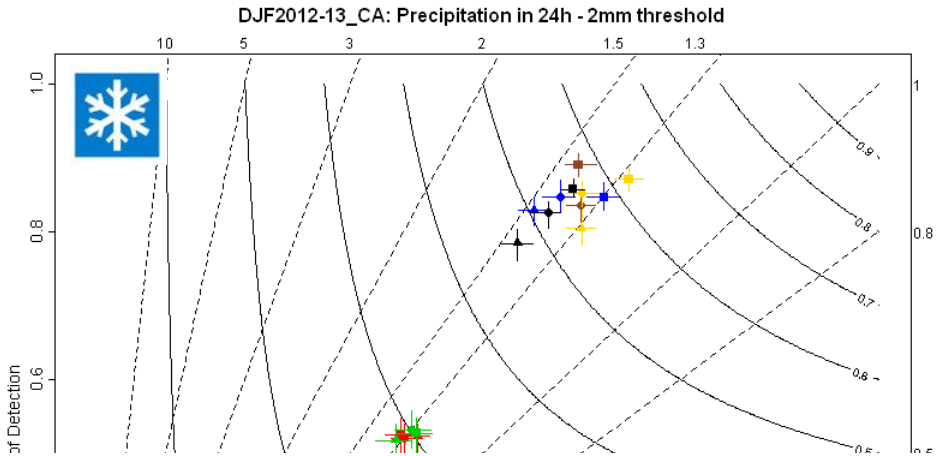


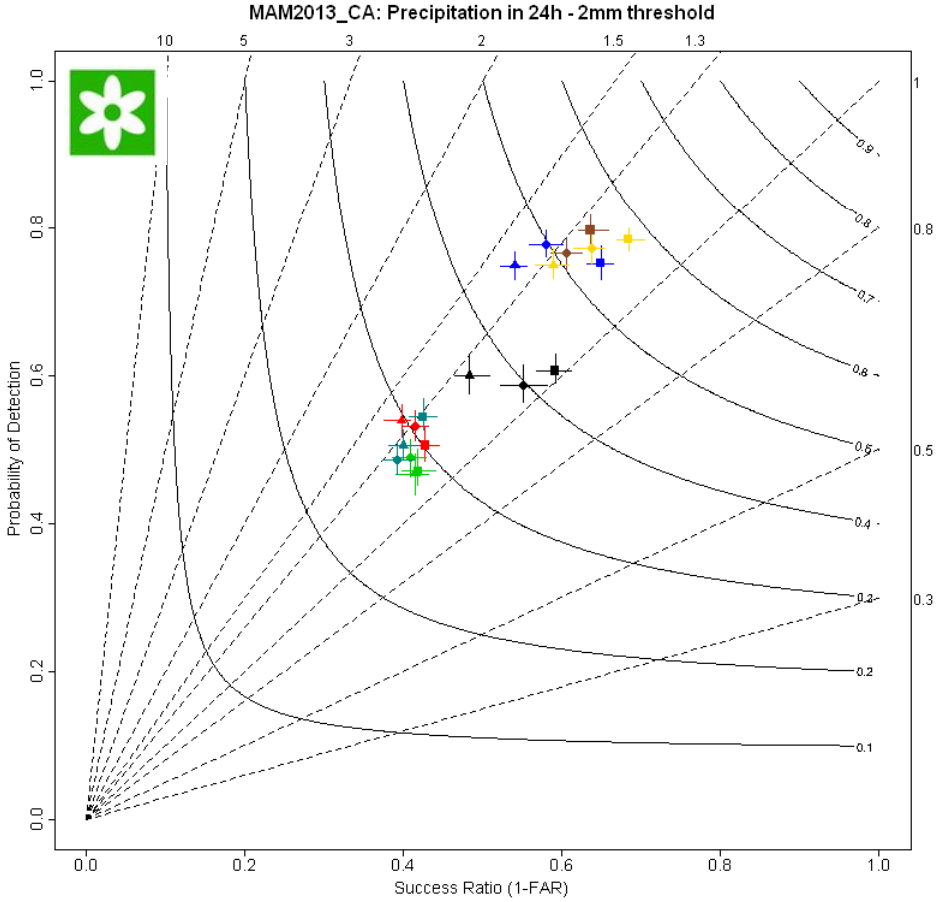


Average over area > 2 mm/24h

1

I7 + 24
I7 + 48
I7 + 72
7 + 24
7 + 48
7 + 72
EU + 24
EU + 48
EU + 72
ME + 24
ME + 48
ME + 72
I2 + 24
I2 + 48
IT + 24
GR + 24
GR + 48
GR + 72
ECMWF + 24
ECMWF + 48
ECMWF + 72

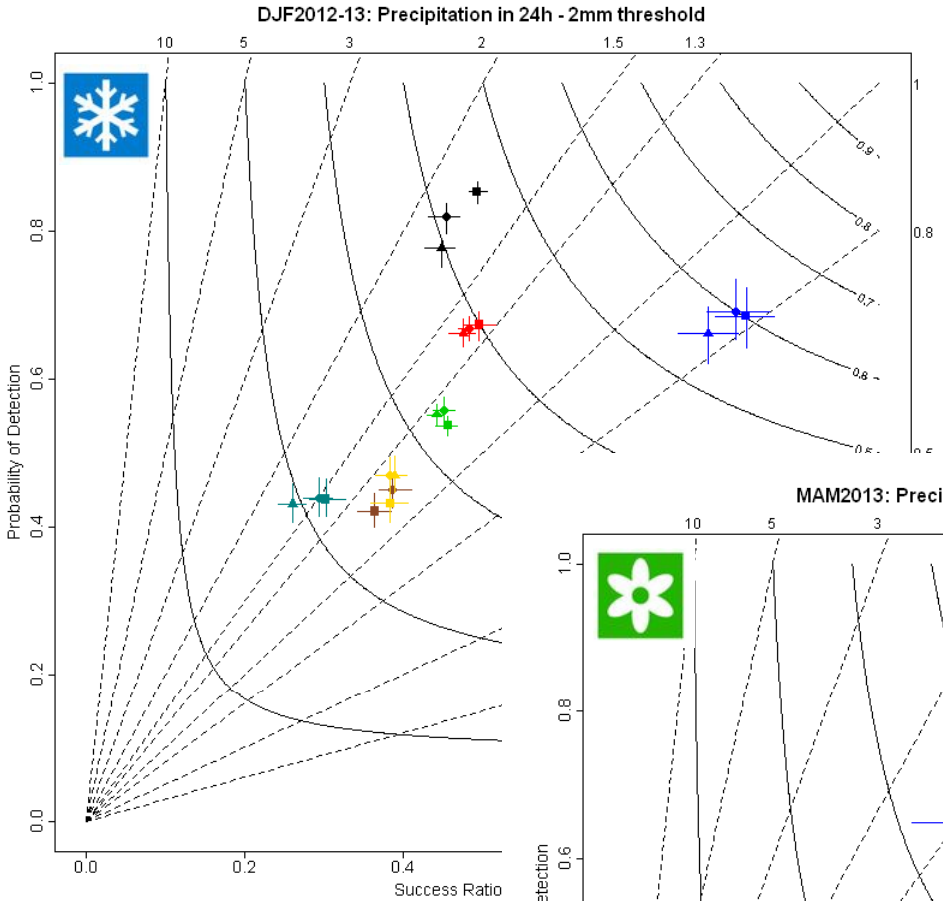


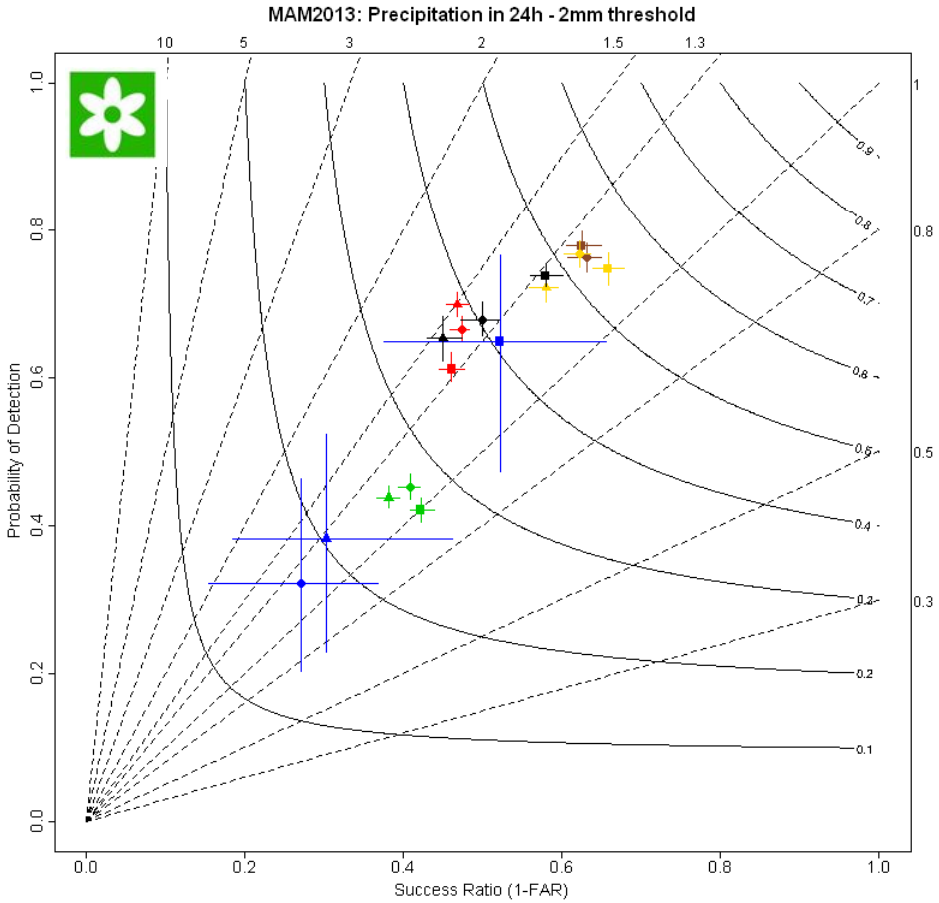


- COSMO-7 + 24
- COSMO-7 + 48
- COSMO-7 + 72
- COSMO-GR + 24
- COSMO-GR + 48
- COSMO-GR + 72
- COSMO-I7 + 24
- COSMO-I7 + 48
- COSMO-ME + 24
- COSMO-ME + 48
- COSMO-ME + 72
- COSMO-PL + 24
- COSMO-PL + 48
- COSMO-PL + 72
- COSMO-EU + 24
- COSMO-EU + 48
- COSMO-EU + 72
- COSMO-RU + 24
- COSMO-RU + 48
- COSMO-RU + 72

