ICON-GR (2.5km) Performance

- **MAM Verification over Greek domain (with VERSUS software)**
- **Summer test Case of Precipitation**

TEMPERATURE AT 2M - 00 Run
Stratification : All greek station - Period: MAM 2020
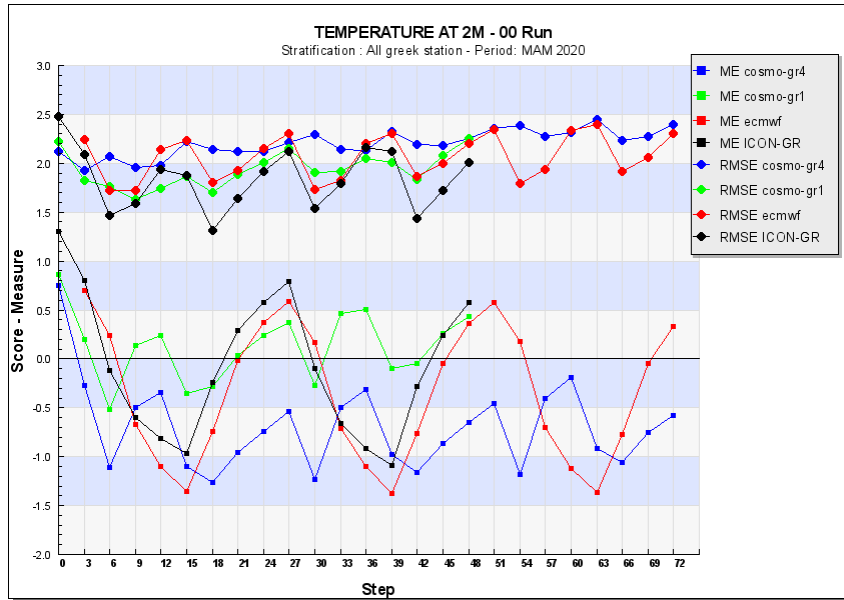
T2m: ICON bias diurnal cycle similar to IFS- slight overestimation night – underestimation noon. ICON RMSE variable with time and lower than COSMO models


DEW POINT TEMPERATURE AT 2M - 00 Run
Stratification : All greek station - Period: MAM 2020
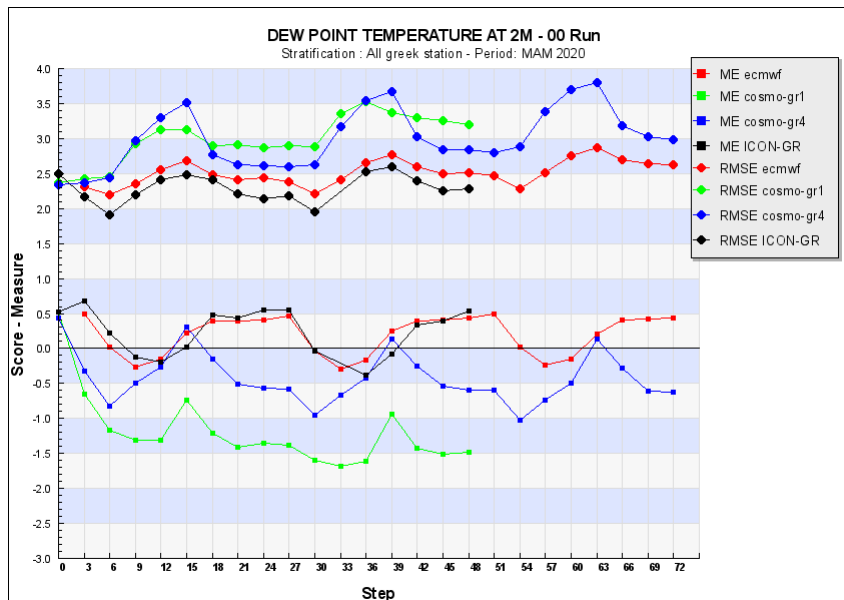
Td2m: Bias diurnal cycle similar to IFS , slight overestimation night – close to zero noon. ICON RMSE lower than COSMO models

