



Verification of ICON-2I (nearly-operational phase)

WG5 MEETING : MODEL ERROR Identification - 24/01/2024

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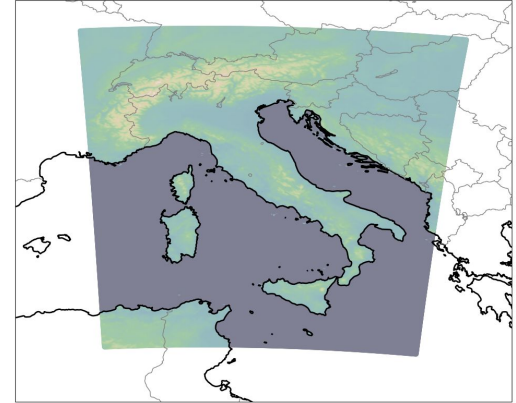
Most of the results refer to the comparison with COSMO-2I:

- Same resolution: 2.2 km
- Same numbers of vertical levels: 65 (but non at the same height)
- ICON-2I domain 40% larger

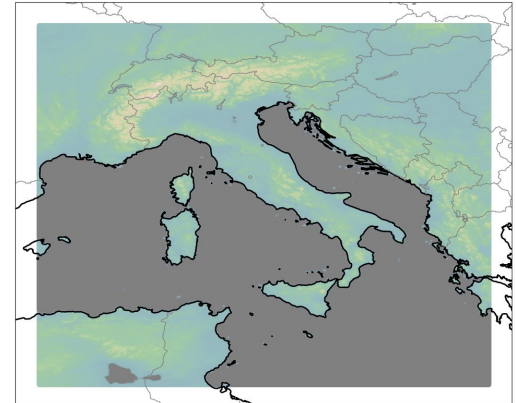
Verification of near surface parameters:

- test period: 2-22 August 2022
+ 30 April-18 May 2023
- 00 UTC run
- Data assimilation (KENDA) + BC IFS-ECMWF
- OBS: all synop stations in Cosmo-2I domain
- METHODS: feedback-file MEC

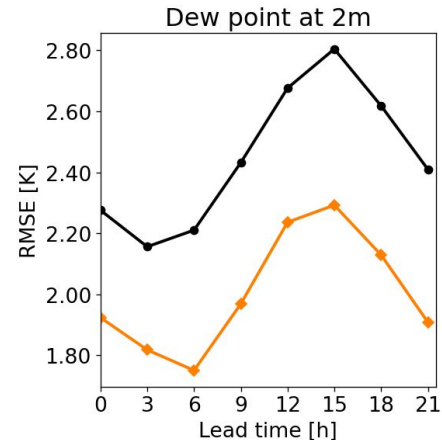
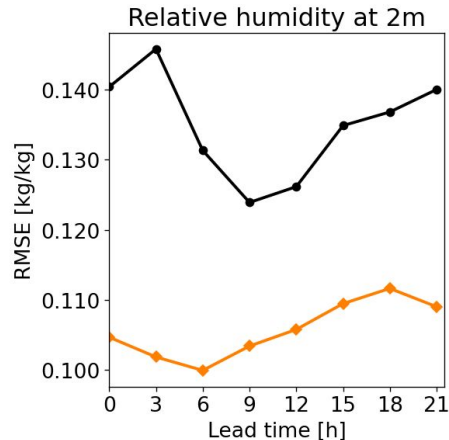
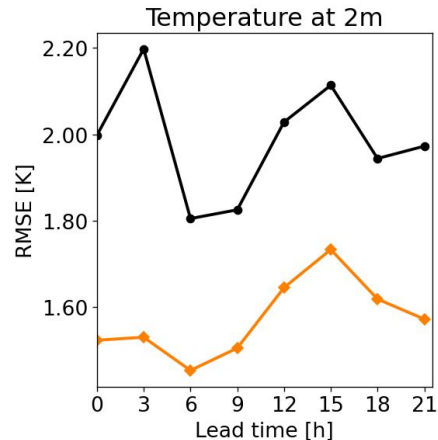
COSMO-2I



