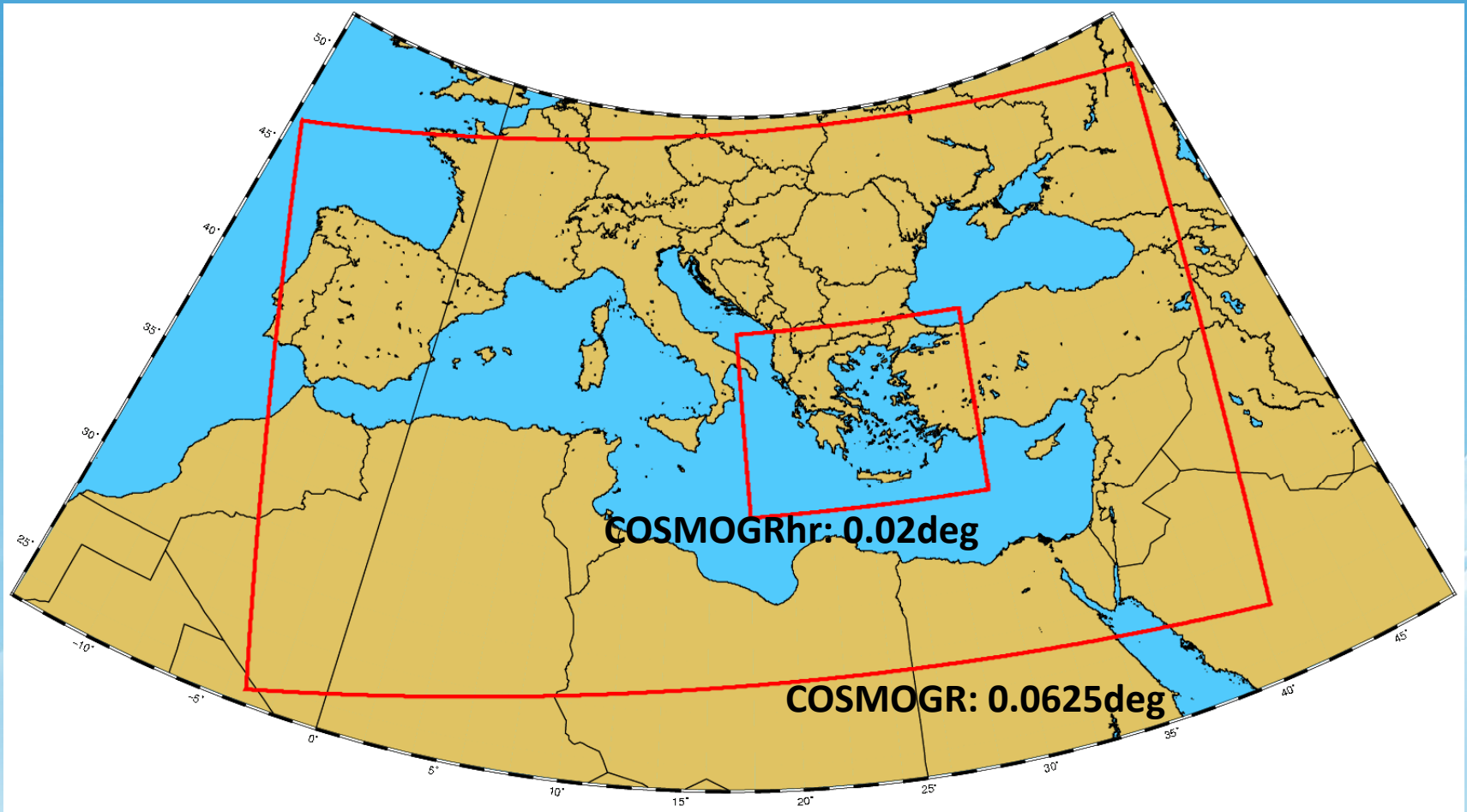
Stratified Verification applied to COSMOGR