ICON
IFS-ECMWF
COSMO4
COSMO1

WIND SPEED AT 10 M - 00 Run
Stratification : All greek station - Period: MAM 2020
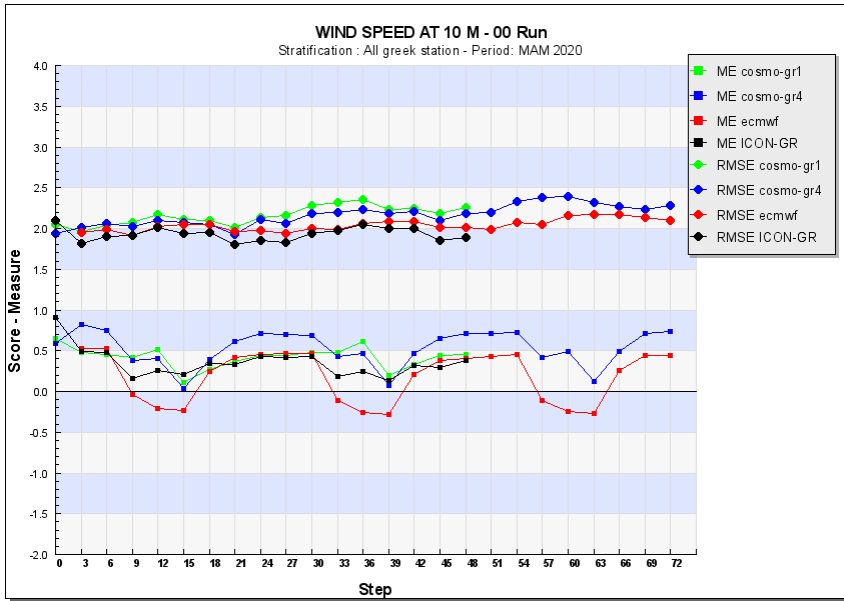
WS 10m (all values): ICON bias similar diurnal cycle with COSMO, slight overestimation especially night.
ICON RMSE lower than other models

WIND SPEED AT 10 M - 00 Run
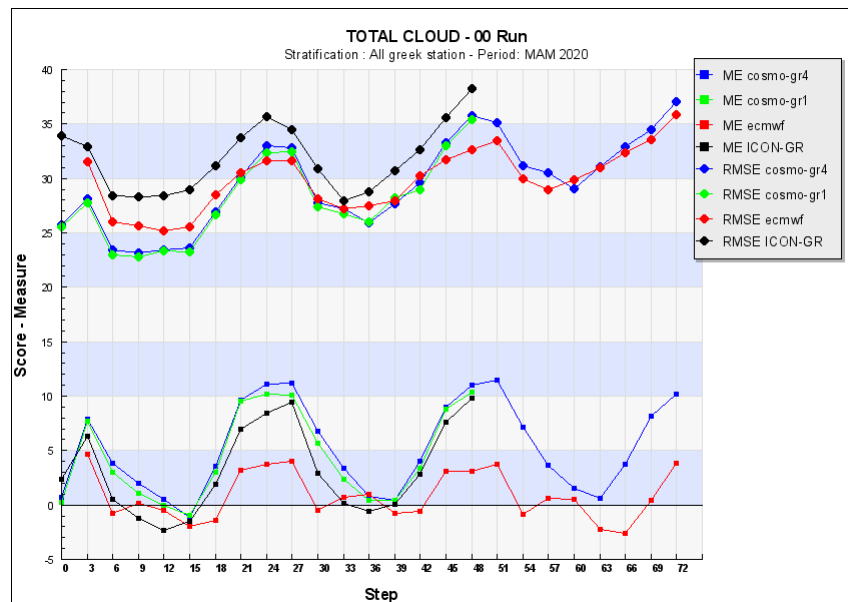Stratification : All greek station - Period: MAM 2020
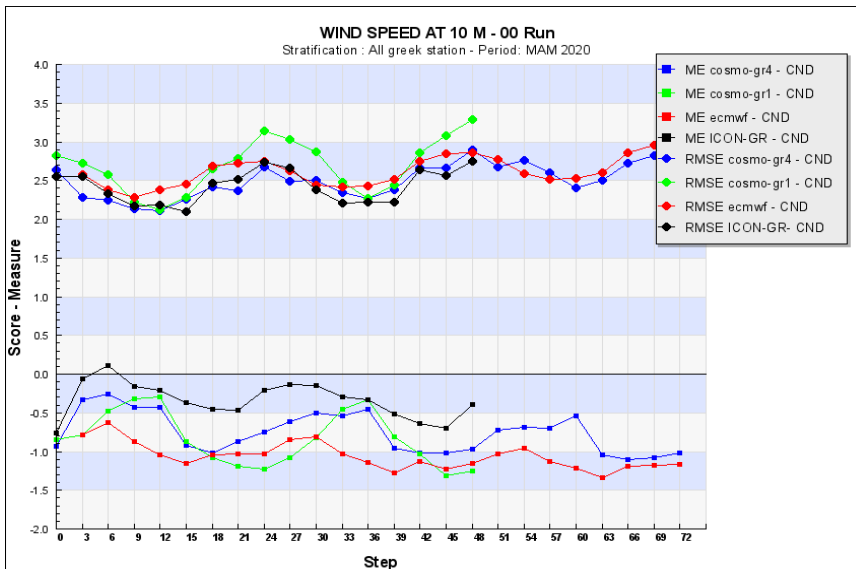
WS 10m (>10kt) : ICON results better than all other models with only slight underestimation at noon