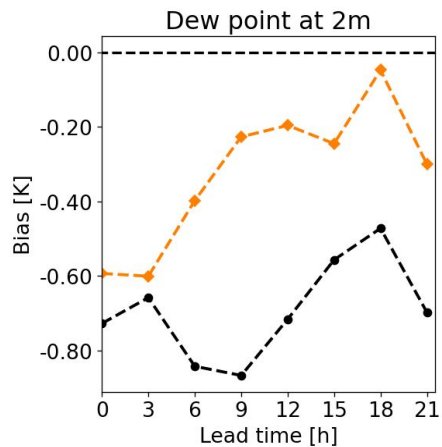
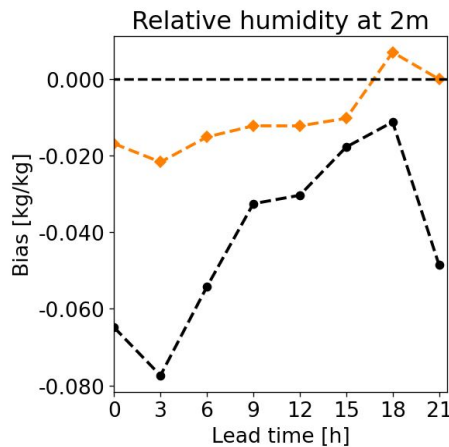
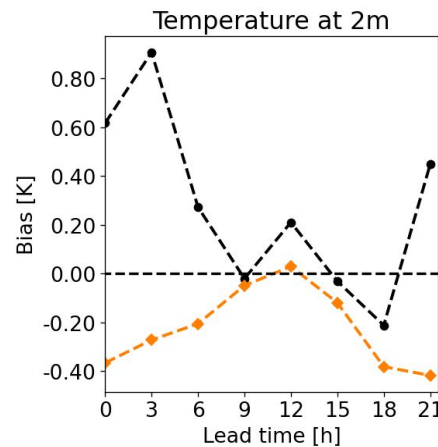
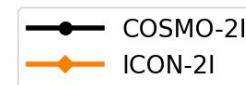
ICON-2I



Near surface variables T,RH,TD

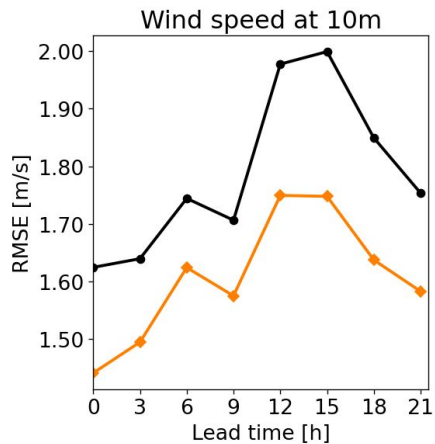
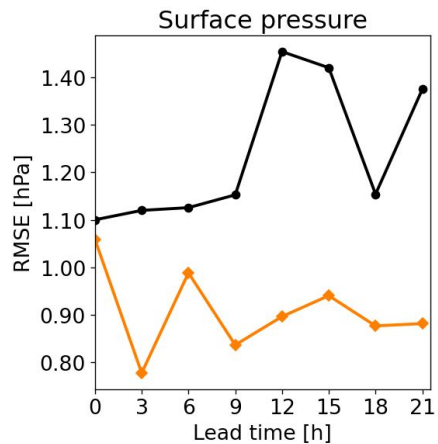


RMSE

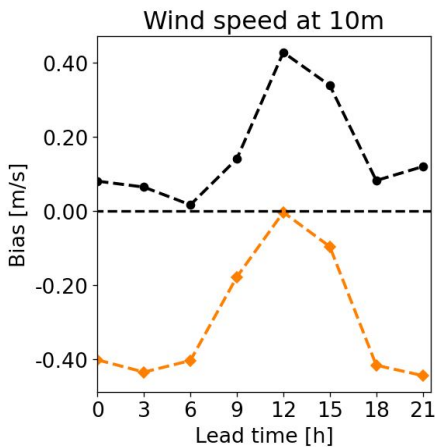
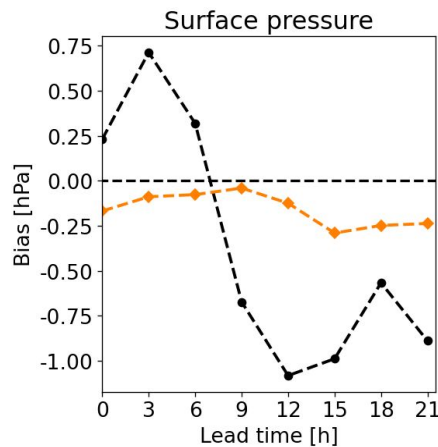


BIAS

Near surface variables: P, WS



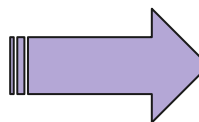
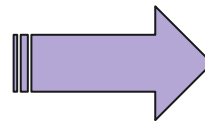
RMSE



BIAS

All scores seem to be improved

- T2m slightly underestimated but better than the systematic overestimation of COSMO-2I during the night (problem for inversion in Po valley)
- Concerning humidity ICON-2I is less dry than COSMO-2I, but still a bit dry
- Surface pressure reduce the diurnal cycle of the error
- Wind speed RMSE is reduced but the intensity is a bit underestimated

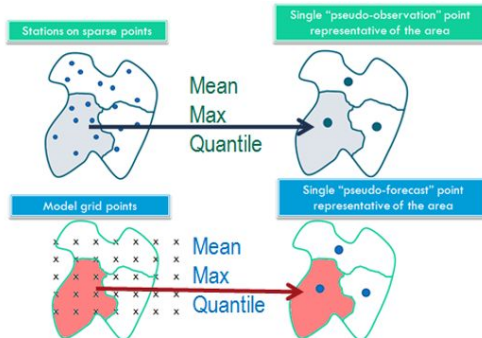


stratification of the observations based on height of the stations (plain, mountain, part of the domain)