Average over area > 2 mm/24h

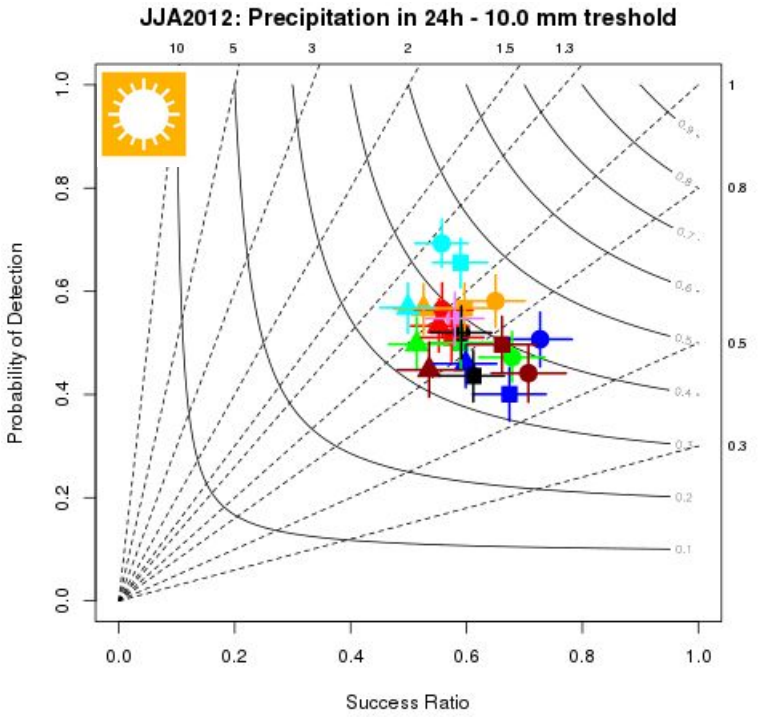
2

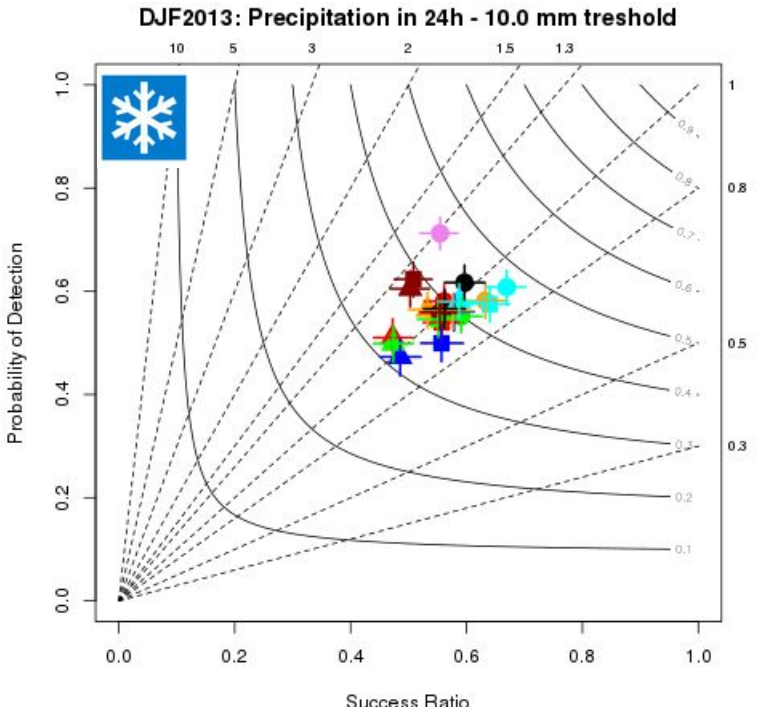


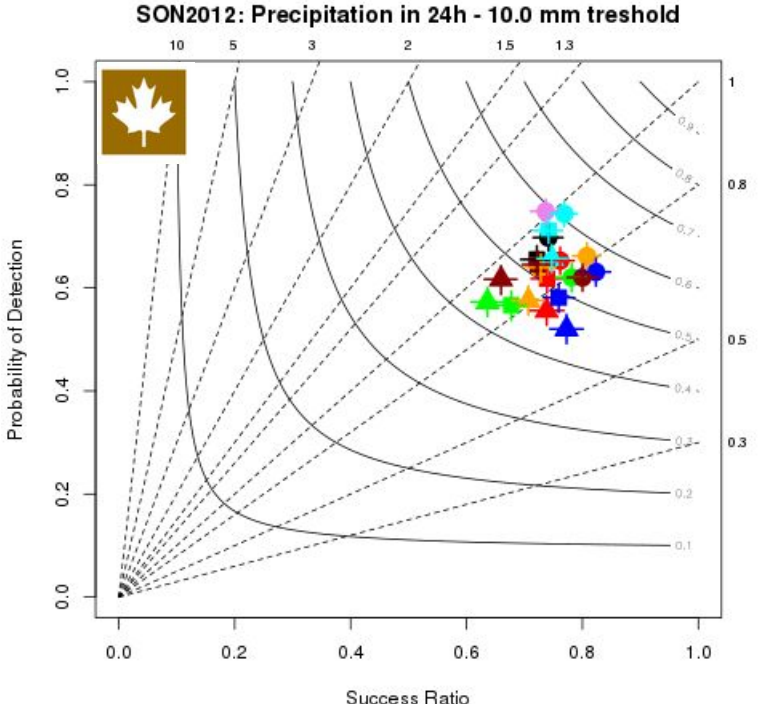


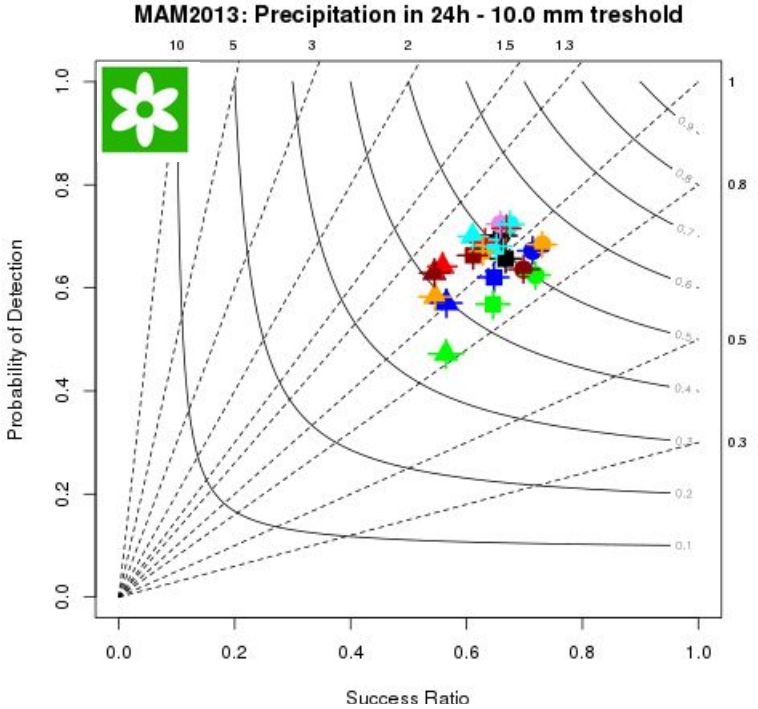
Average over area > 2 mm/24h

3





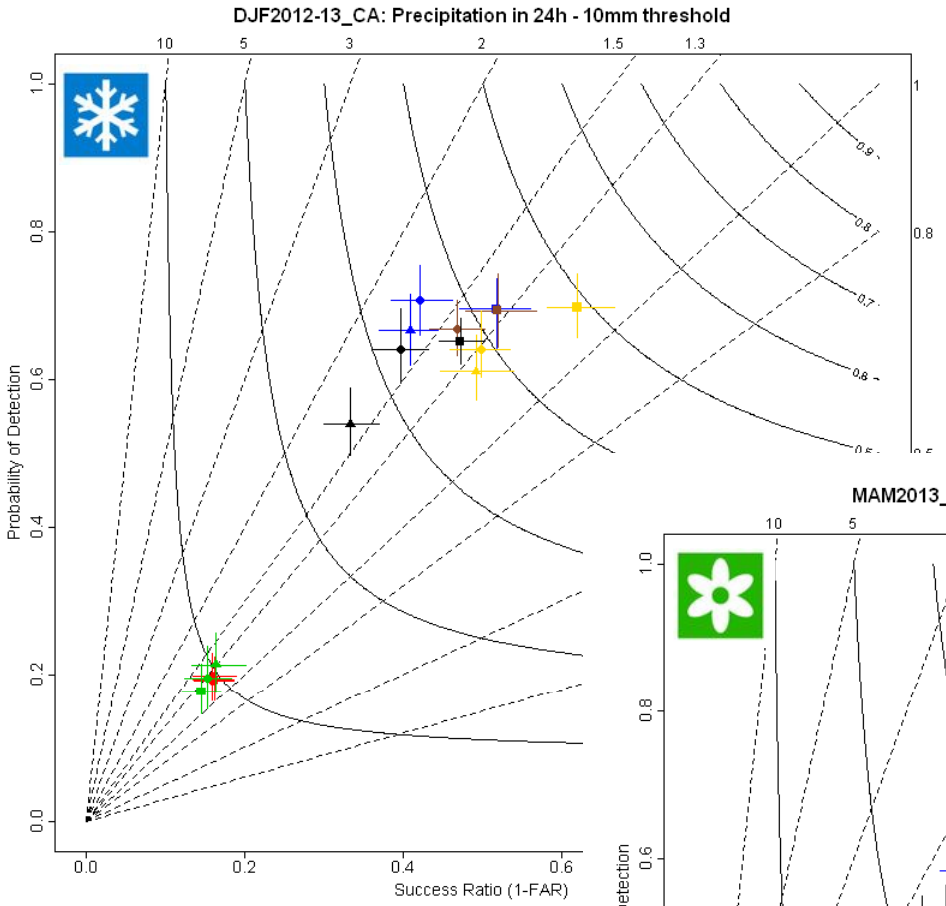




Average over area > 10 mm/24h

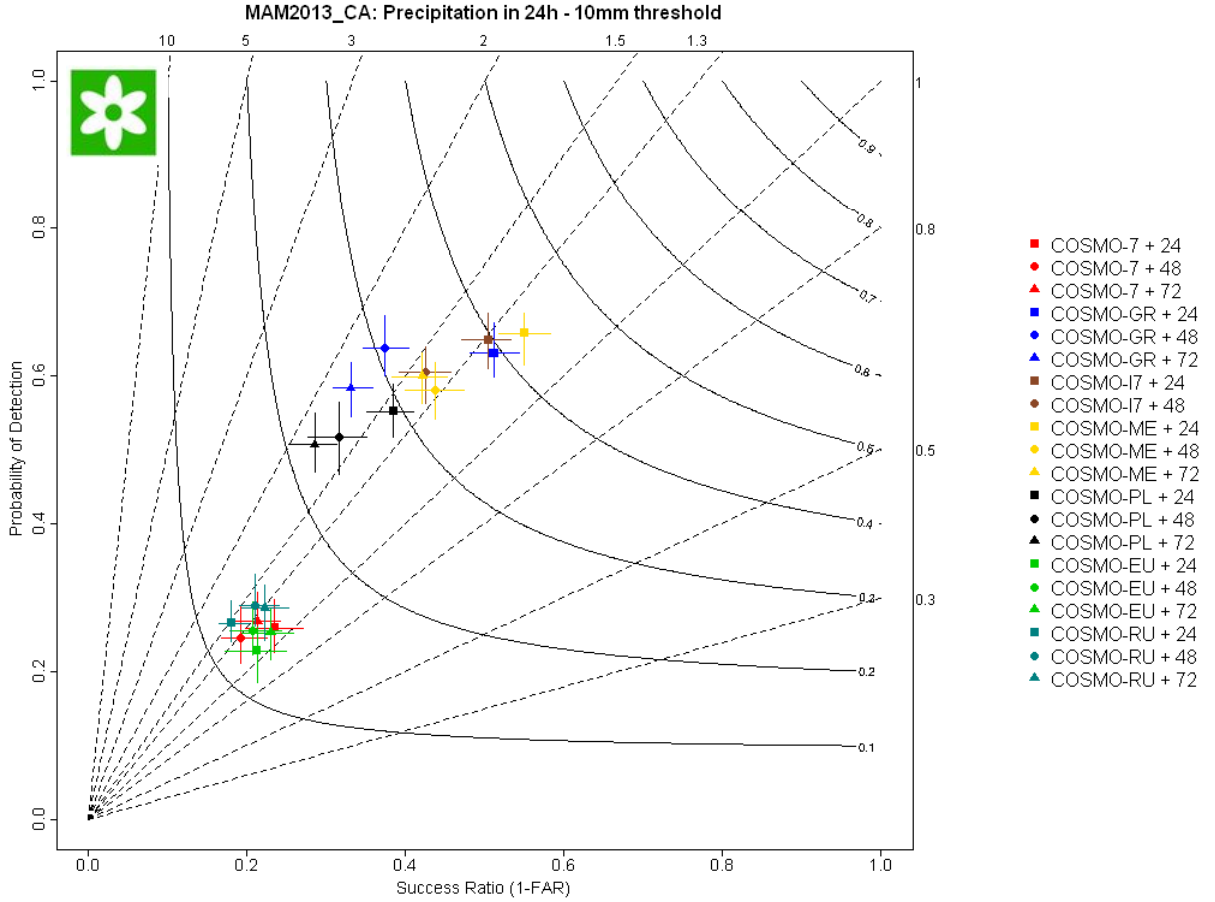
1

I7 + 24
I7 + 48
I7 + 72
7 + 24
7 + 48
7 + 72
EU + 24
EU + 48
EU + 72
ME + 24
ME + 48
ME + 72
I2 + 24
I2 + 48
IT + 24
GR + 24
GR + 48
GR + 72
ECMWF + 24
ECMWF + 48
ECMWF + 72