ICON-GR
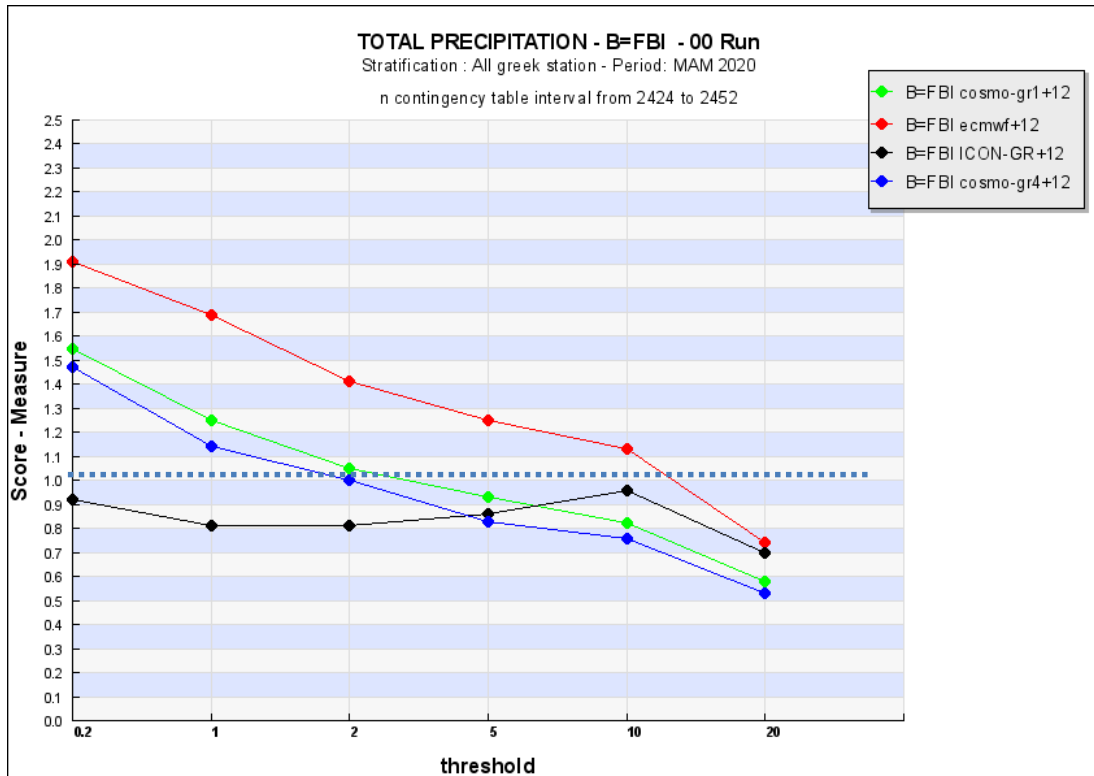**IFS-ECMWF**
COSMO4
COSMO1
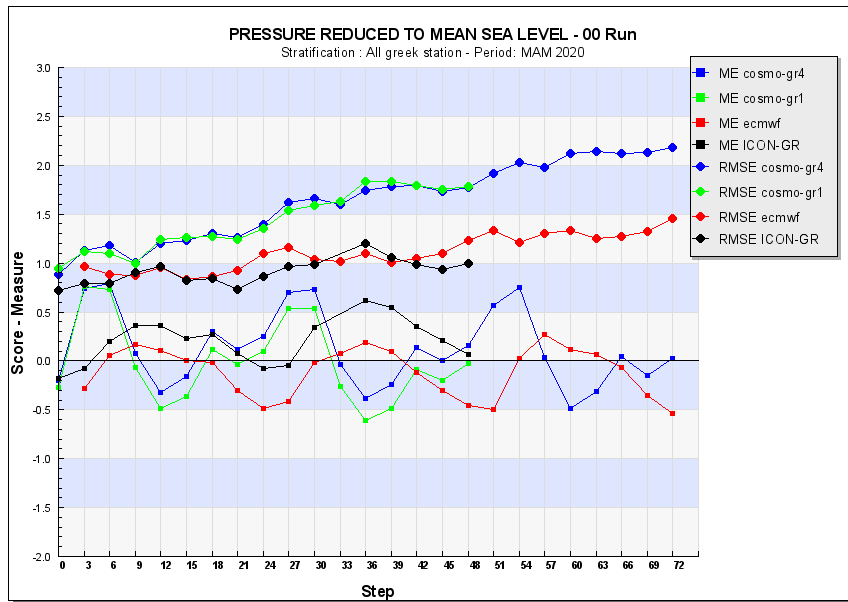
MSLP: ICON Bias Cycle more consistent with IFS-ECMWF. Slight overestimation noon. ICON RMSE lower than COSMO models