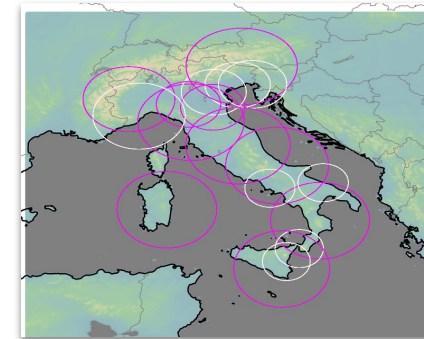
Conditional verification based on wind intensity
(based on the experience with COSMO-2I, wind speed error depends on intensity: low winds are overestimated, high winds are underestimated)

Verification of precipitation

- ICON-2I in comparison with Cosmo-2I, Cosmo-5M and IFS-ECMWF
- period: MAM2023 - JJA2023
- 00 UTC run
- ICON-2I with NO Data Assimilation (ANALYS+BC from IFS-ECMWF)
- OBS:
 - operational: high-density rain-gauges network
 - test: radar adjusted with rain-gauges
- METHODS: DIST (mean -max in the area)

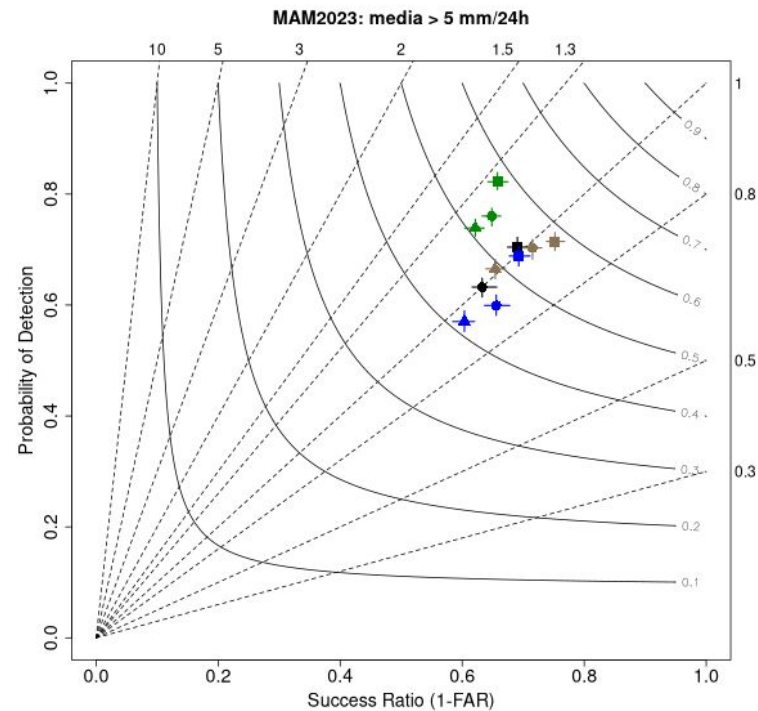
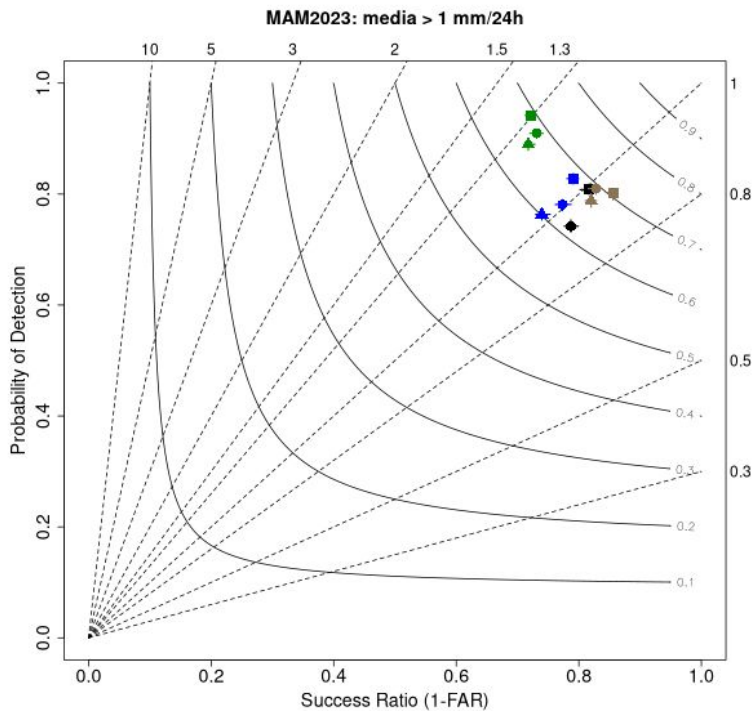