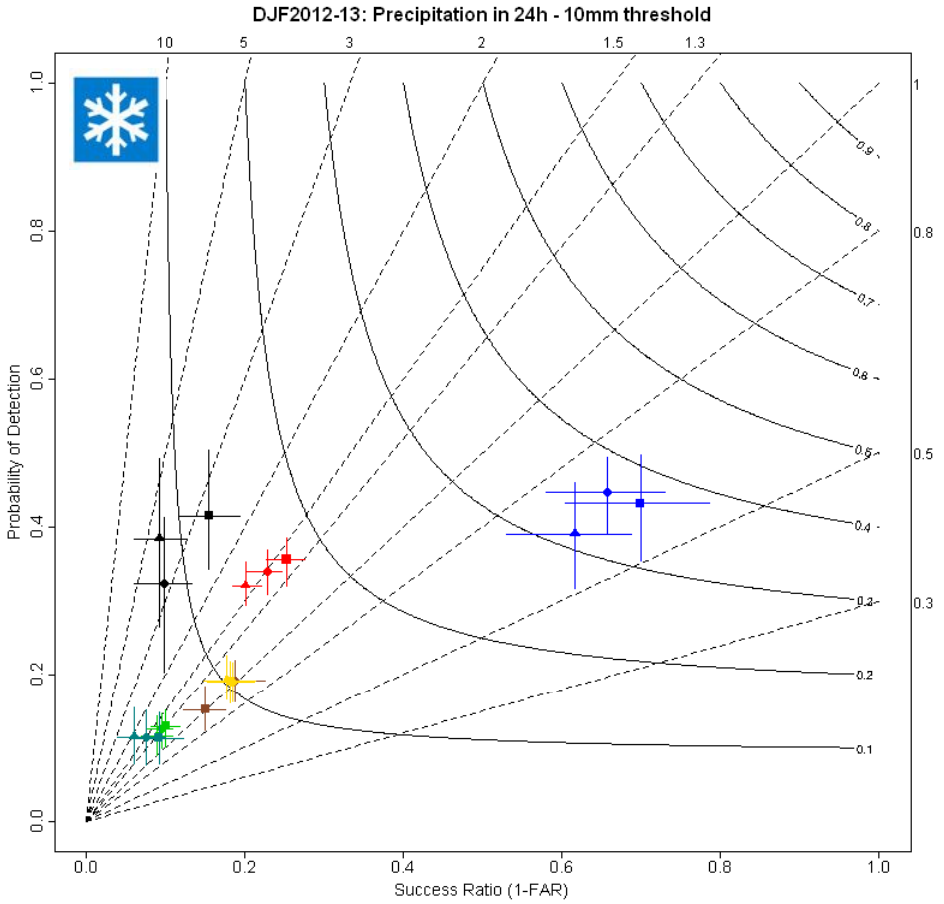
Average over area > 10 mm/24h

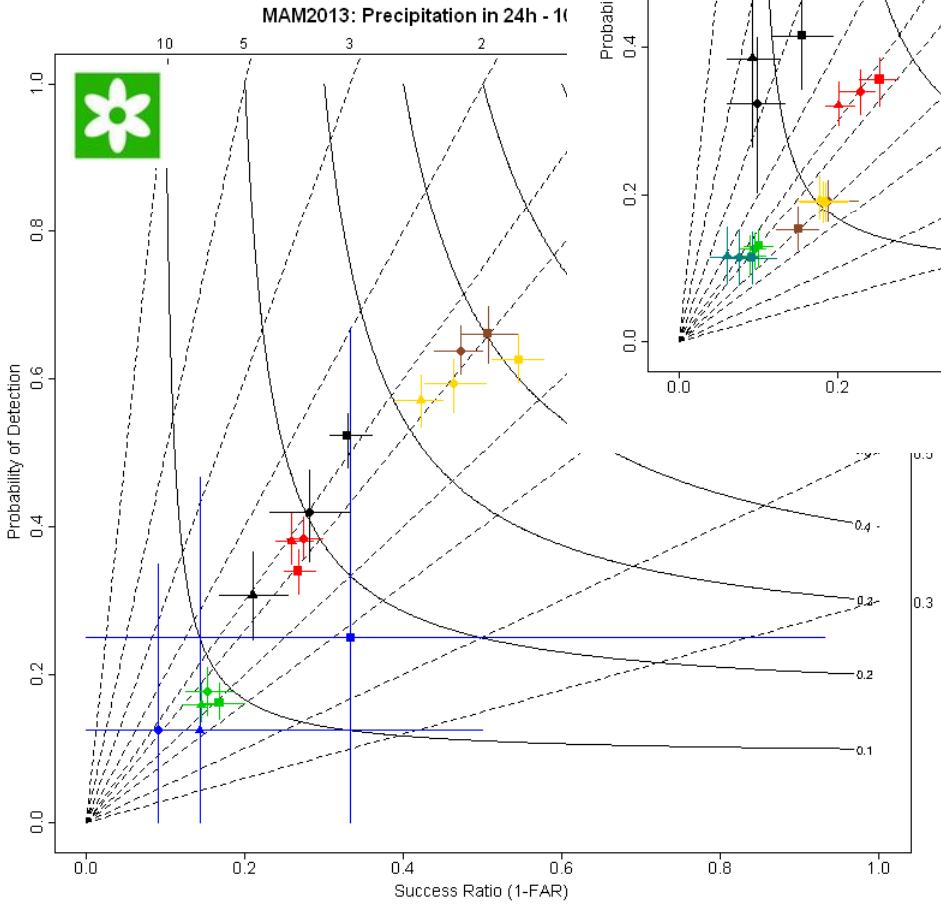
2

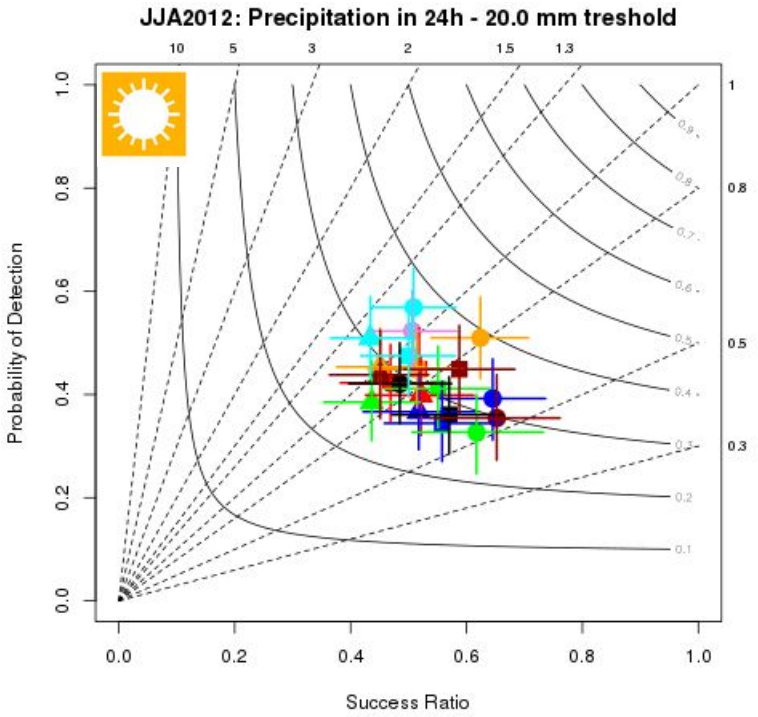


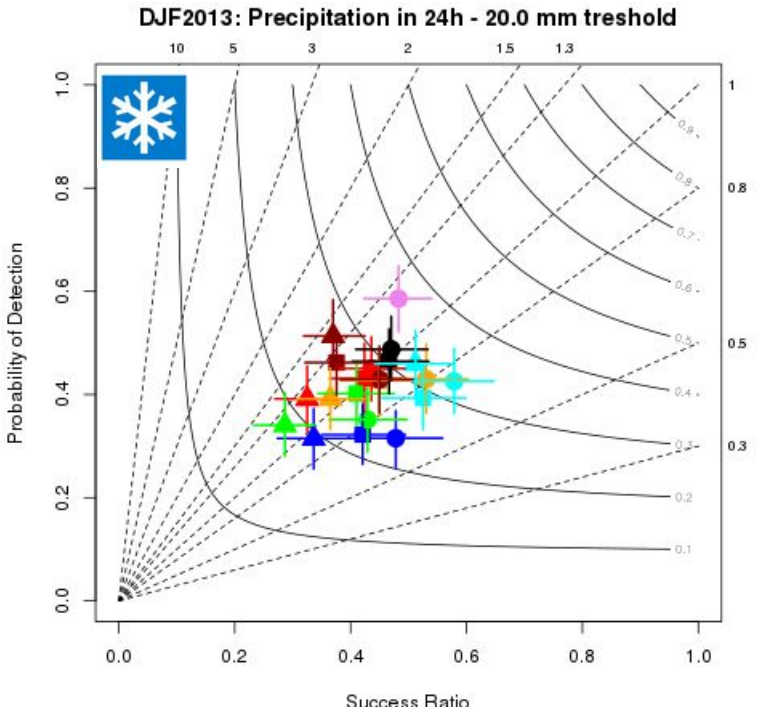
Average over area > 10 mm/24h

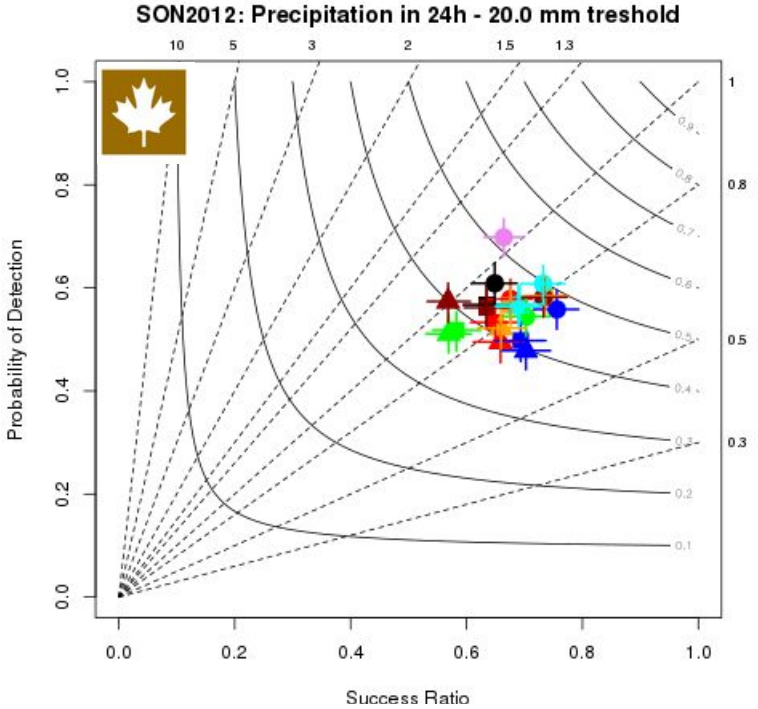
3

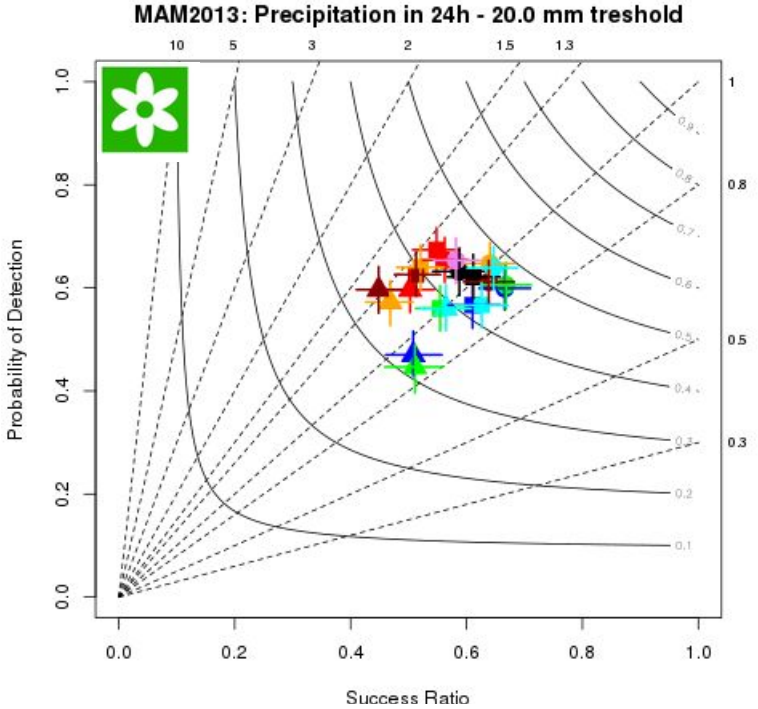












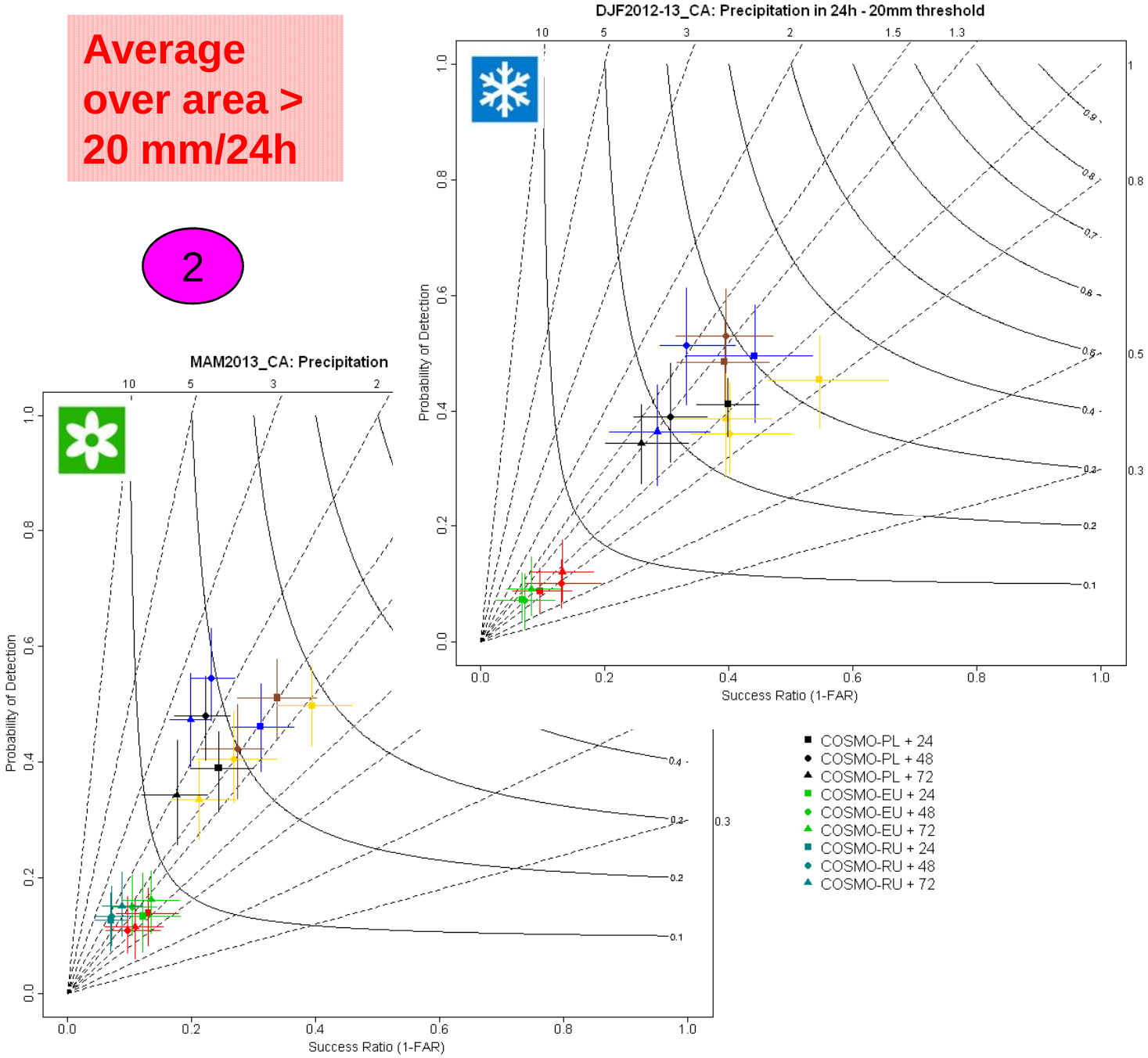
Average over area > 20 mm/24h

1

I7 + 24
I7 + 48
I7 + 72
7 + 24
7 + 48
7 + 72
EU + 24
EU + 48
EU + 72
ME + 24
ME + 48
ME + 72
I2 + 24
I2 + 48
IT + 24
GR + 24
GR + 48
GR + 72
ECMWF + 24
ECMWF + 48
ECMWF + 72