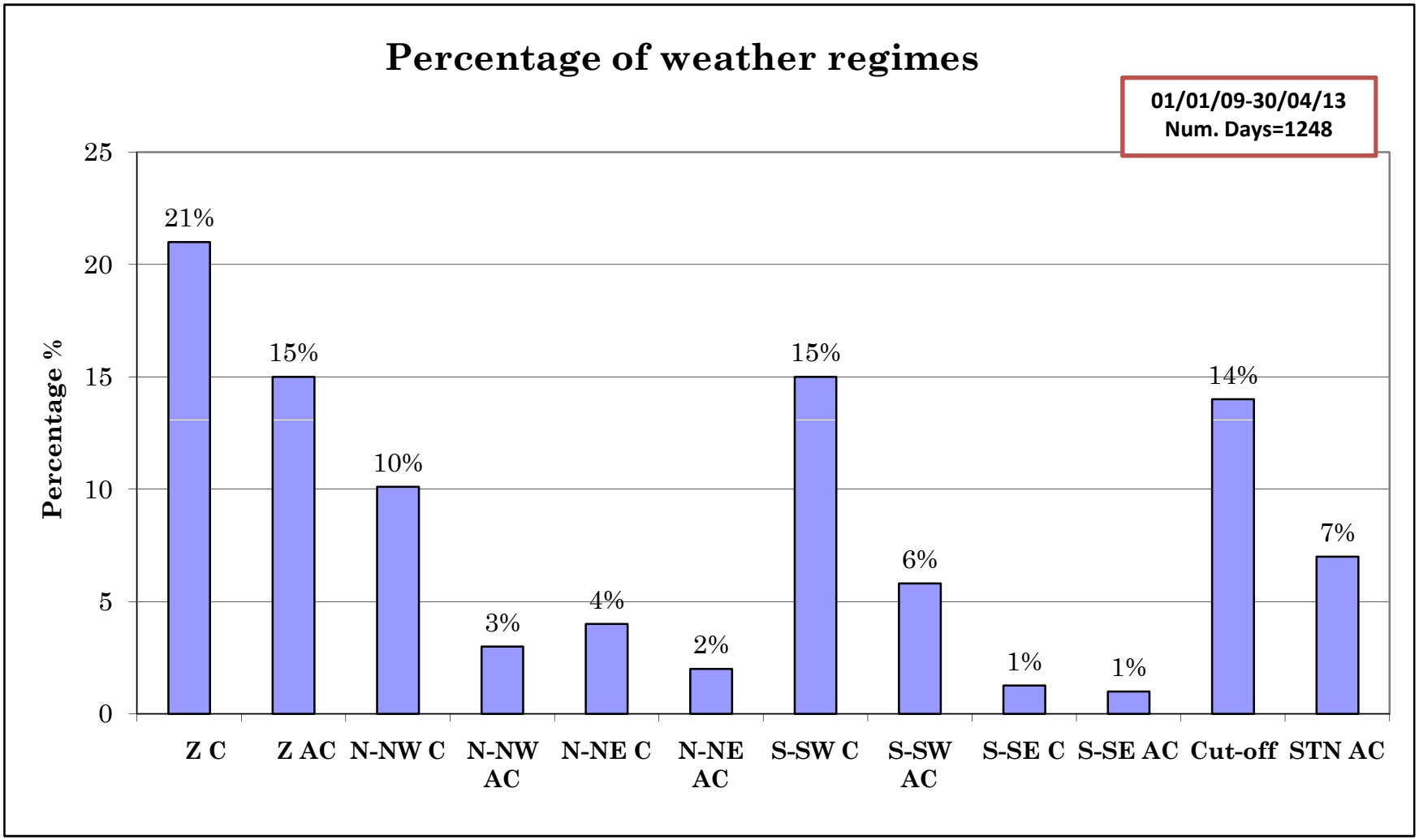
Flora Gofa

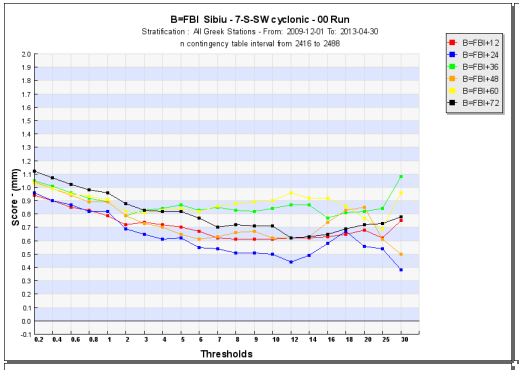
ΕΘΝΙΚΗ
ΜΕΤΕΩΡΟΛΟΓΙΚΗ
ΥΠΗΡΕΣΙΑ
HELLENIC NATIONAL METEOROLOGICAL SERVICE

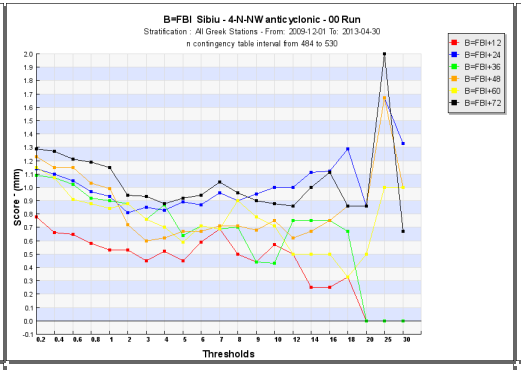
WG5 Parallel Session, COSMO GM, Sibiu 2013



COSMOGR Grid Area


Percentage of weather regimes
01/01/09-30/04/13
Num. Days=1248
Percentage %
25
20
15
10
5
0
21%
15%
10%
3%
4%
2%
15%
6%
1%
1%
14%
7%
Z C
Z AC
N-NW C
N-NW AC
N-NE C
N-NE AC
S-SW C
S-SW AC
S-SE C
S-SE AC
Cut-off
STN AC


B=FBI Sibiu - 7-S-SW cyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 2416 to 2488
B=FBI+12
B=FBI+24