rain gauges

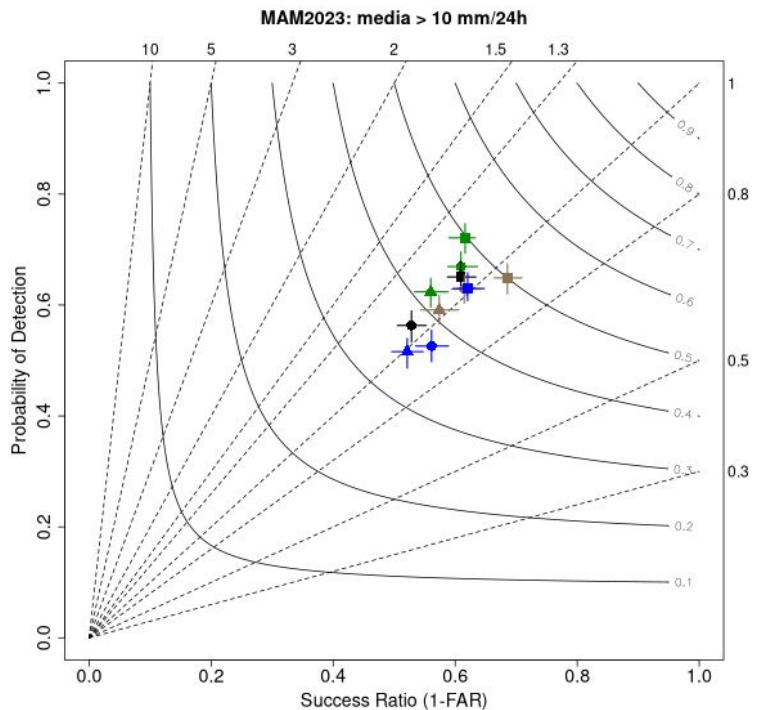


radar

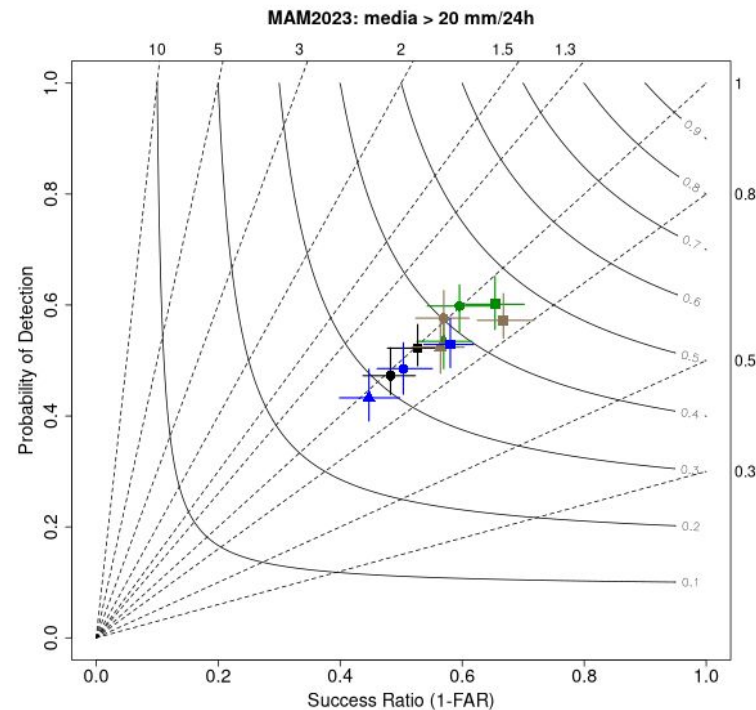
MAM 2023 operational verification - 24 hours accumulation