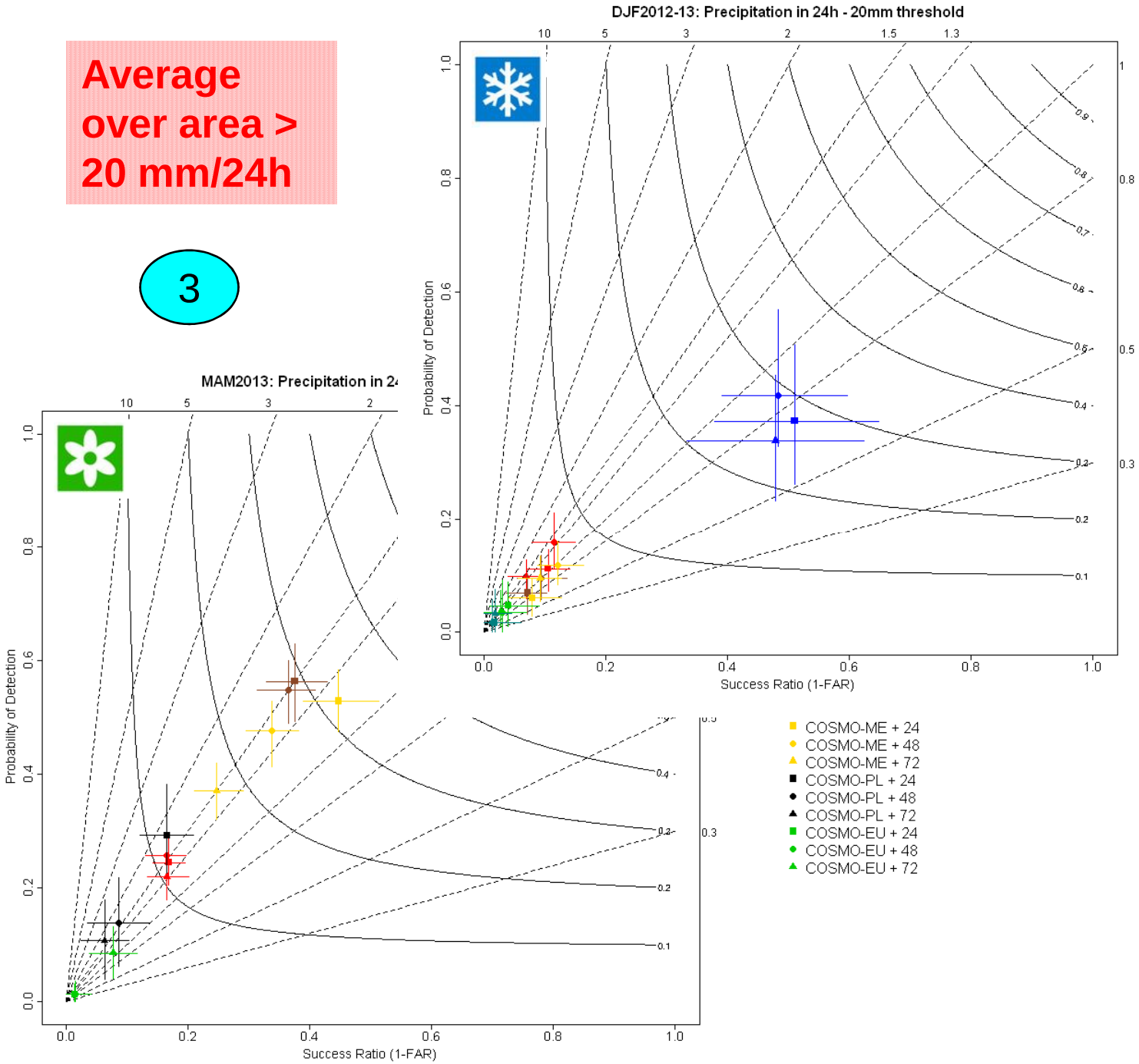
Average over area > 20 mm/24h

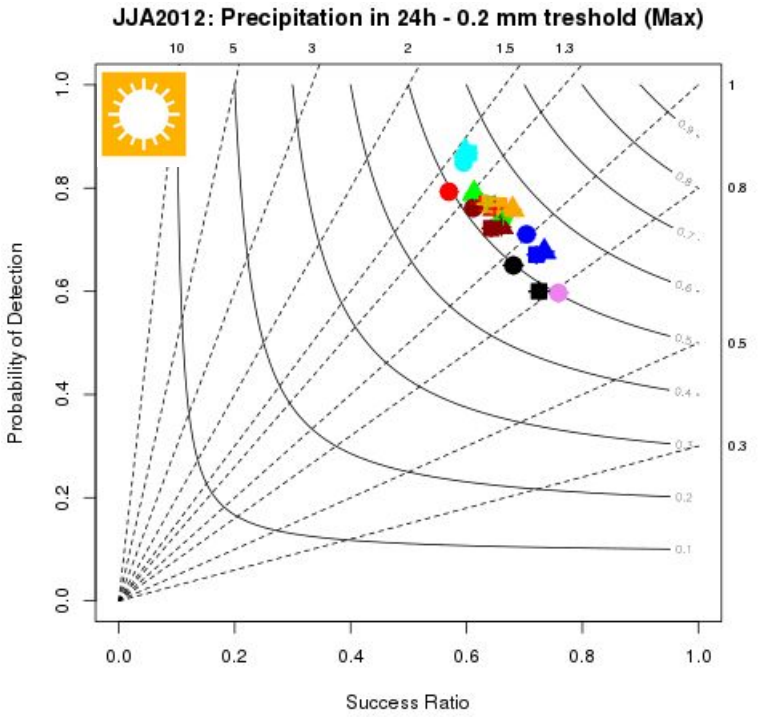
2

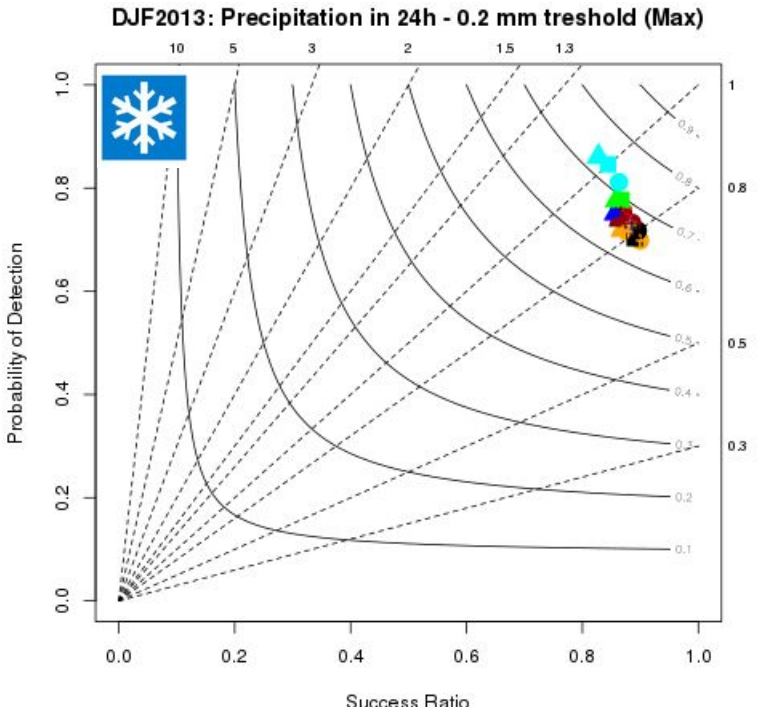


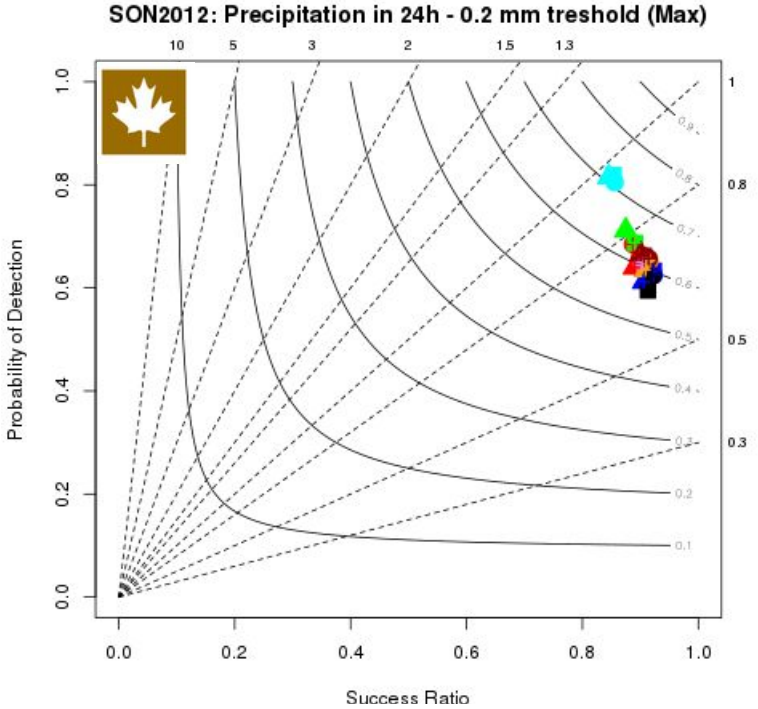
Average over area > 20 mm/24h

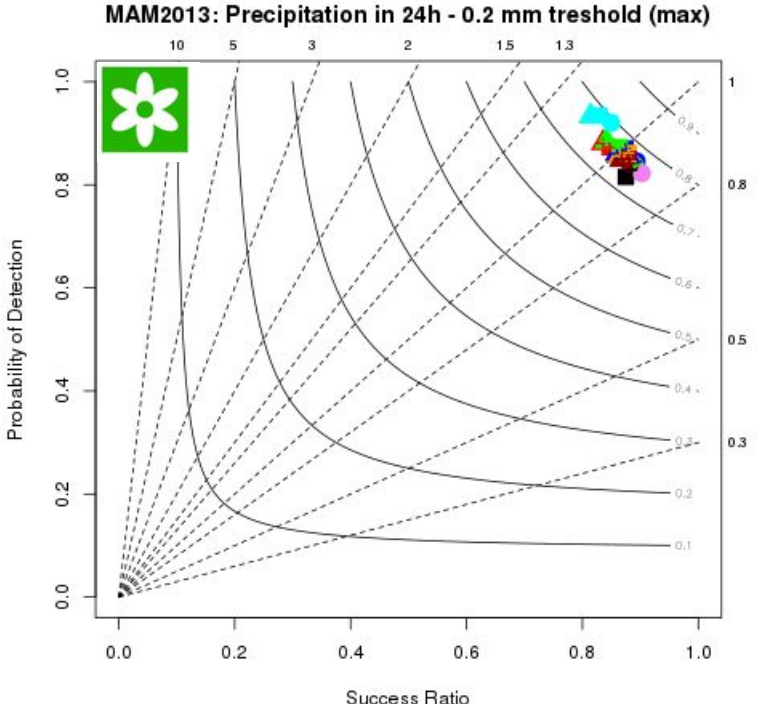
3







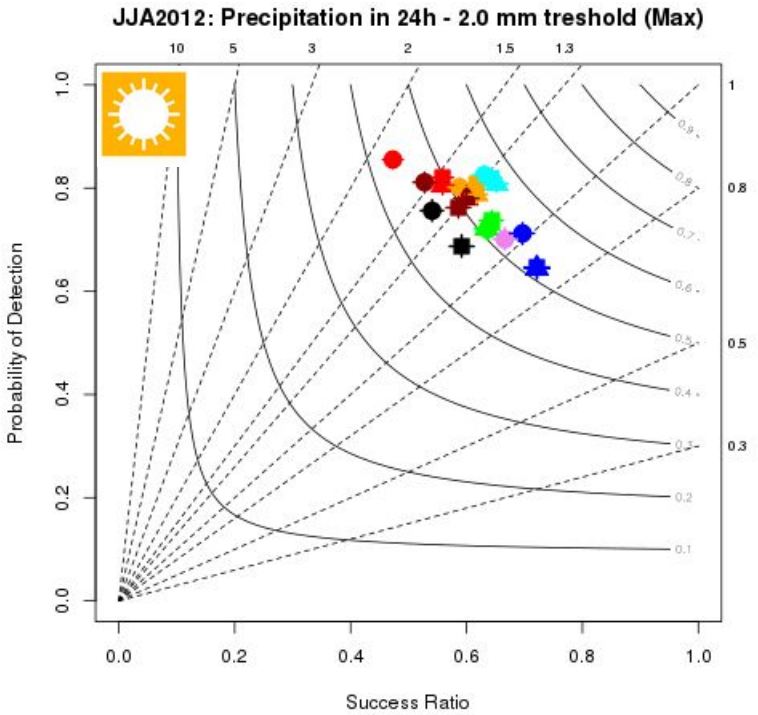


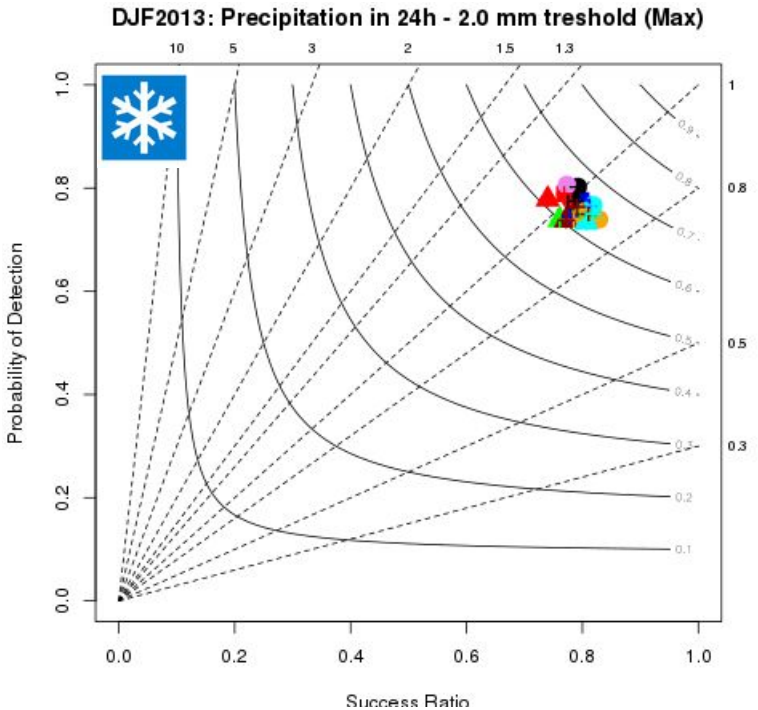


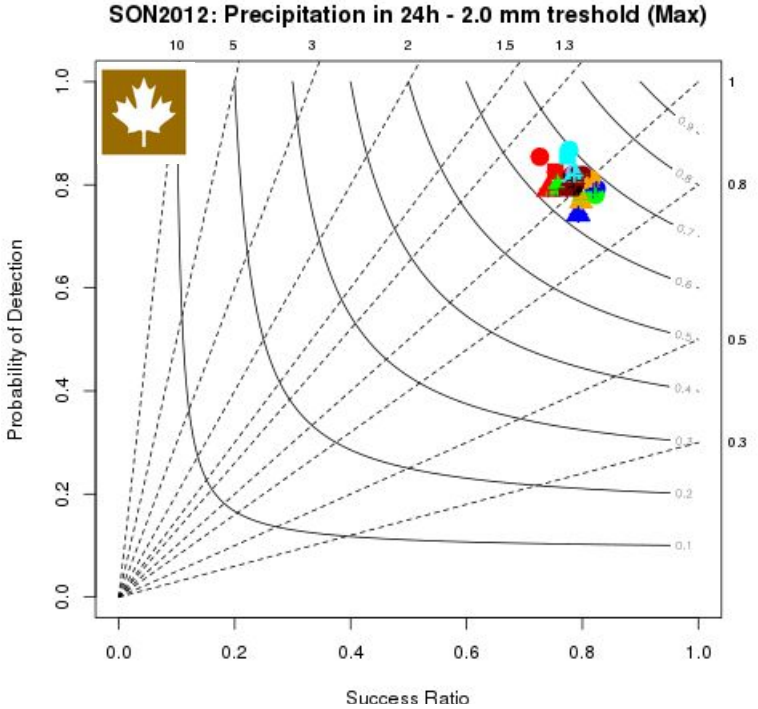
Maximum over area > 0.2 mm/24h

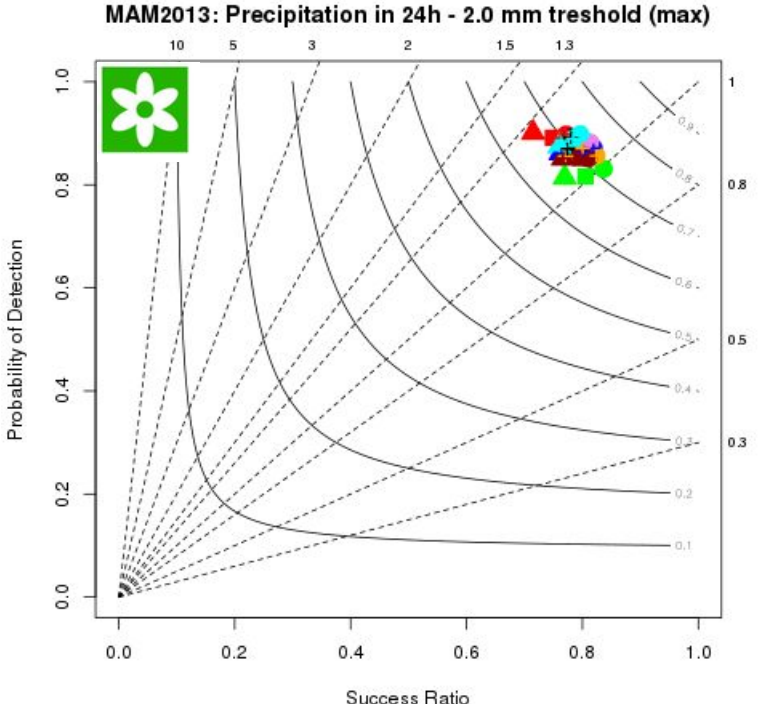
1

- I7 + 24
- I7 + 48
- I7 + 72
- 7 + 24
- 7 + 48
- 7 + 72
- EU + 24
- EU + 48
- EU + 72
- ME + 24
- ME + 48
- ME + 72
- I2 + 24
- I2 + 48
- IT + 24
- GR + 24
- GR + 48
- GR + 72
- ECMWF + 24
- ECMWF + 48
- ECMWF + 72





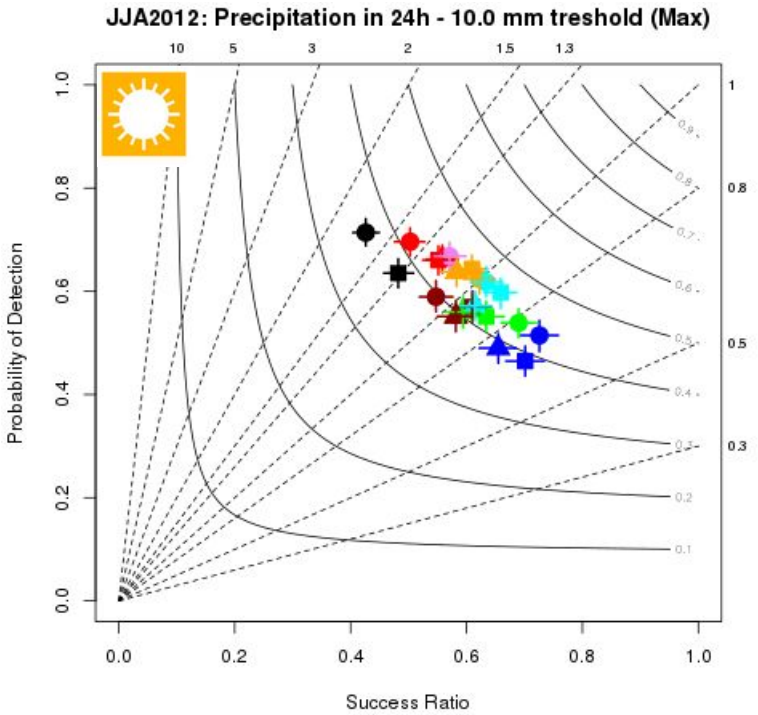


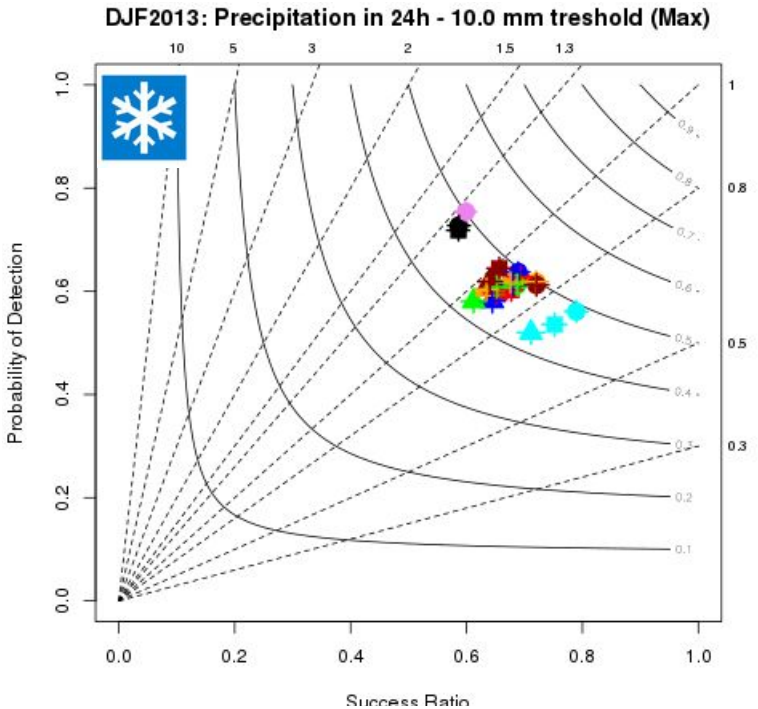


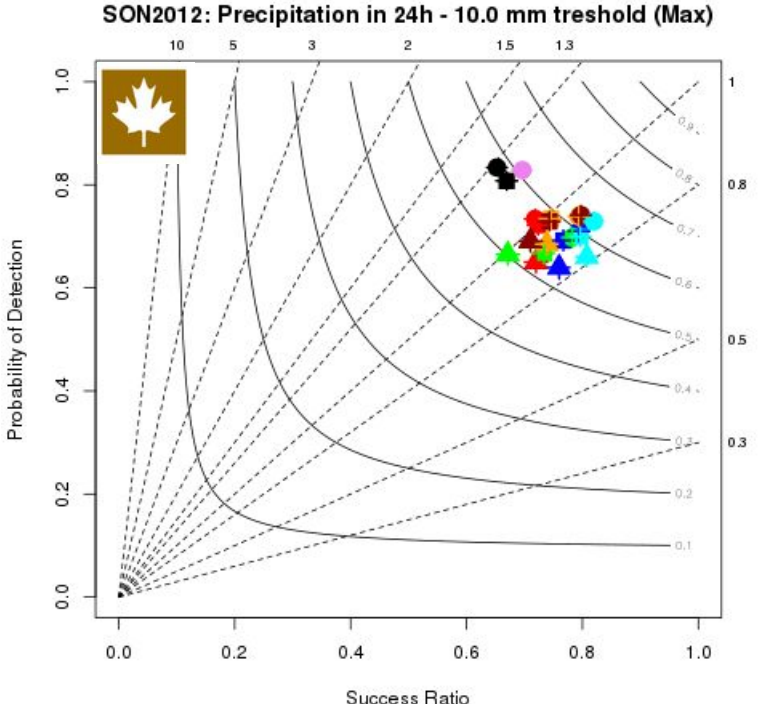
Maximum over area > 2 mm/24h

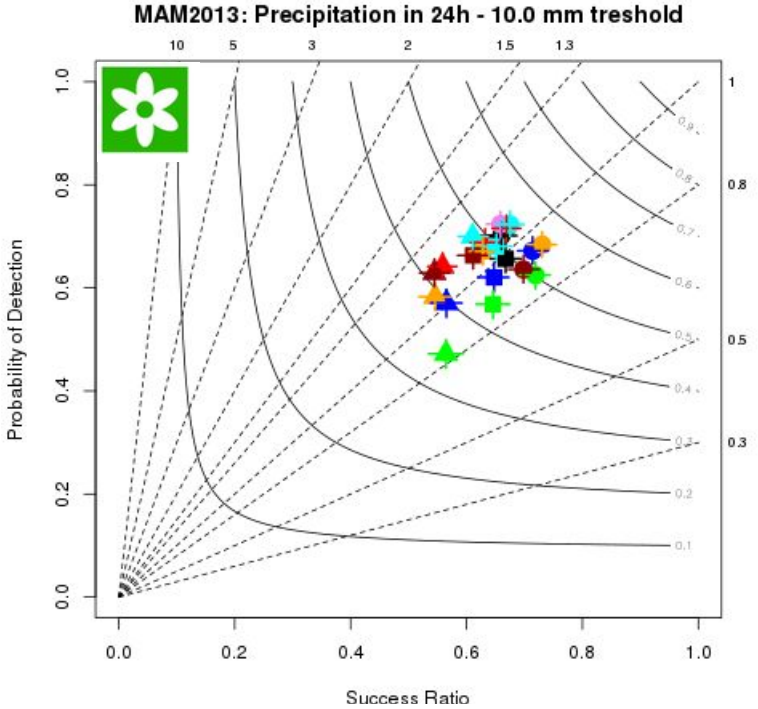
1

- I7 + 24
- I7 + 48
- I7 + 72
- 7 + 24
- 7 + 48
- 7 + 72
- EU + 24
- EU + 48
- EU + 72
- ME + 24
- ME + 48
- ME + 72
- I2 + 24
- I2 + 48
- IT + 24
- GR + 24
- GR + 48
- GR + 72
- ECMWF + 24
- ECMWF + 48
- ECMWF + 72