TCC: ICON bias similar diurnal cycle with COSMO, with night time overestimation.
RMSE slightly higher than COSMO models

ICON-GR
IFS-ECMWF
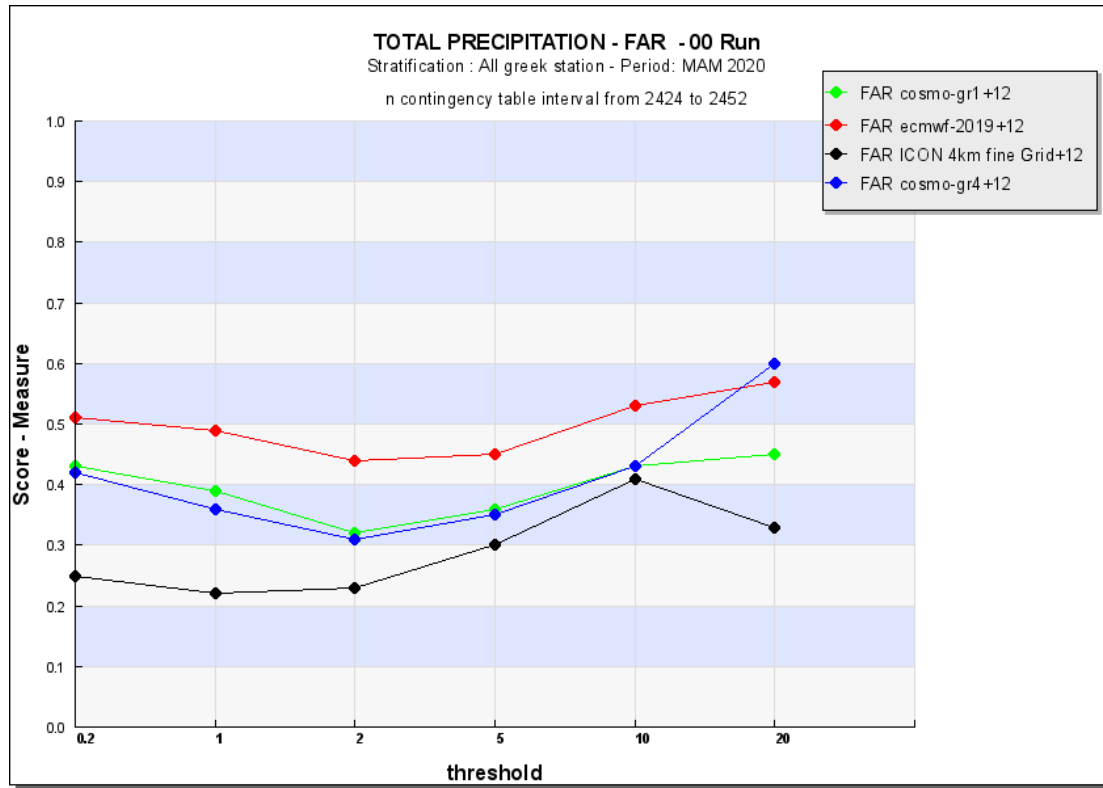**COSMO4**
COSMO1

12h Precipitation (step 12)

TOTAL PRECIPITATION - B=FBI - 00 Run
Stratification : All greek station - Period: MAM 2020

n contingency table interval from 2424 to 2452

Legend:
- B=FBI cosmo-gr1+12
- B=FBI ecmwf+12
- B=FBI ICON-GR+12
- B=FBI cosmo-gr4+12

Thresholds 0.2 to 20mm

Frequency Bias (FBI)
ICON-GR **FBI** satisfactory (slightly less than 1-
number of events slightly underestimated)
Less variability with thresholds

ICON-GR
IFS-ECMWF
COSMO4
COSMO1

12h Precipitation (Step 12)

TOTAL PRECIPITATION - FAR - 00 Run
Stratification : All greek station - Period: MAM 2020
n contingency table interval from 2424 to 2452