MAM 2023 operational verification - 24 hours accumulation

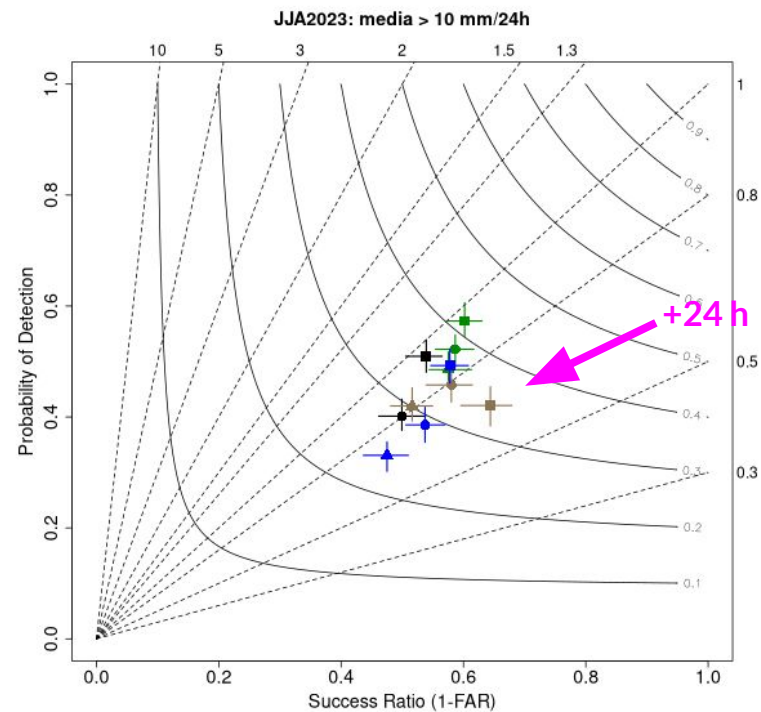
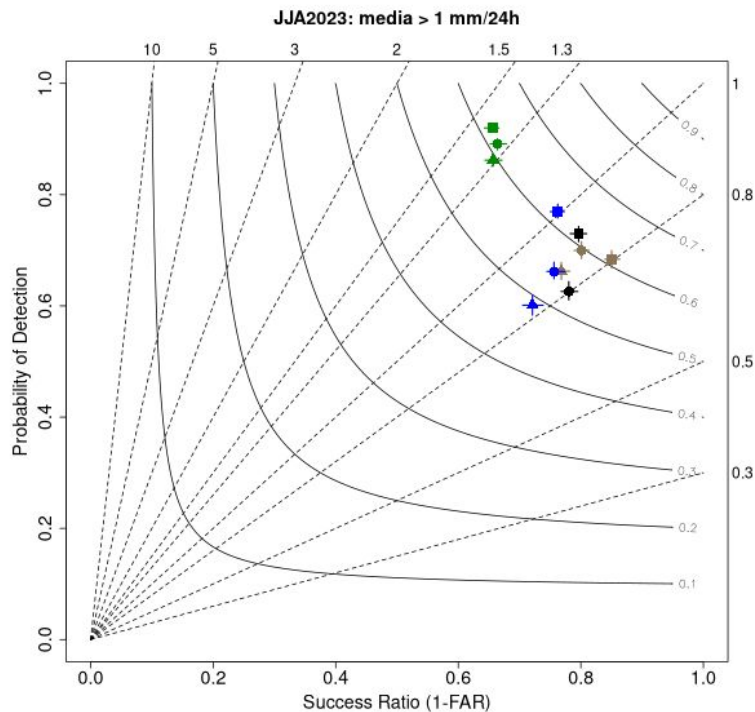