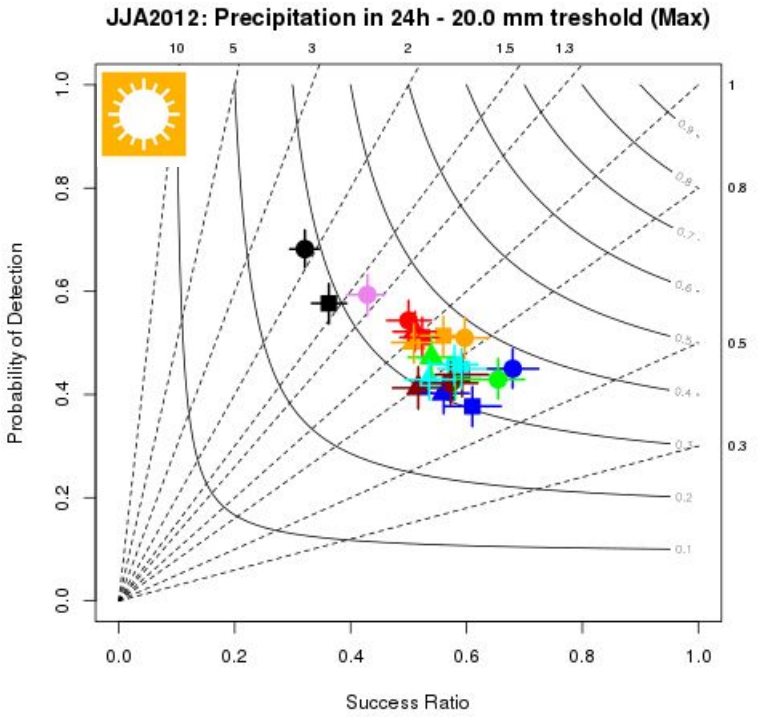


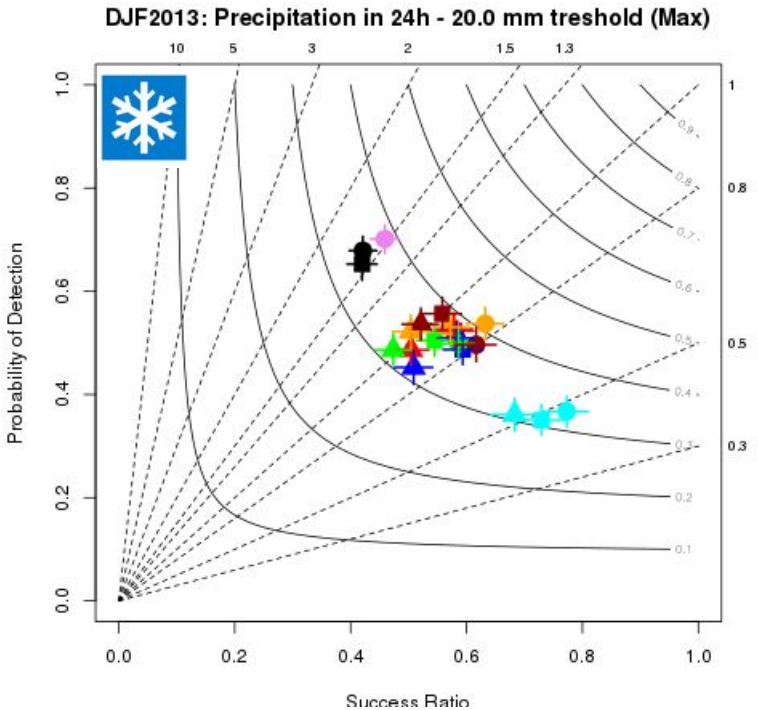


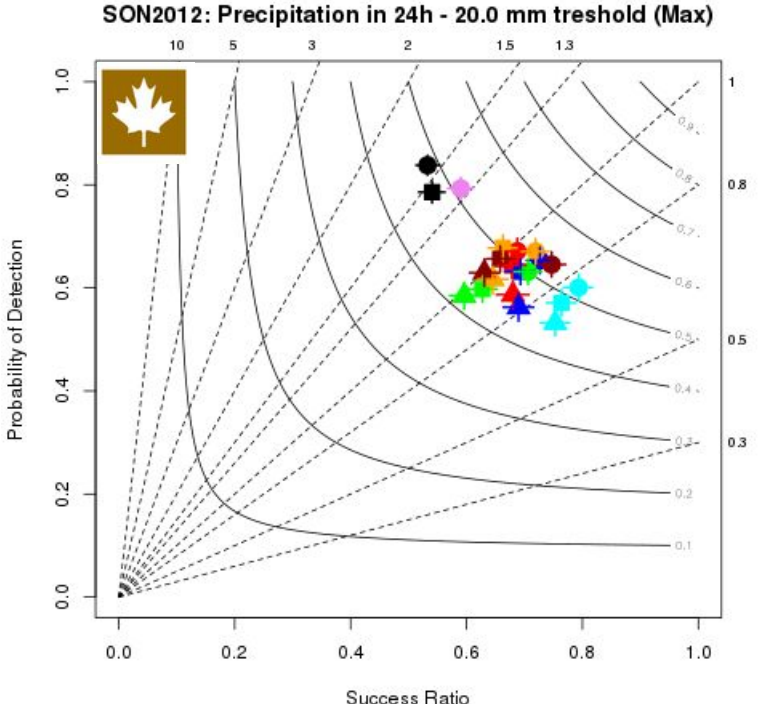
Maximum over area > 10 mm/24h

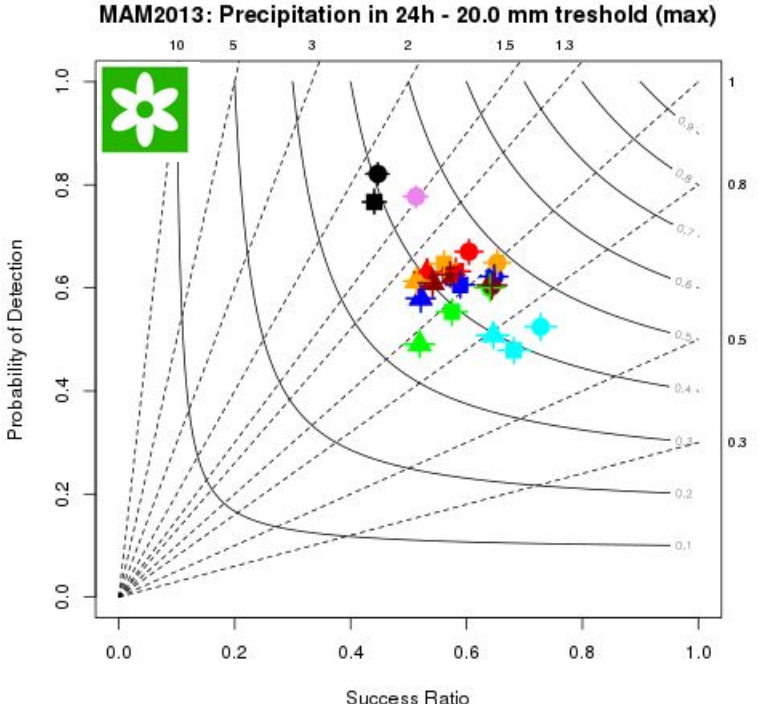
1

- I7 + 24
- I7 + 48
- I7 + 72
- 7 + 24
- 7 + 48
- 7 + 72
- EU + 24
- EU + 48
- EU + 72
- ME + 24
- ME + 48
- ME + 72
- I2 + 24
- I2 + 48
- IT + 24
- GR + 24
- GR + 48
- GR + 72
- ECMWF + 24
- ECMWF + 48
- ECMWF + 72





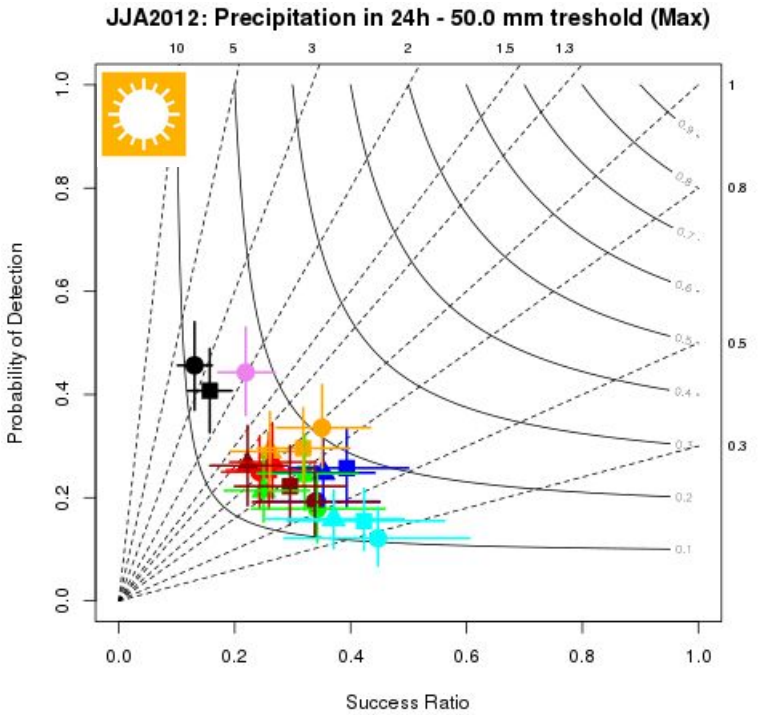


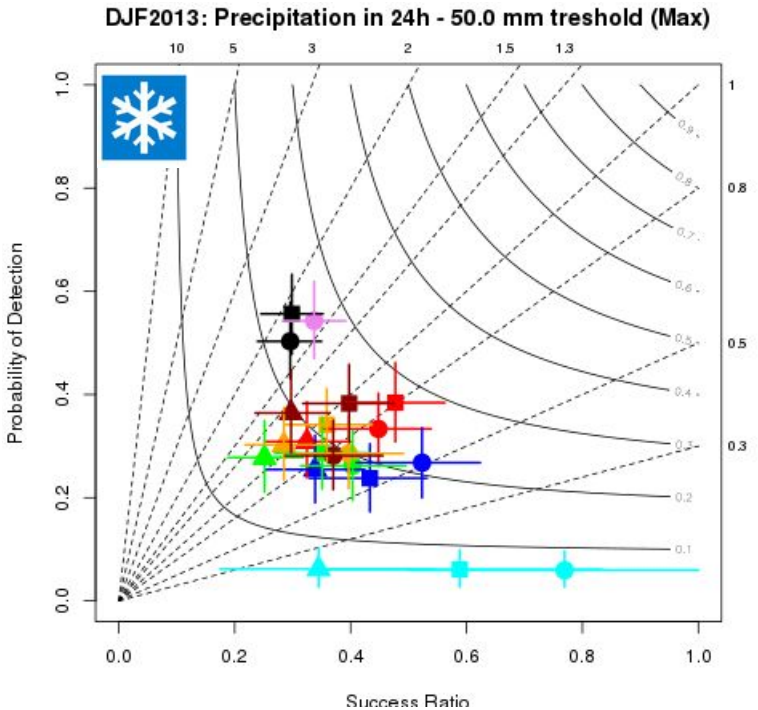


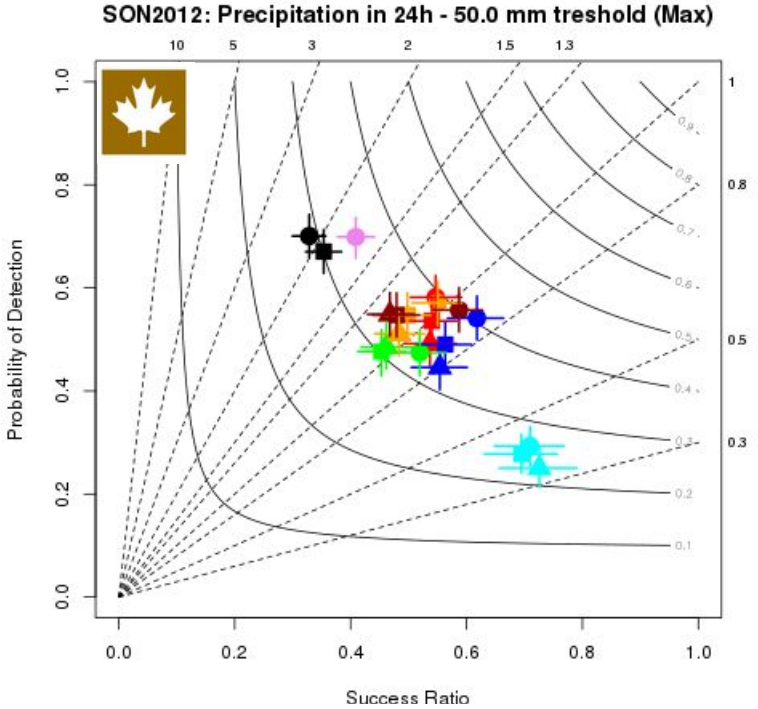
Maximum over area > 20 mm/24h

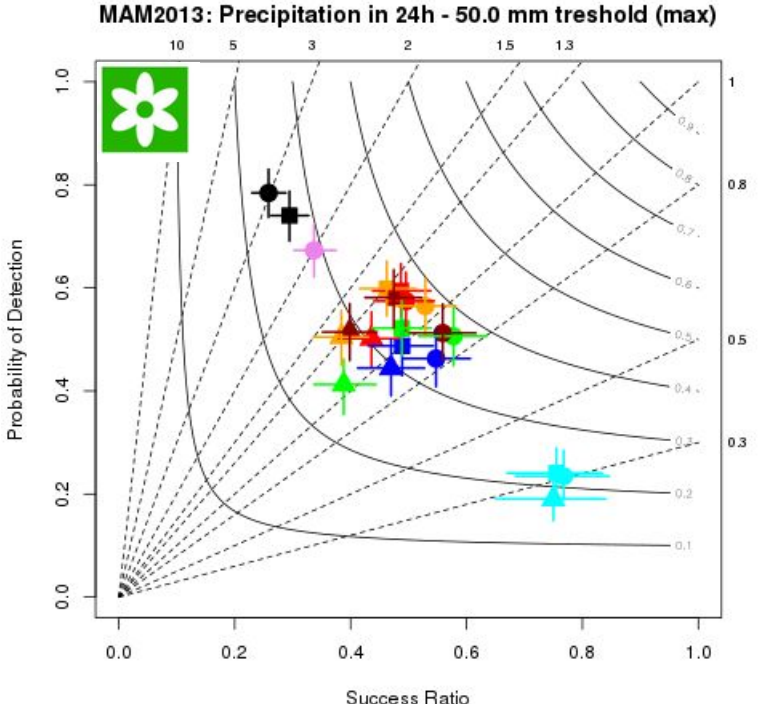
1

- I7 + 24
- I7 + 48
- I7 + 72
- 7 + 24
- 7 + 48
- 7 + 72
- EU + 24
- EU + 48
- EU + 72
- ME + 24
- ME + 48
- ME + 72
- I2 + 24
- I2 + 48
- IT + 24
- GR + 24
- GR + 48
- GR + 72
- ECMWF + 24
- ECMWF + 48
- ECMWF + 72