Legend:
- FAR cosmo-gr1 +12
- FAR ecmwf-2019 +12
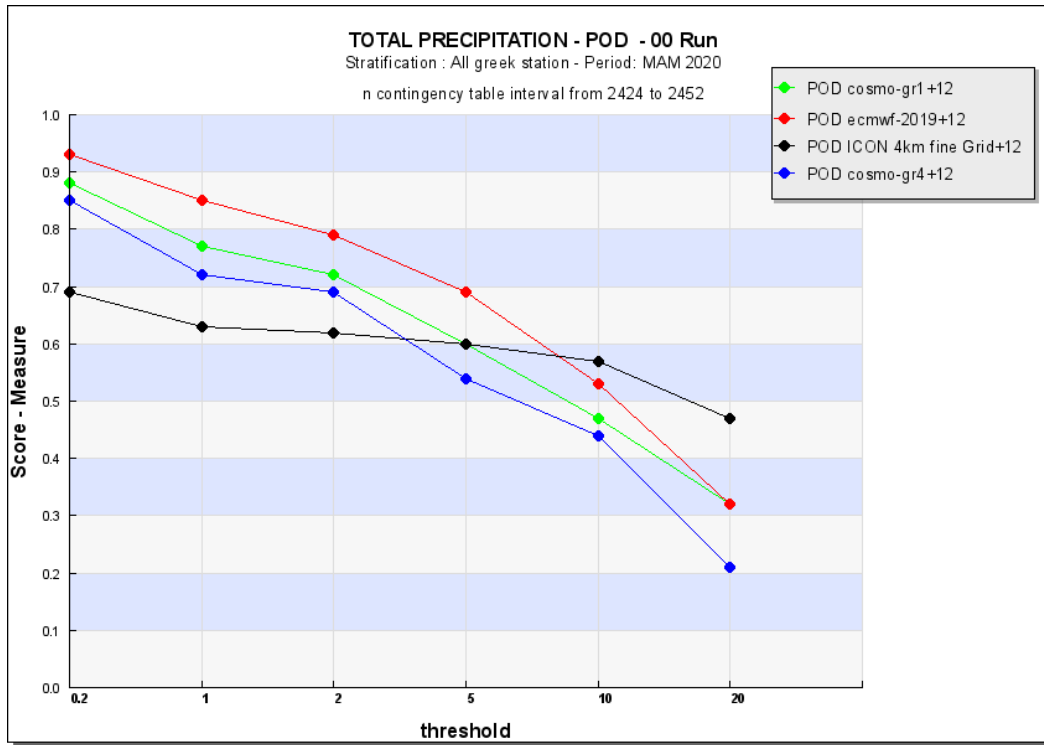- FAR ICON 4km fine Grid+12
- FAR cosmo-gr4 +12

Thresholds 0.2 to 20mm

False Alarm Rate (FAR): ICON-GR
FAR lower than other models->
Less false alarms-slightly increases
with threshold

ICON-GR
IFS-ECMWF
COSMO4
COSMO1

12h Precipitation (Step 12)

TOTAL PRECIPITATION - POD - 00 Run
Stratification : All greek station - Period: MAM 2020