MEAN IN THE AREA > 10 mm/24h

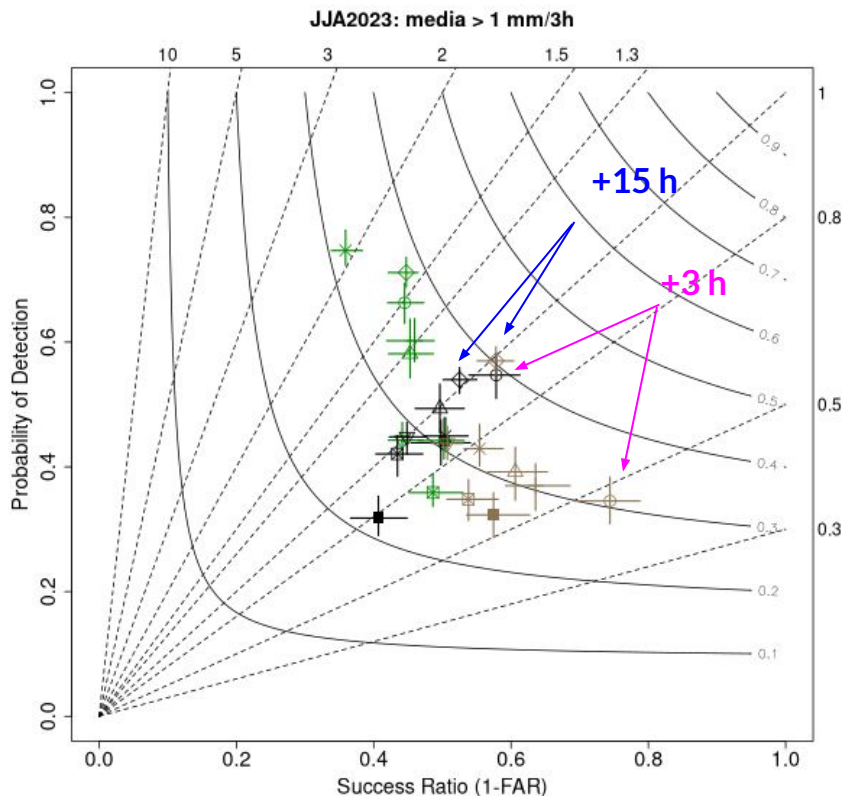


MEAN IN THE AREA > 20 mm/24h

JJA 2023 operational verification - 24 hours accumulation



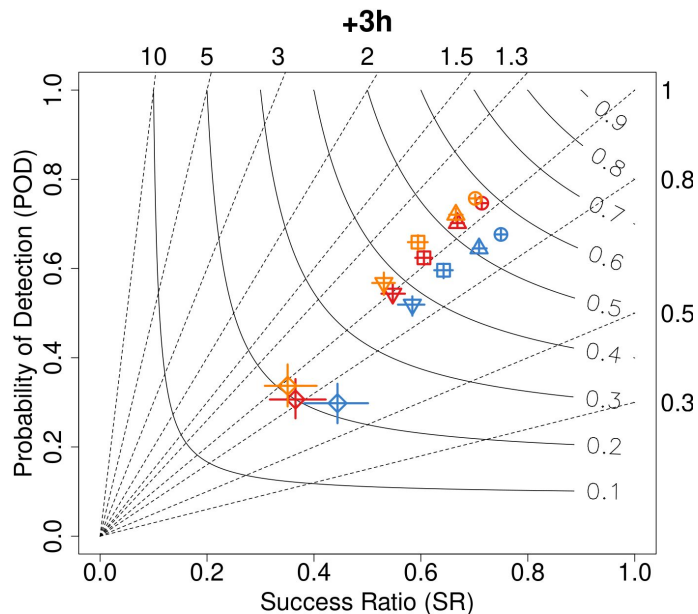
JJA 2023 operational verification - 3 hours accumulation



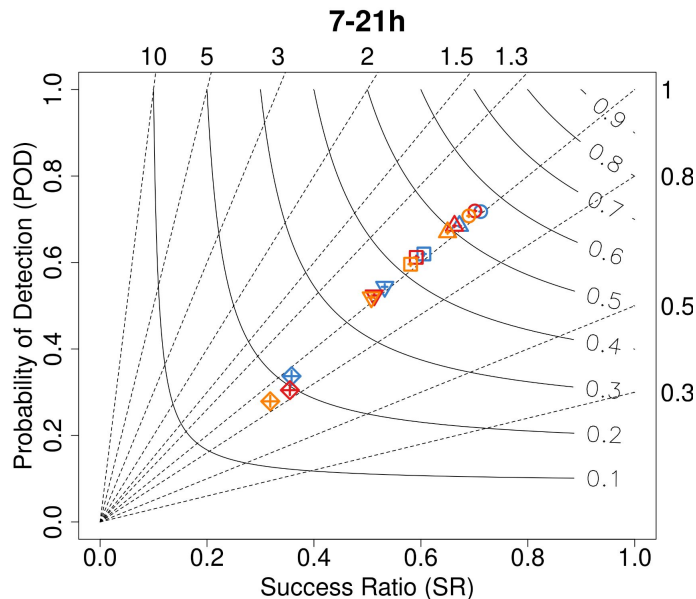
- IFS-ECMWF +3h
- △ IFS-ECMWF +6h
- + IFS-ECMWF +9h
- × IFS-ECMWF +12h
- ◇ IFS-ECMWF +15h
- ▽ IFS-ECMWF +18h
- ⊠ IFS-ECMWF +21h
- IFS-ECMWF +24h
- COSMO-2I +3h
- △ COSMO-2I +6h
- + COSMO-2I +9h
- × COSMO-2I +12h
- ◇ COSMO-2I +15h
- ▽ COSMO-2I +18h
- ⊠ COSMO-2I +21h
- COSMO-2I +24h
- ICON-2I +3h
- △ ICON-2I +6h
- + ICON-2I +9h
- × ICON-2I +12h
- ◇ ICON-2I +15h
- ▽ ICON-2I +18h
- ⊠ ICON-2I +21h
- ICON-2I +24h

MEAN IN THE AREA > 1 mm/3h

TEST ON IMPACT OF DATA ASSIMILATION (may 2023)



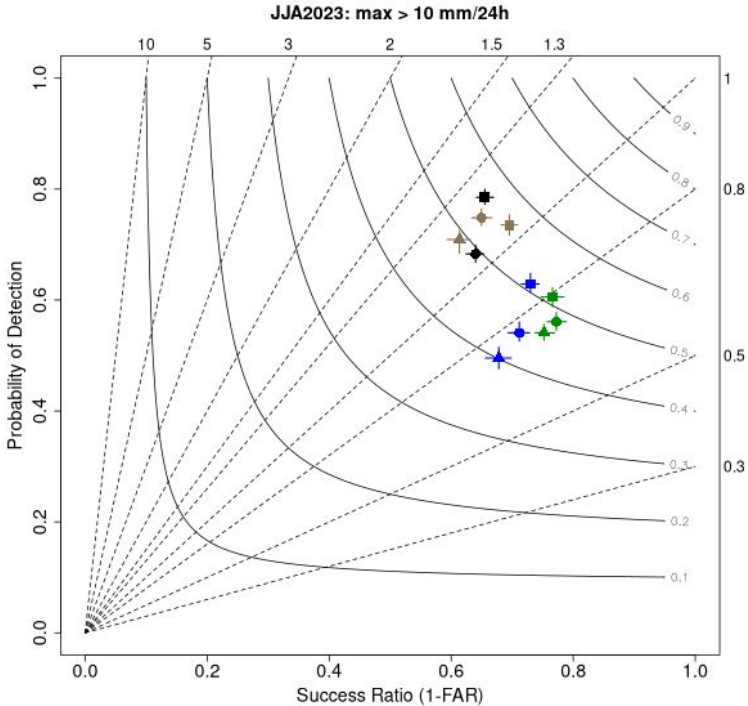
- thr = 0.1 mm
 - △ thr = 0.2 mm
 - thr = 0.5 mm
 - ▽ thr = 1 mm
 - ◇ thr = 3 mm
- nokenda
 - conv
 - conv+LHN