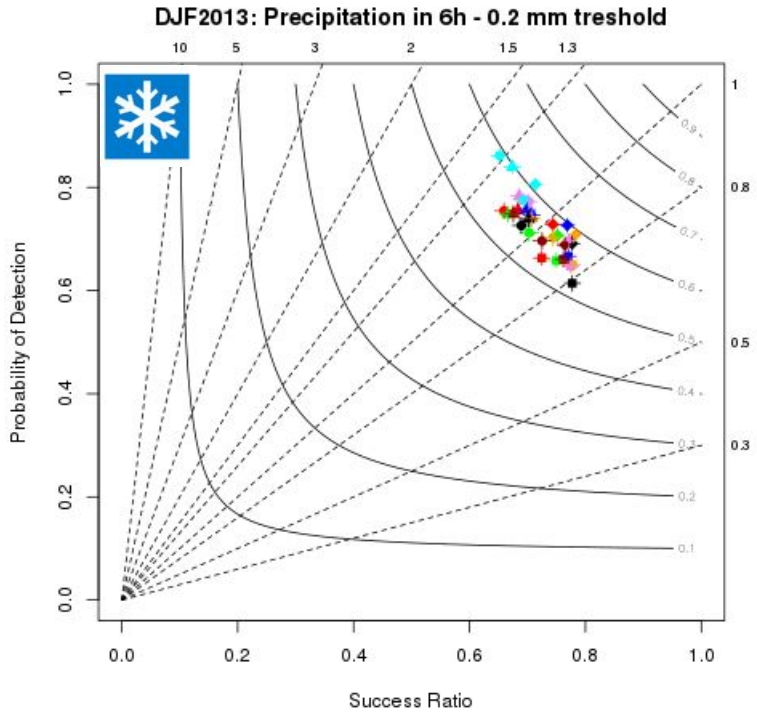


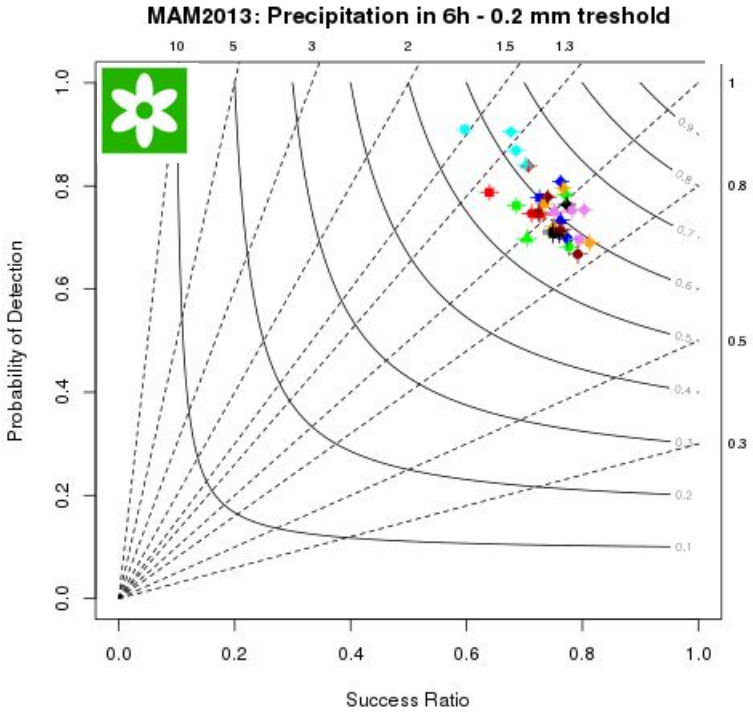
Maximum over area > 50 mm/24h

1

- I7 + 24
- I7 + 48
- I7 + 72
- 7 + 24
- 7 + 48
- 7 + 72
- EU + 24
- EU + 48
- EU + 72
- ME + 24
- ME + 48
- ME + 72
- I2 + 24
- I2 + 48
- IT + 24
- GR + 24
- GR + 48
- GR + 72
- ECMWF + 24
- ECMWF + 48
- ECMWF + 72

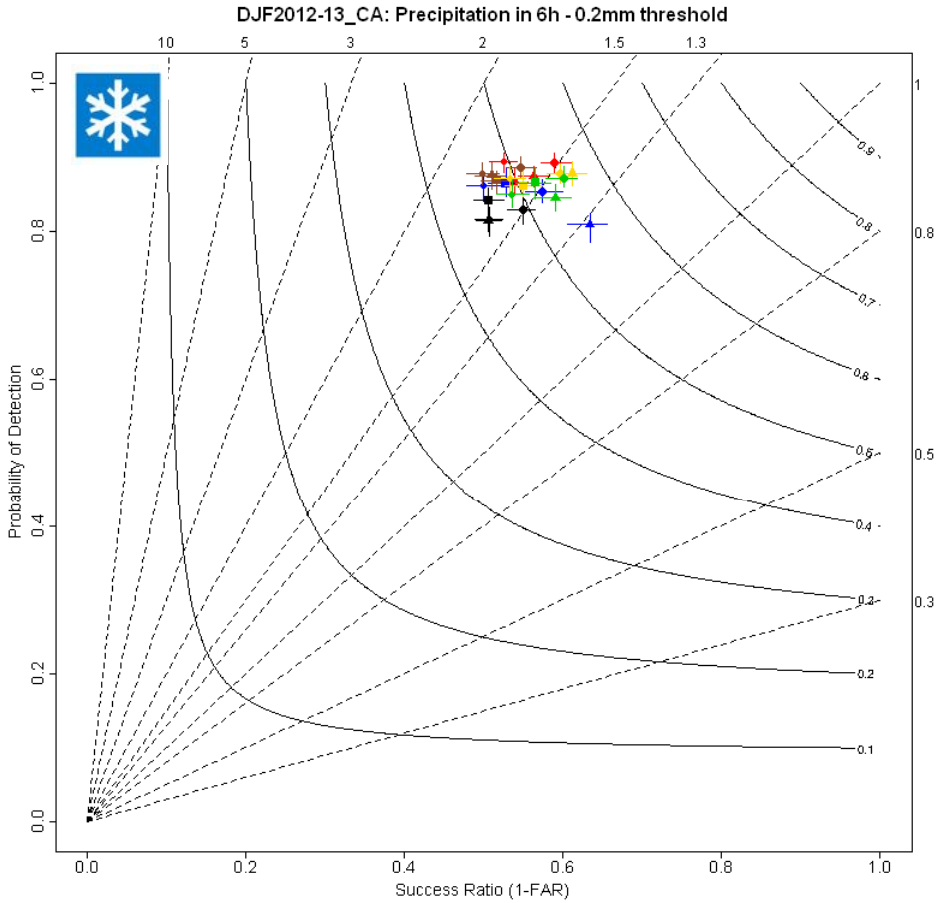
1





Average over area > 0.2 mm/6h

- I7 0006
- I7 0612
- I7 1218
- I7 1824
- 7 0006
- 7 0612
- 7 1218
- 7 1824
- EU 0006
- EU 0612
- EU 1218
- EU 1824
- ME 0006
- ME 0612
- ME 1218
- ME 1824
- I2 0006
- I2 0612
- I2 1218
- I2 1824
- IT 0006
- IT 0612
- IT 1218
- IT 1824
- GR 0006
- GR 0612
- GR 1218
- GR 1824
- ECMWF 0006
- ECMWF 0612
- ECMWF 1218
- ECMWF 1824

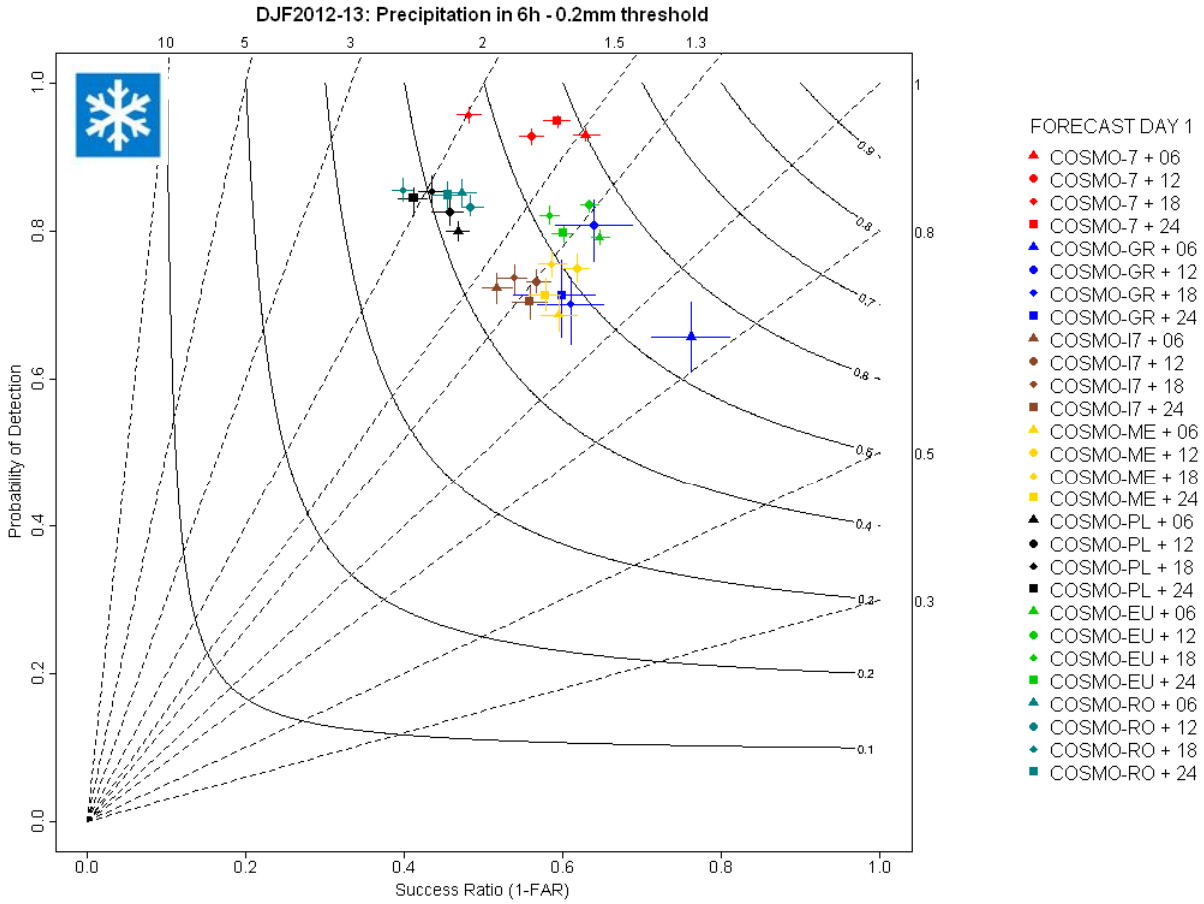


FORECAST DAY 1

- COSMO-7 + 06
- COSMO-7 + 12
- COSMO-7 + 18
- COSMO-7 + 24
- COSMO-GR + 06
- COSMO-GR + 12
- COSMO-GR + 18
- COSMO-GR + 24
- COSMO-I7 + 06
- COSMO-I7 + 12
- COSMO-I7 + 18
- COSMO-I7 + 24
- COSMO-ME + 06
- COSMO-ME + 12
- COSMO-ME + 18
- COSMO-ME + 24
- COSMO-PL + 06
- COSMO-PL + 12
- COSMO-PL + 18
- COSMO-PL + 24
- COSMO-EU + 06
- COSMO-EU + 12
- COSMO-EU + 18
- COSMO-EU + 24