B=FBI+36
B=FBI+48
B=FBI+60
B=FBI+72
Score - (mm)
Thresholds


B=FBI Sibiu - 4-N-NW anticyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 484 to 530
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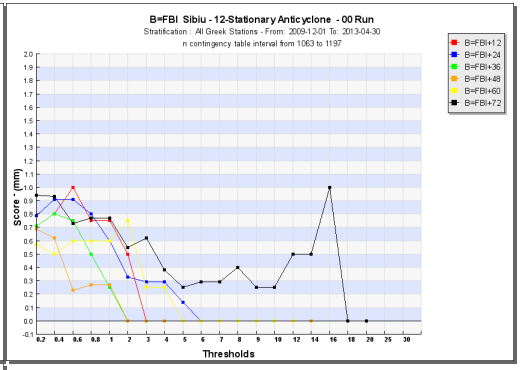
B=FBI+24
B=FBI+36
B=FBI+48
B=FBI+60
B=FBI+72
Score - (mm)
Thresholds


B=FBI Sibiu - 12-Stationary Anticyclone - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 1063 to 1197
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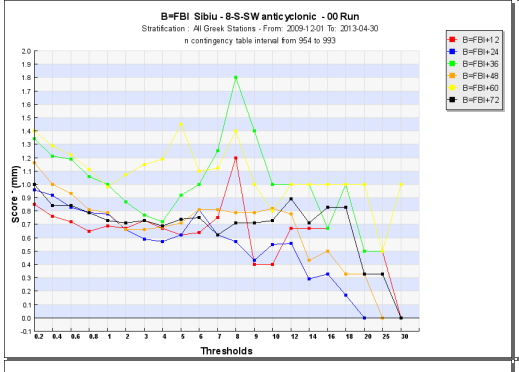
B=FBI+24
B=FBI+36
B=FBI+48
B=FBI+60
B=FBI+72
Score - (mm)
Thresholds