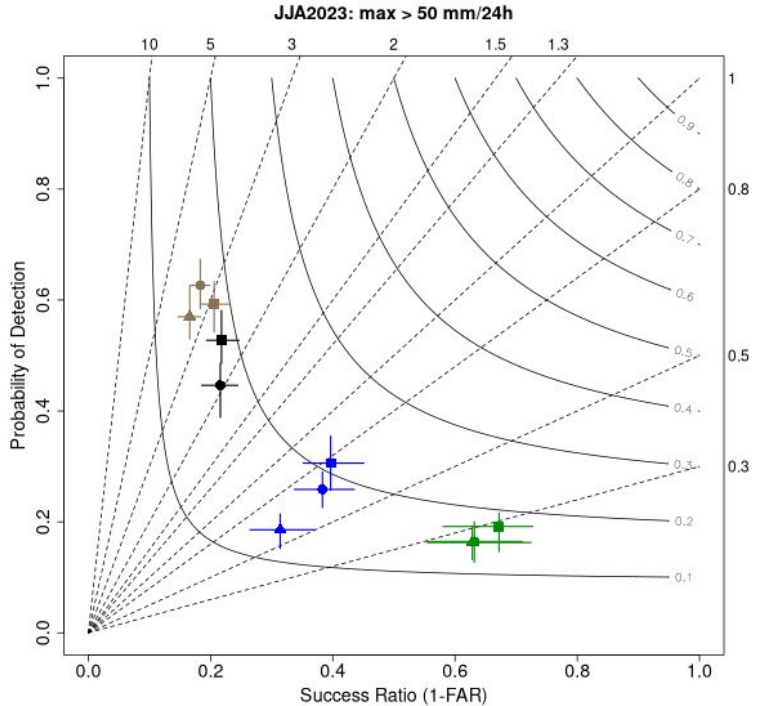
- thr = 0.1 mm
 - △ thr = 0.2 mm
 - thr = 0.5 mm
 - ▽ thr = 1 mm
 - ◇ thr = 3 mm
- nokenda
 - conv
 - conv+LHN

**MEAN IN THE AREA
1 hour
accumulation**

JJA 2023 operational verification - 24 hour accumulation

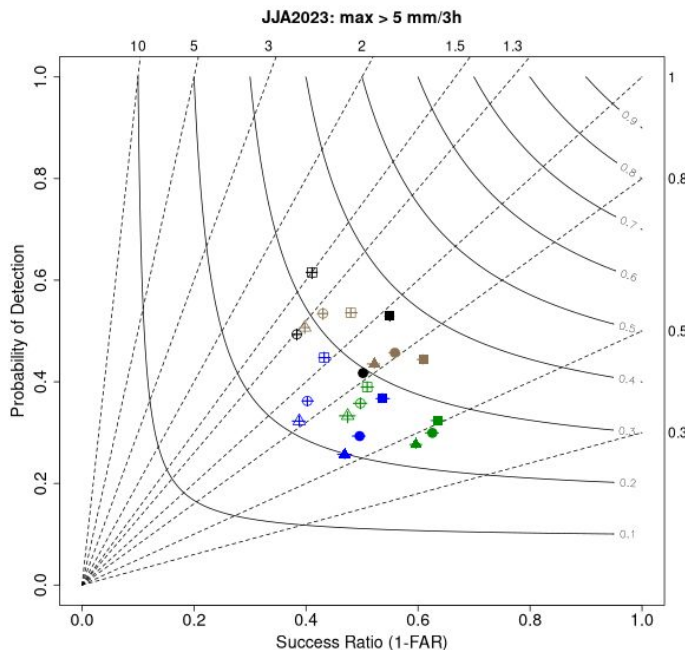


MAX IN THE AREA > 10 mm/24h

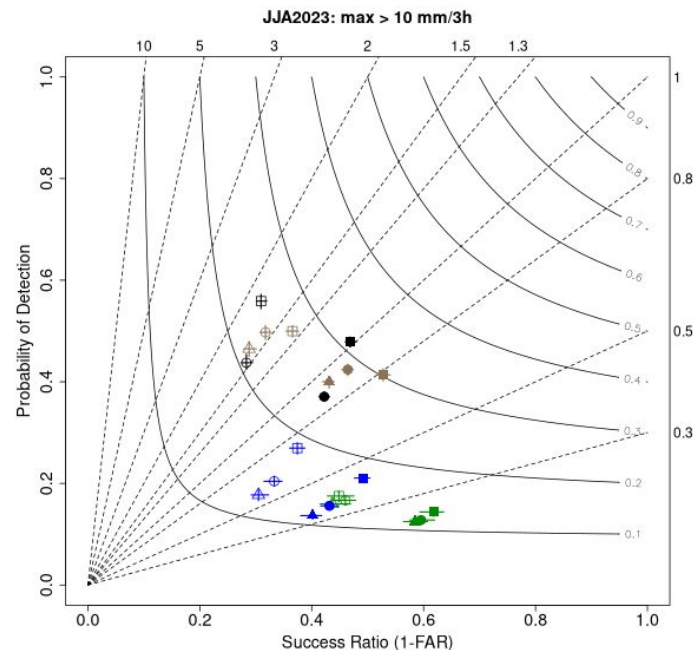


MAX IN THE AREA > 50 mm/24h

JJA 2023 operational verification - 3 hour accumulation (grouped by day) (using raingauges (empty symbols) or radar-adjust with raingauges (filled symbols))