Average over area > 0.2 mm/6h

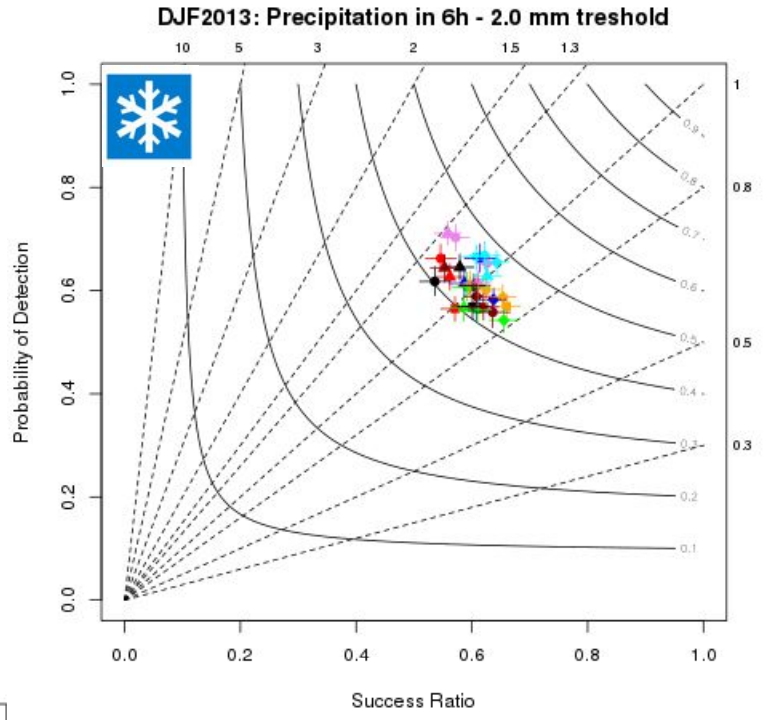
2

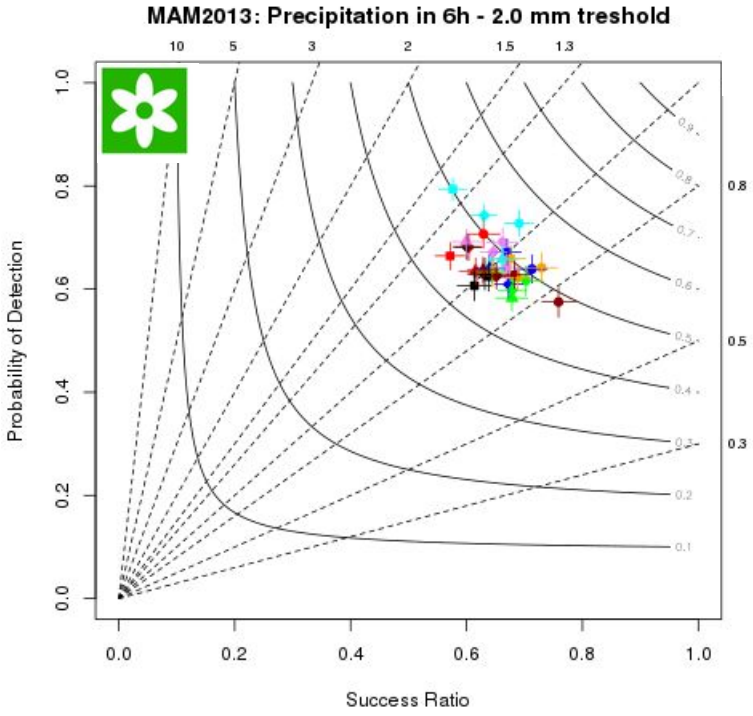


Average over area > 0.2 mm/6h

3

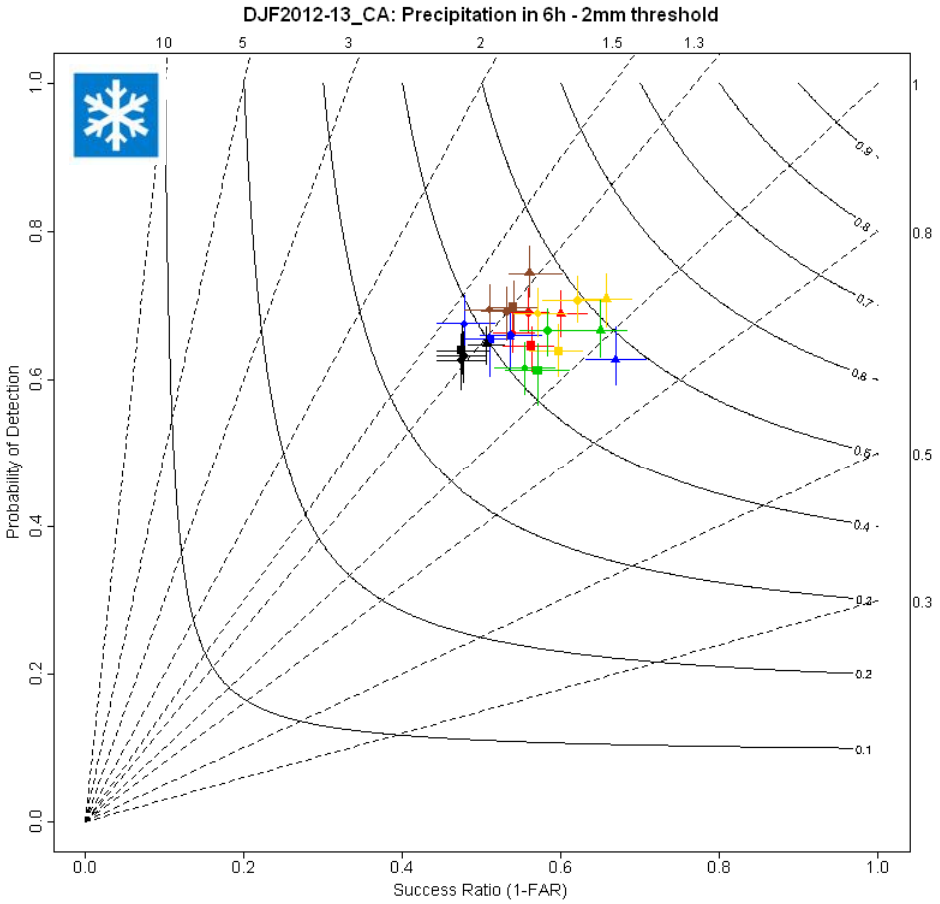
1





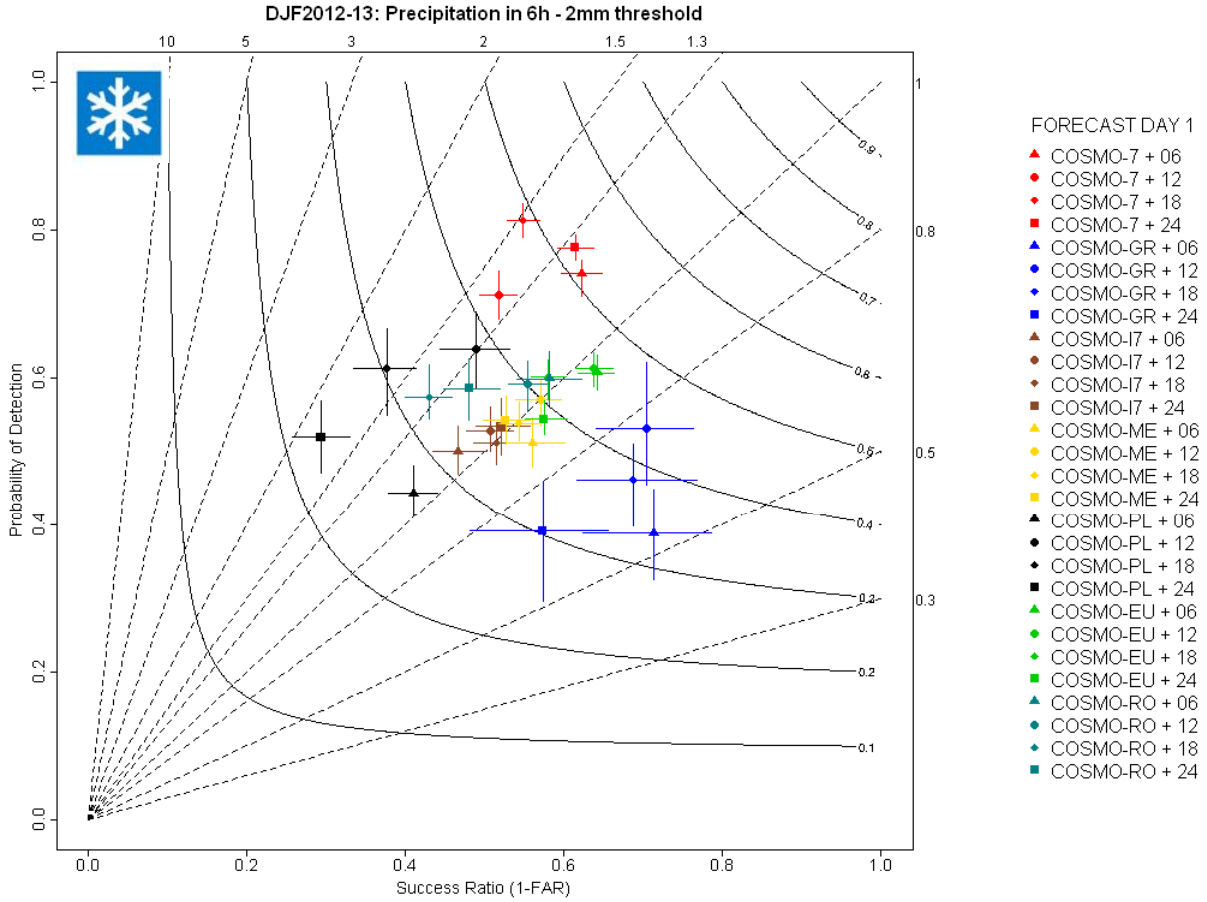
Average over area > 2 mm/6h

- I7 0006
- I7 0612
- I7 1218
- I7 1824
- 7 0006
- 7 0612
- 7 1218
- 7 1824
- EU 0006
- EU 0612
- EU 1218
- EU 1824
- ME 0006
- ME 0612
- ME 1218
- ME 1824
- I2 0006
- I2 0612
- I2 1218
- I2 1824
- IT 0006
- IT 0612
- IT 1218
- IT 1824
- GR 0006
- GR 0612
- GR 1218
- GR 1824
- ECMWF 0006
- ECMWF 0612
- ECMWF 1218
- ECMWF 1824



Average over area > 2 mm/6h

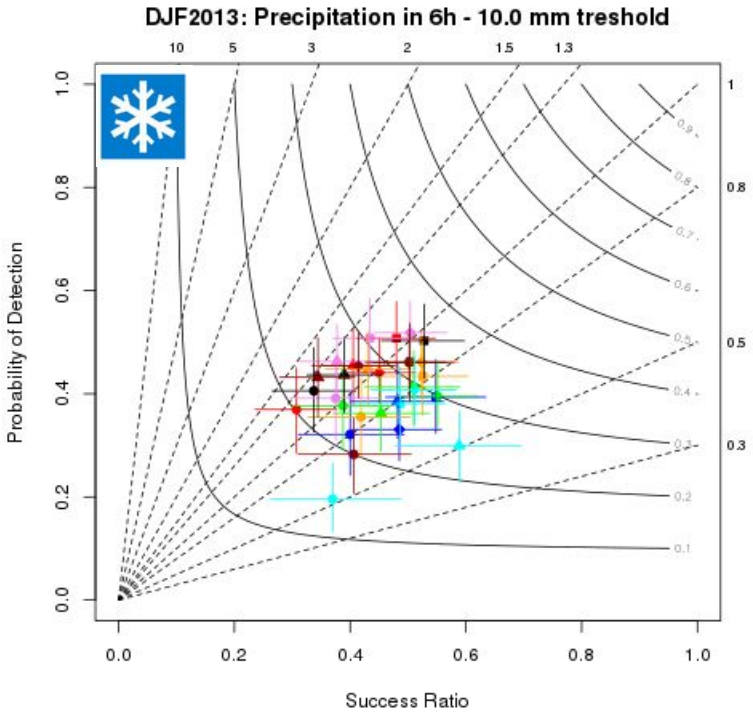
2

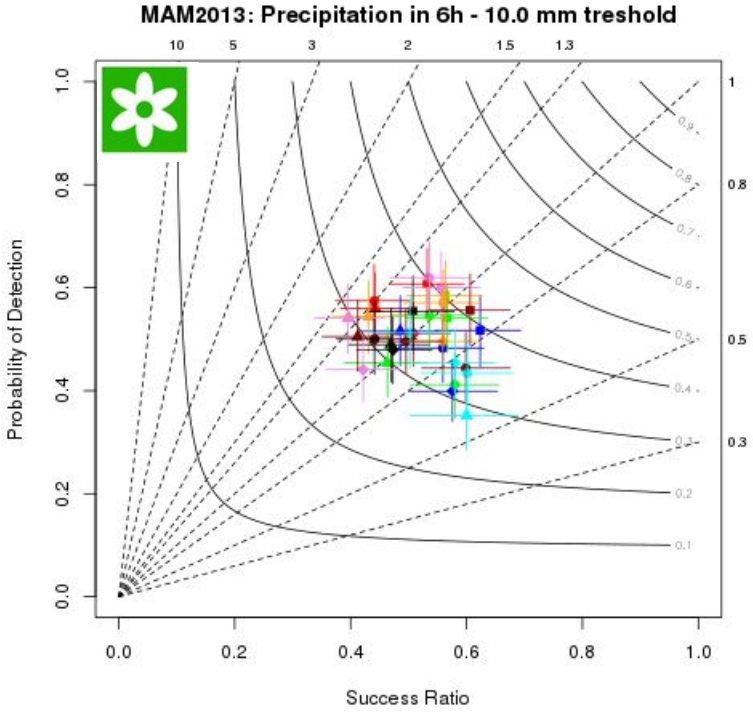


Average over area > 2 mm/6h

3

1



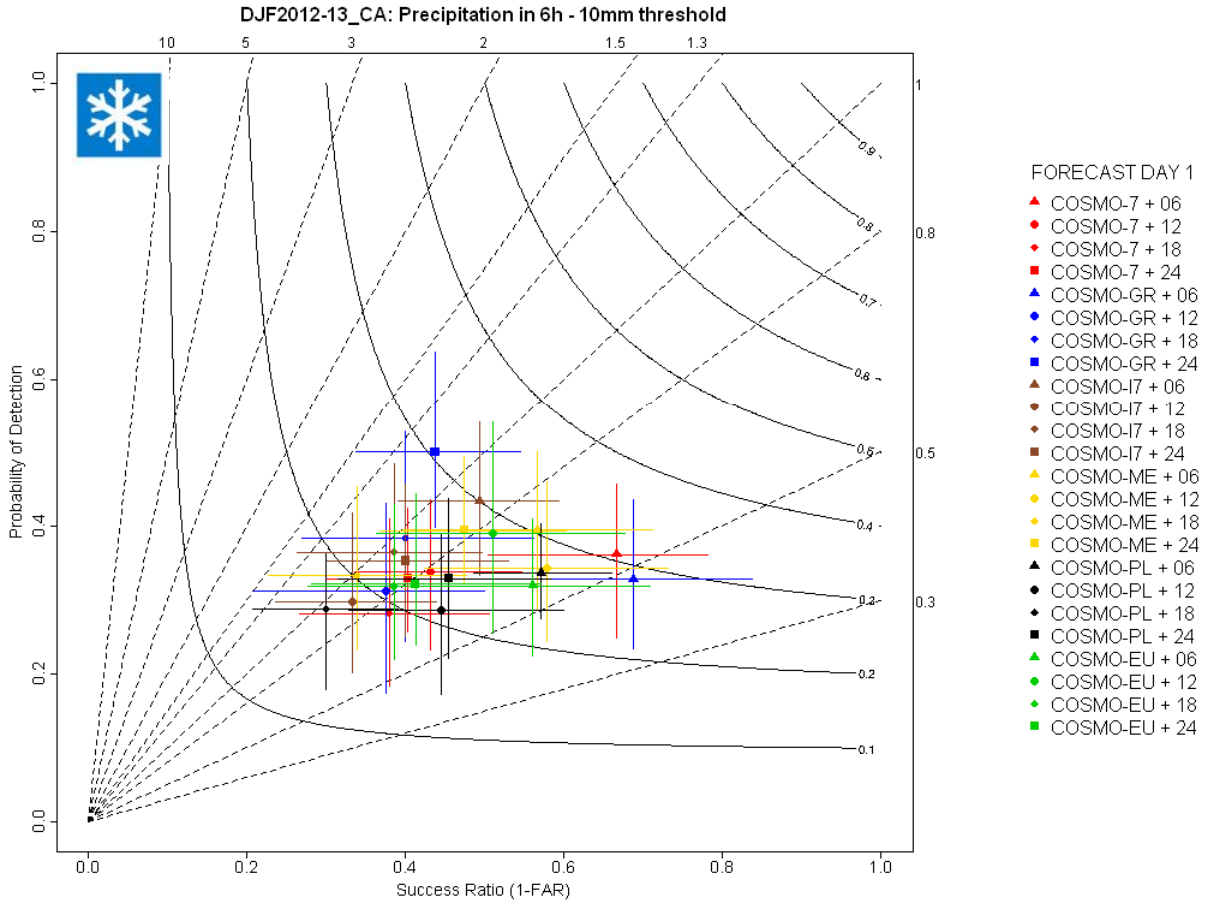


Average over area > 10 mm/6h

- I7 0006
- I7 0612
- I7 1218
- I7 1824
- 7 0006
- 7 0612
- 7 1218
- 7 1824
- EU 0006
- EU 0612
- EU 1218
- EU 1824
- ME 0006
- ME 0612
- ME 1218
- ME 1824
- I2 0006
- I2 0612
- I2 1218
- I2 1824
- IT 0006
- IT 0612
- IT 1218
- IT 1824
- GR 0006
- GR 0612
- GR 1218
- GR 1824
- ECMWF 0006
- ECMWF 0612
- ECMWF 1218
- ECMWF 1824