n contingency table interval from 2424 to 2452

- POD cosmo-gr1 +12
- POD ecmwf-2019+12
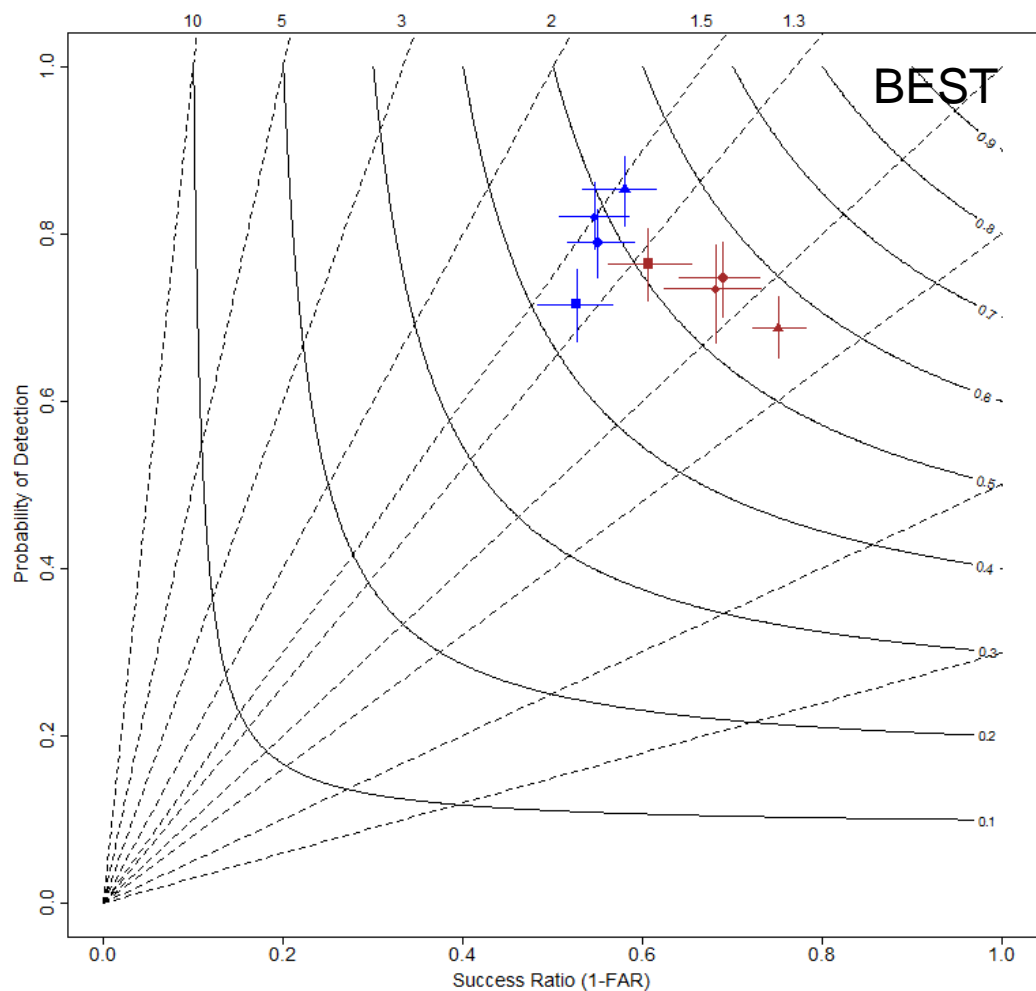- POD ICON 4km fine Grid+12
- POD cosmo-gr4 +12

Thresholds 0.2 to 20mm
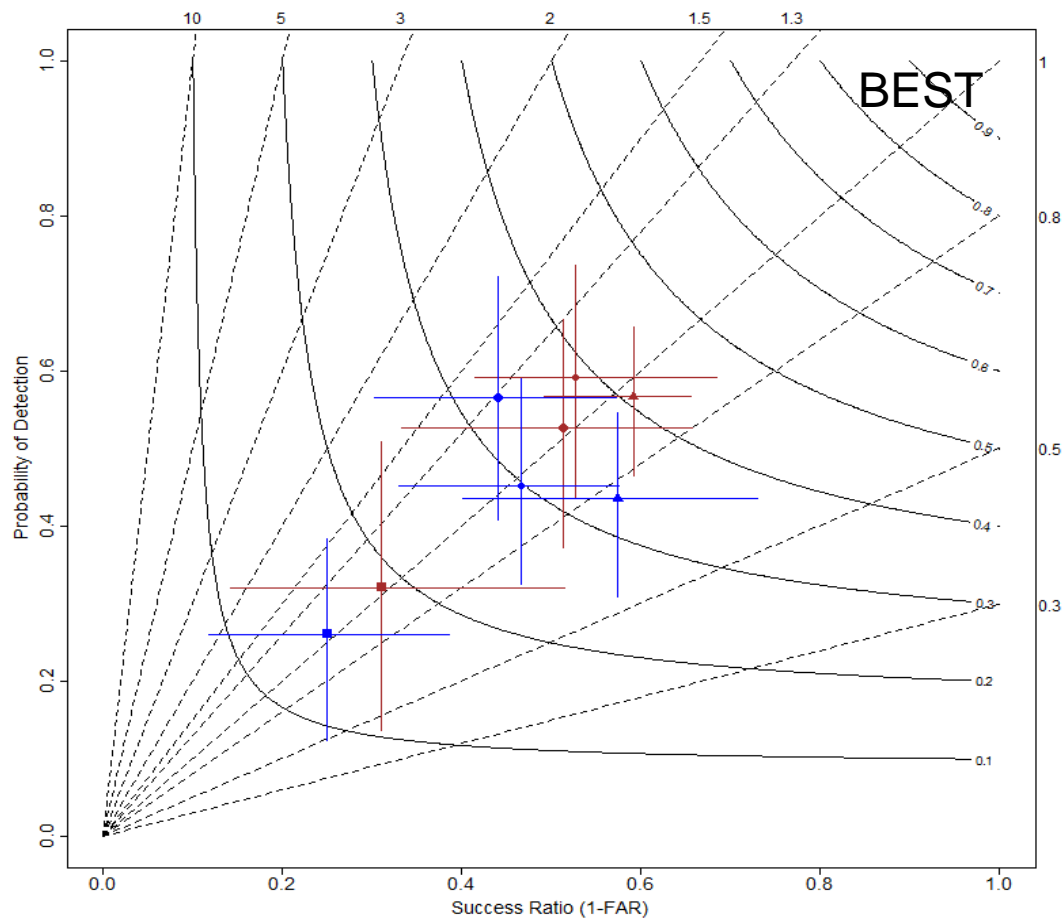
ICON-GR
IFS-ECMWF
COSMO4
COSMO1