B=FBI Sibiu - 8-S-SW anticyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 954 to 993
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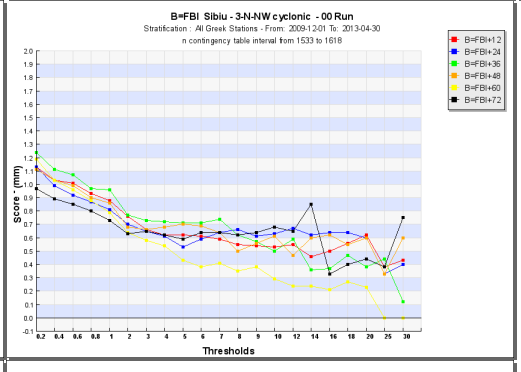
B=FBI+48
B=FBI+60
B=FBI+72
Score - (mm)
Thresholds


B=FBI Sibiu - 3-N-NW cyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 1533 to 1618
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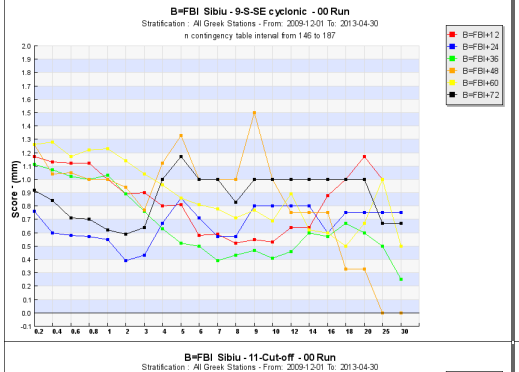
B=FBI+24
B=FBI+36
B=FBI+48
B=FBI+60
B=FBI+72
Score - (mm)
Thresholds


B=FBI Sibiu - 9-S-SE cyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 146 to 187
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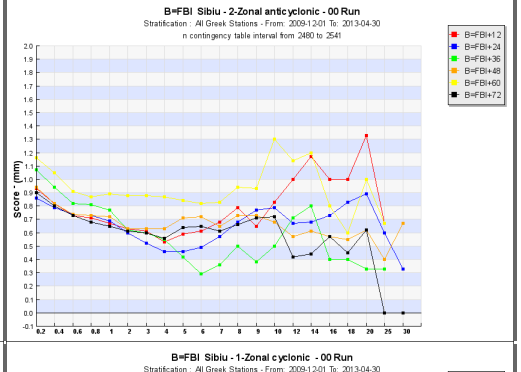
B=FBI+24
B=FBI+36
B=FBI+48
B=FBI+60
B=FBI+72
Score - (mm)
Thresholds


B=FBI Sibiu - 2-Zonal anticyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 2480 to 2541
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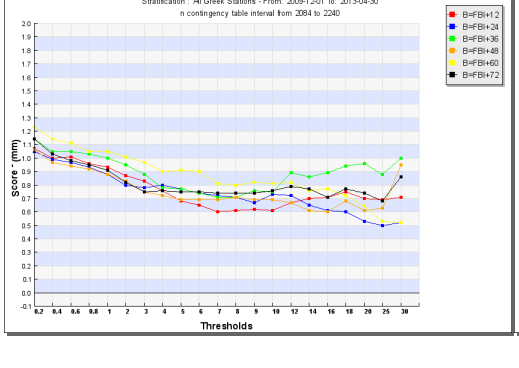
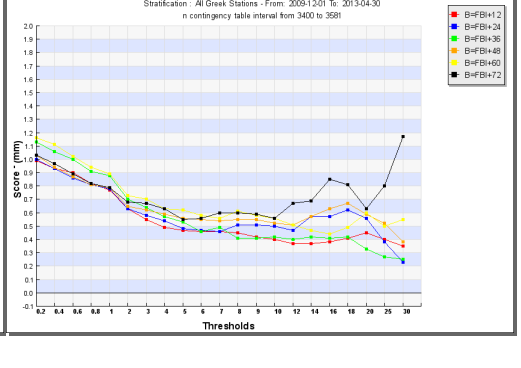
B=FBI+24
B=FBI+36
B=FBI+48
B=FBI+60
B=FBI+72
Score - (mm)
Thresholds