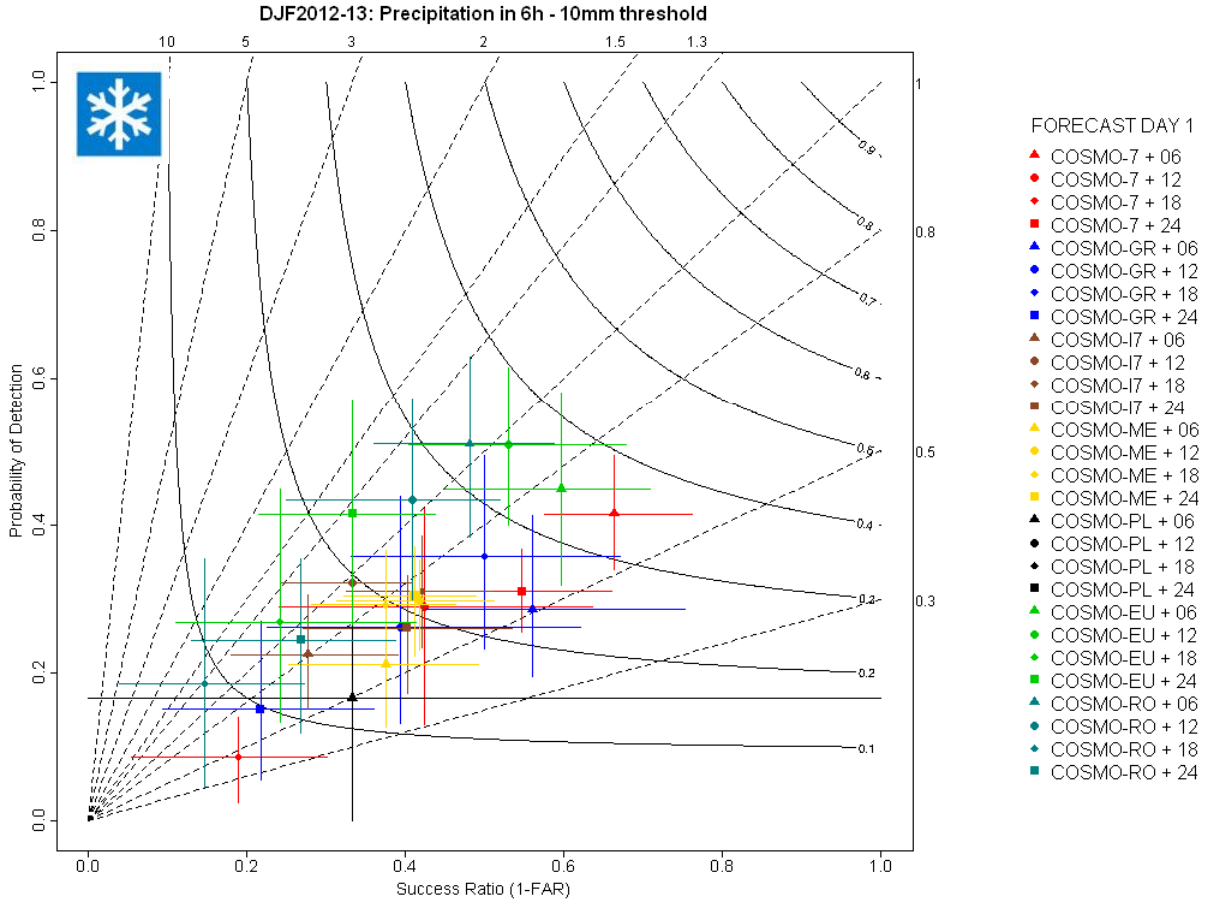
Average over area > 10 mm/6h

2

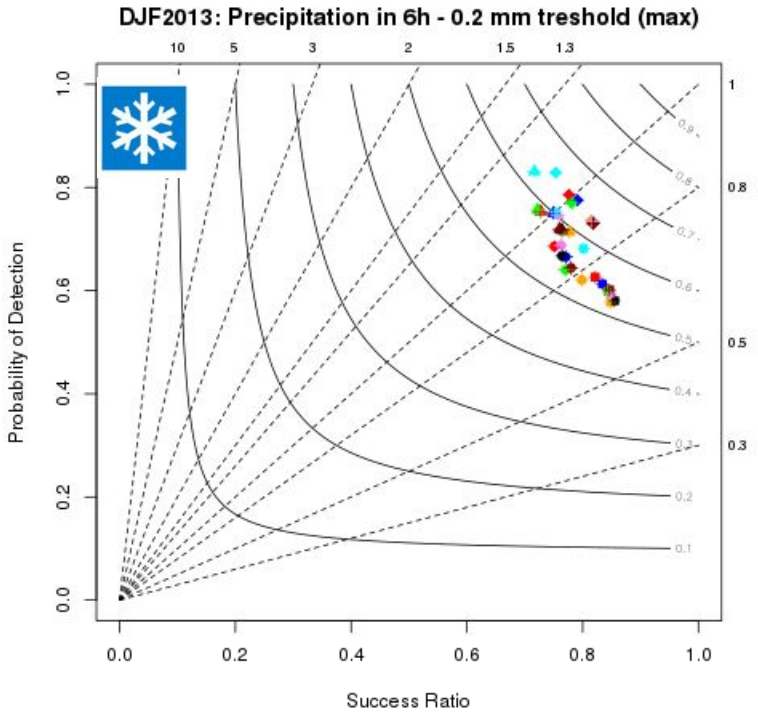


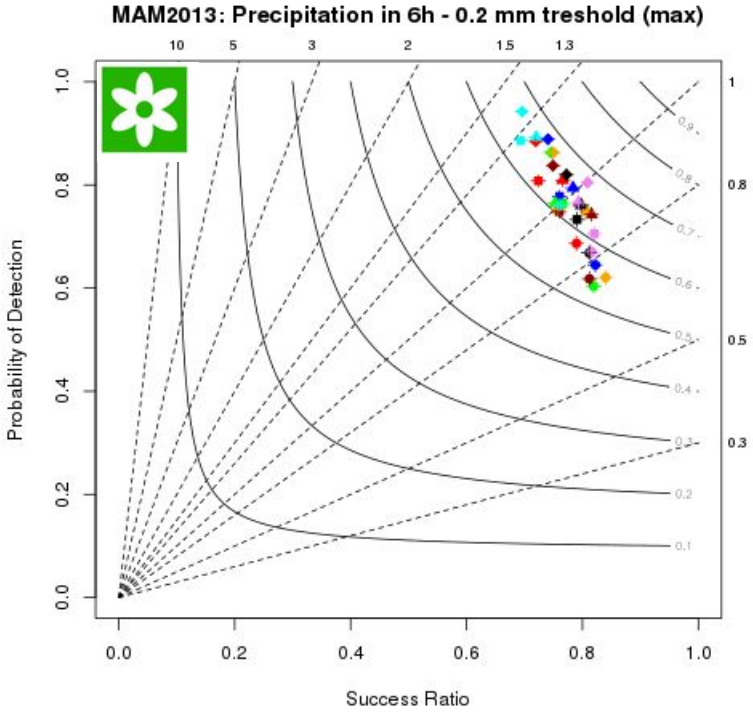
Average over area > 10 mm/6h

3



1

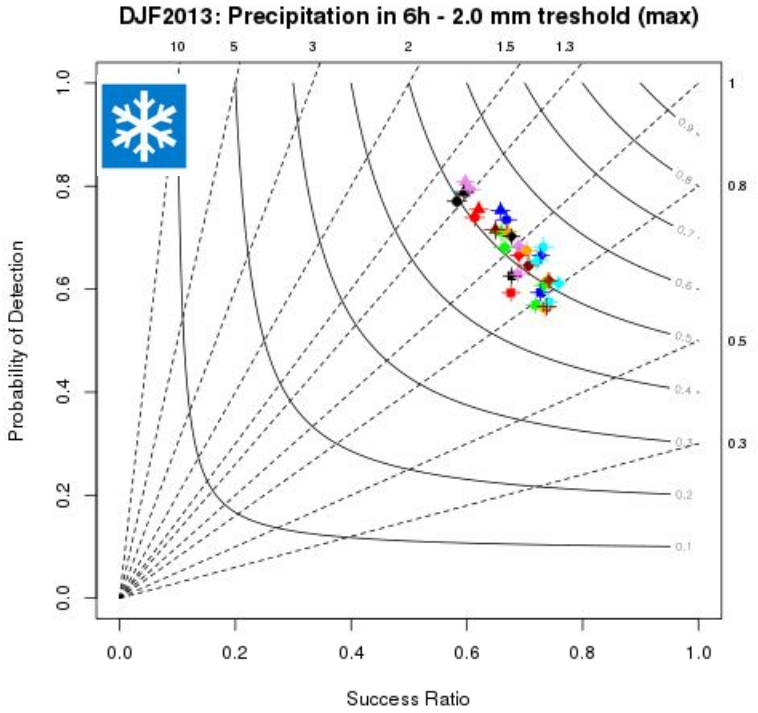


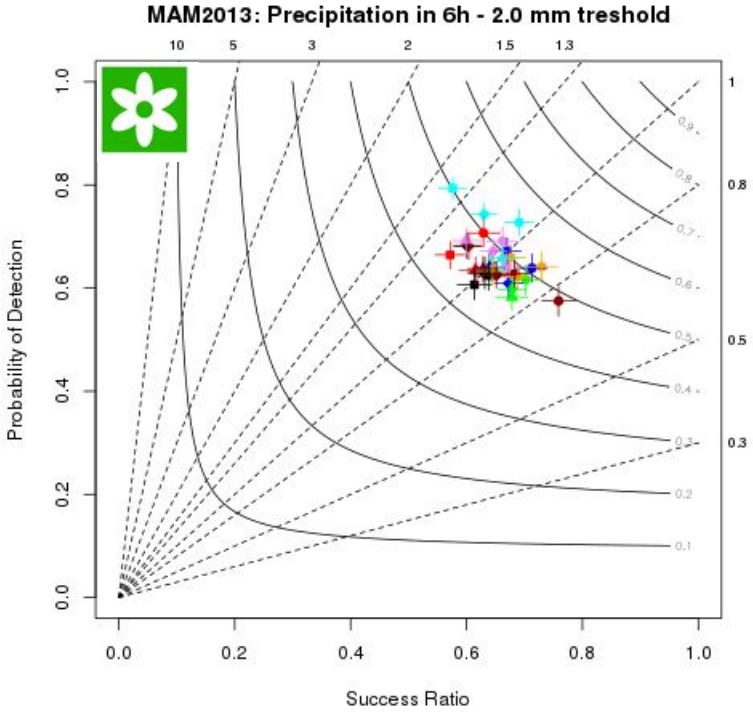


Maximum over area > 0.2 mm/6h

- I7 0006
- I7 0612
- I7 1218
- I7 1824
- 7 0006
- 7 0612
- 7 1218
- 7 1824
- EU 0006
- EU 0612
- EU 1218
- EU 1824
- ME 0006
- ME 0612
- ME 1218
- ME 1824
- I2 0006
- I2 0612
- I2 1218
- I2 1824
- IT 0006
- IT 0612
- IT 1218
- IT 1824
- GR 0006
- GR 0612
- GR 1218
- GR 1824
- ECMWF 0006
- ECMWF 0612
- ECMWF 1218
- ECMWF 1824

1

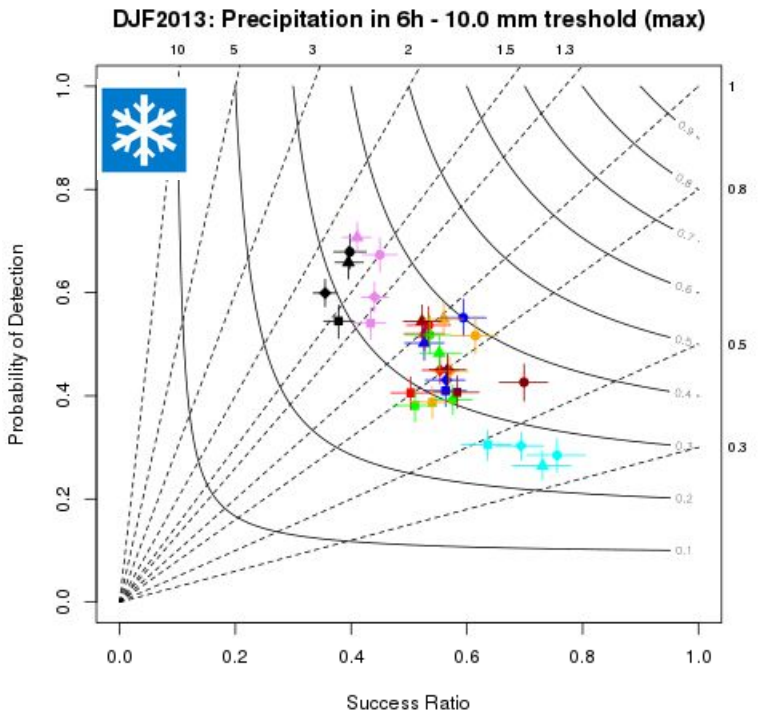


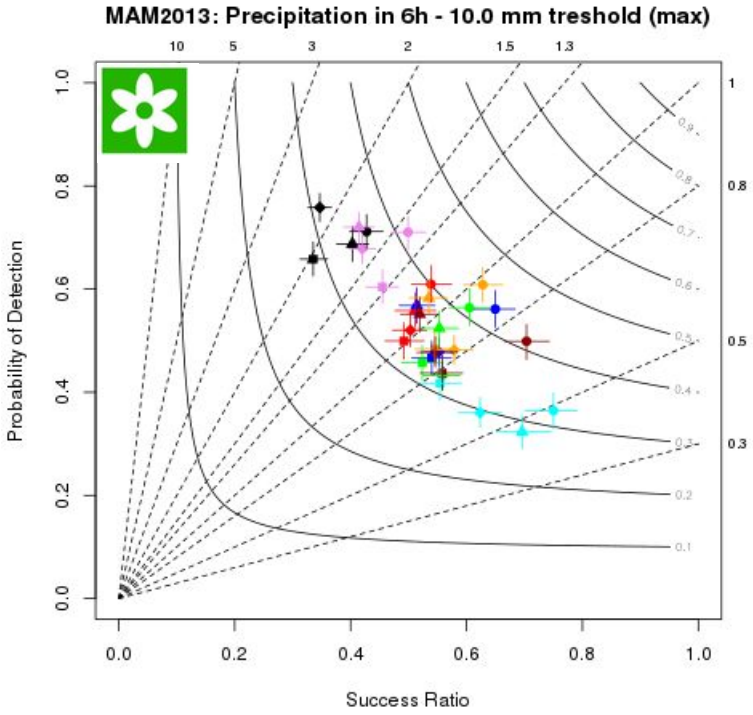


Maximum over area > 2 mm/6h

- I7 0006
- I7 0612
- I7 1218
- I7 1824
- 7 0006
- 7 0612
- 7 1218
- 7 1824
- EU 0006
- EU 0612
- EU 1218
- EU 1824
- ME 0006
- ME 0612
- ME 1218
- ME 1824
- I2 0006
- I2 0612
- I2 1218
- I2 1824
- IT 0006
- IT 0612
- IT 1218
- IT 1824
- GR 0006
- GR 0612
- GR 1218
- GR 1824
- ECMWF 0006
- ECMWF 0612
- ECMWF 1218
- ECMWF 1824

1

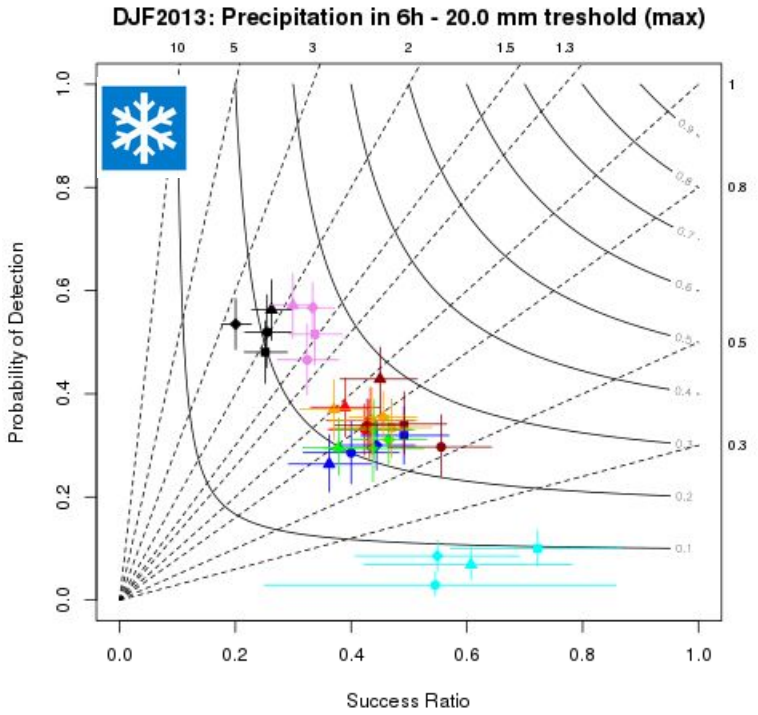


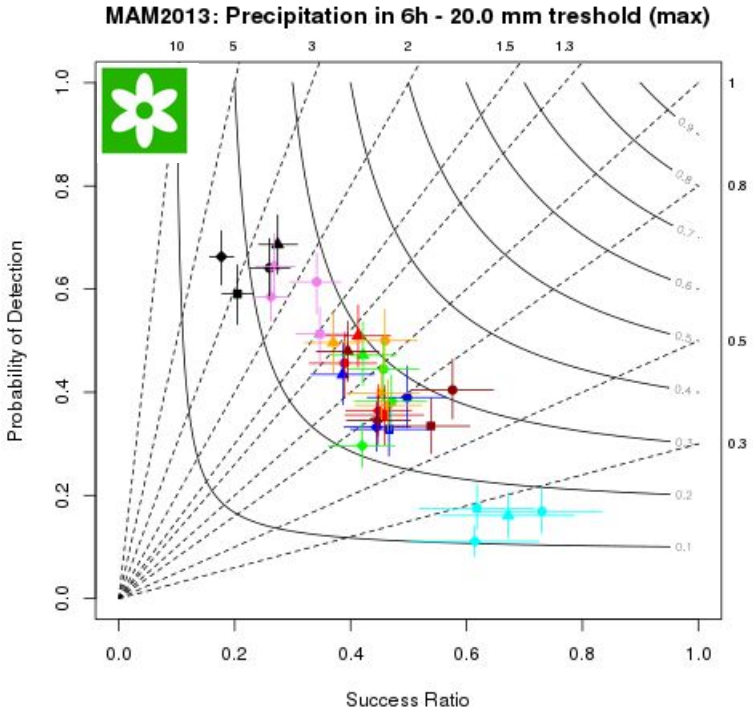


Maximum over area > 10 mm/6h

- I7 0006
- I7 0612
- I7 1218
- I7 1824
- 7 0006
- 7 0612
- 7 1218
- 7 1824
- EU 0006
- EU 0612
- EU 1218
- EU 1824
- ME 0006
- ME 0612
- ME 1218
- ME 1824
- I2 0006
- I2 0612
- I2 1218
- I2 1824
- IT 0006
- IT 0612
- IT 1218
- IT 1824
- GR 0006
- GR 0612
- GR 1218
- GR 1824
- ECMWF 0006
- ECMWF 0612
- ECMWF 1218
- ECMWF 1824

1





Maximum over area > 20 mm/6h

- I7 0006
- I7 0612
- I7 1218
- I7 1824
- 7 0006
- 7 0612
- 7 1218
- 7 1824
- EU 0006
- EU 0612
- EU 1218
- EU 1824
- ME 0006
- ME 0612
- ME 1218
- ME 1824
- I2 0006
- I2 0612
- I2 1218
- I2 1824
- IT 0006
- IT 0612
- IT 1218
- IT 1824
- GR 0006
- GR 0612
- GR 1218
- GR 1824
- ECMWF 0006
- ECMWF 0612
- ECMWF 1218
- ECMWF 1824

Some considerations (also considering the great emails exchange during August…)

24h

1. Over Italy the models scores seem to have a sort of "homogeneous characteristic" and the skills for high thresholds diverge and make worse depending on horizontal resolution.

2. Over CA there are some "strange behaviour": two distinct groups. The first one (ME,I7,PL,GR) seems to follow more or less the "Italy characteristic", the second one (EU, 7, RU) definitely no.

3. Over VD the errors seems to be scattered and sometimes the skills are worse than CA skill

6h

Different behaviour from 24h !!
Italy and CA seem to be quite similar BUT VD is different with scattered points in the graphs

The question.....
Why??????????

1) It is of course useful for each countries to investigate the characteristics, peculiarity, the errors and deficiencies of the own model version over the own territory, BUT it is also necessary (in my opinion) to have a more wide and complete vision→ a common area (Italy or another area) with a common dataset (base rate) used by everyone in order to compare objectively the results

2) how big is the impact of the methodology of verification on the final results?

3) Over Italy we consider observed and forecasted mean values over areas, instead over CA and VD we average only the forecasted values (15 km radius) versus the single synop station: is it too stringent?

4) There are some similarities between Italy and CA results, BUT with a general tendency of overestimation over CA: it is perhaps too linked to the observation (single station point)?