Probability of Detection (POD)
ICON-GR worse than COSMO for
low thresholds- better for higher

Performance Diagram
0.2mm MAM 2020 (12h)

Forecast quality worsens for COSMO4 with forecast time,
 relatively constant for ICON-GR (1-FAR decreases- more false
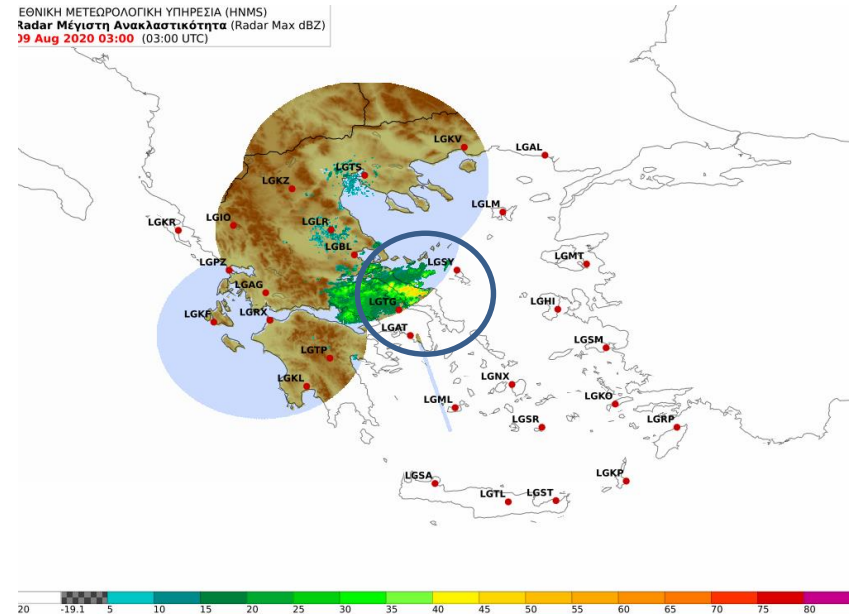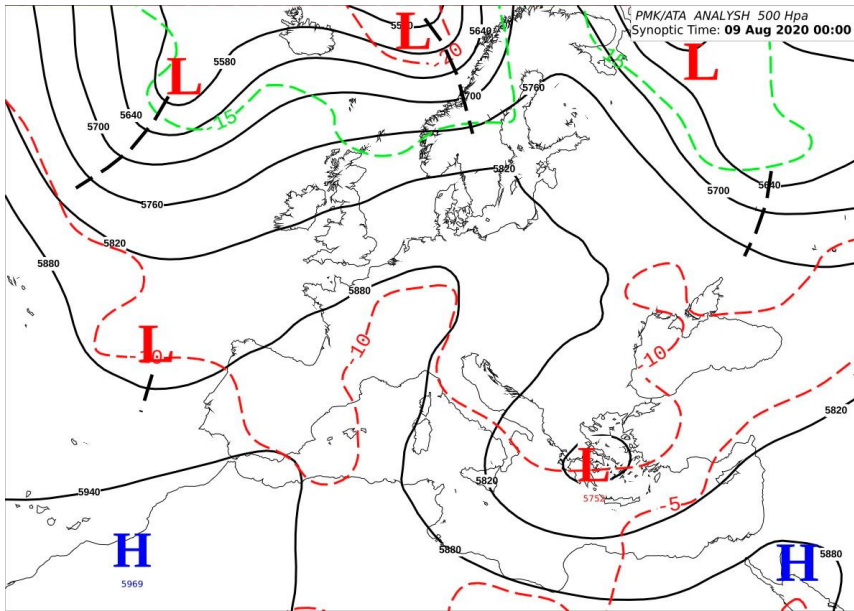alarms with forecast time)

Performance Diagram
10mm MAM 2020 (12h)

FORECAST DAY 1
▲ ICON-GR + 12
● ICON-GR + 24
♦ ICON-GR + 36
■ ICON-GR + 48
▲ COSMO-4 + 12
● COSMO-4 + 24
♦ COSMO-4 + 36
■ COSMO-4 + 48