- COSMO-5M D+0 pluvio
- COSMO-5M D+1 pluvio
- △ COSMO-5M D+2 pluvio
- COSMO-2I D+0 pluvio
- COSMO-2I D+1 pluvio
- IFS-ECMWF D+0 pluvio
- IFS-ECMWF D+1 pluvio
- △ IFS-ECMWF D+2 pluvio
- ICON-2I D+0 pluvio
- ICON-2I D+1 pluvio
- △ ICON-2I D+2 pluvio
- COSMO-5M D+0 radar+pluvio
- COSMO-5M D+1 radar+pluvio
- ▲ COSMO-5M D+2 radar+pluvio
- COSMO-2I D+0 radar+pluvio
- COSMO-2I D+1 radar+pluvio
- IFS-ECMWF D+0 radar+pluvio
- IFS-ECMWF D+1 radar+pluvio
- ▲ IFS-ECMWF D+2 radar+pluvio
- ICON-2I D+0 radar+pluvio
- ICON-2I D+1 radar+pluvio
- ▲ ICON-2I D+2 radar+pluvio



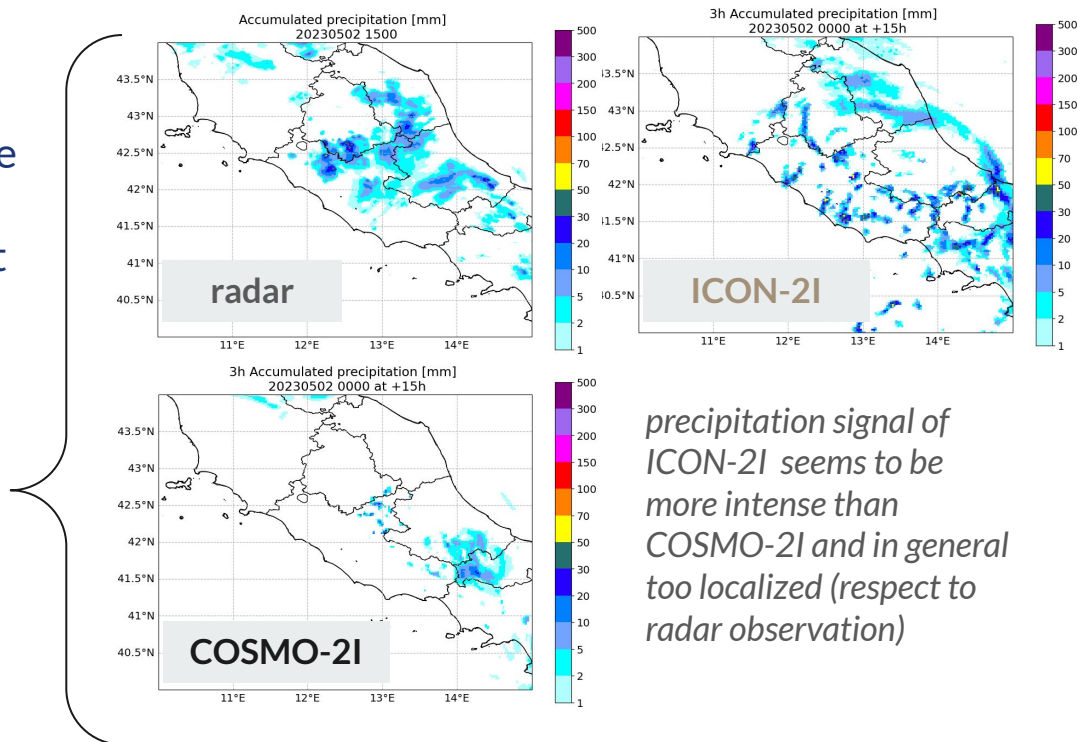
MAX IN THE AREA > 5 mm/3h

MAX IN THE AREA > 20 mm/3h

Precipitation

ICON-2I scores seem to be improved

- Underestimation of precipitation in the first steps of the run with NO DA
- Same behaviour as COSMO-2I respect to different threshold but
 - a bit less False Alarm (higher SR)
 - slightly higher POD
- Underestimation of the number of events as mean in the area during summer
- The use of radar-adj as observed field instead of rain-gauges reduce the number of false alarms for maximum value in the area (for all models) →



importance of the type of observations