For higher thresholds, ICON-GR performs better then COSMO-4

An example
of high
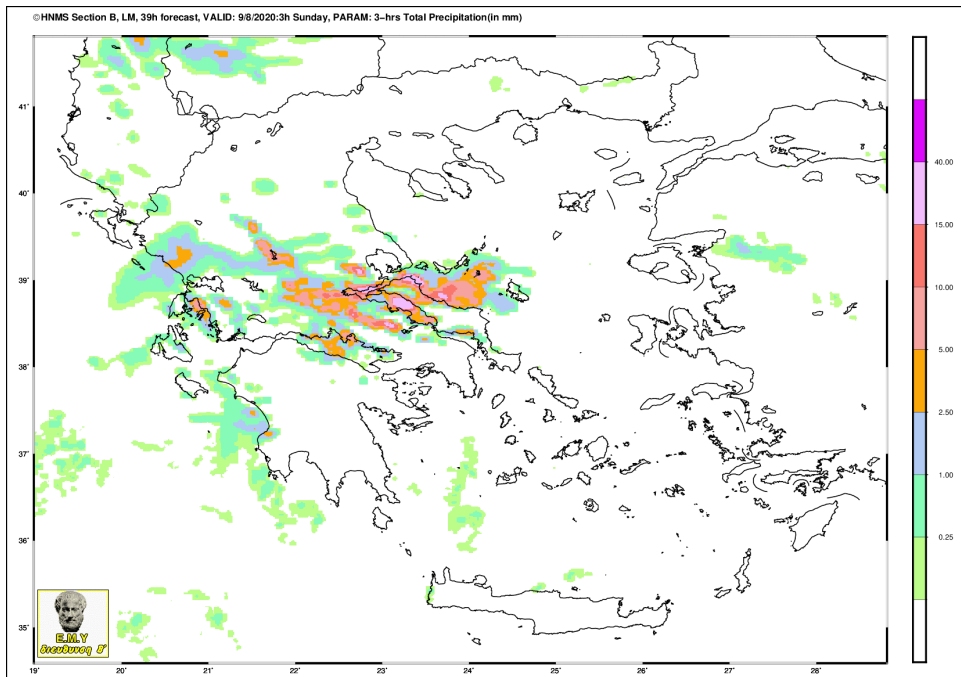values of
Precipitation

8-9 August 2020

**Trough and
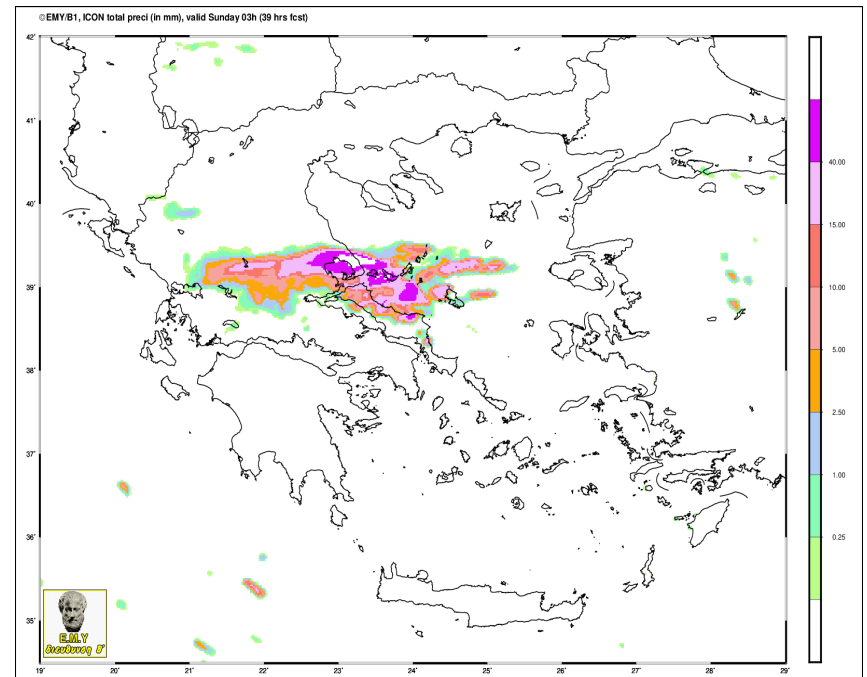cold air after
warm days
Flooding over
Evia island**

9/8/2020 0300 UTC **39** hours of simulation

3h precipitation: ICON shows more precipitation than COSMO4

COSMO4

ICON-GR

9/8/2020 0300 UTC **27** hours of simulation

3h precipitation >100mm ICON forecast better over Evia island

COSMO4

ICON-GR

>100mm