B=FBI Sibiu - 11-Cut-off - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 2084 to 2240
B=FBI+12
B=FBI+24
B=FBI+36
B=FBI+48
B=FBI+60
B=FBI+72
Score - (mm)
Thresholds


B=FBI Sibiu - 1-Zonal cyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 3400 to 3581
B=FBI+12
B=FBI+24
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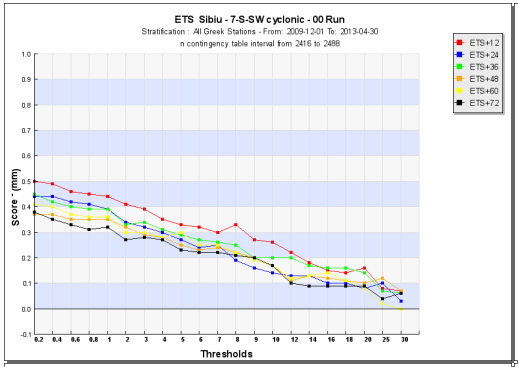
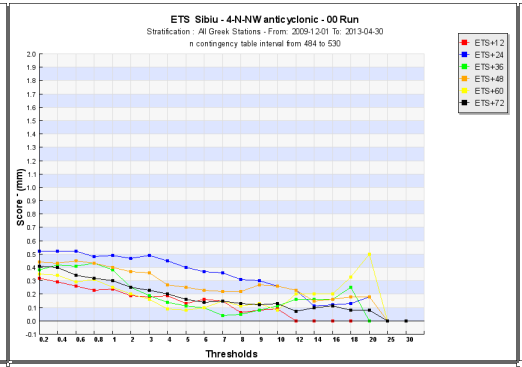
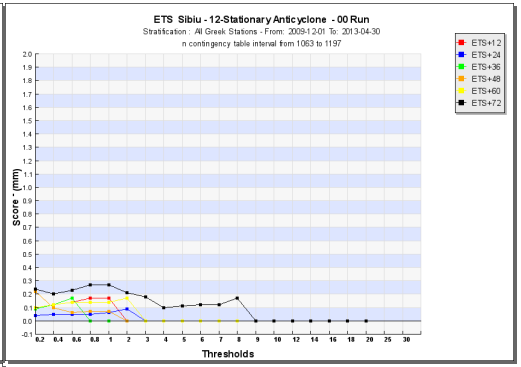
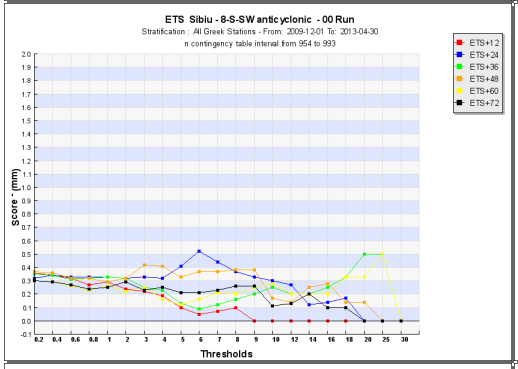
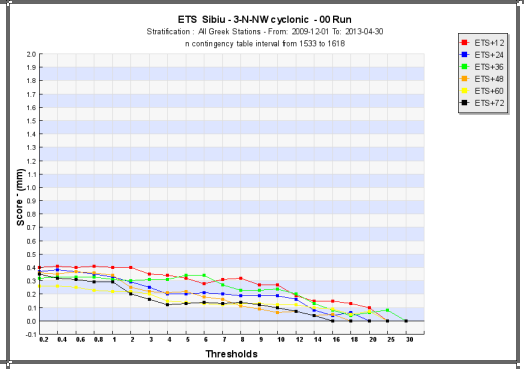
B=FBI+48
B=FBI+60
B=FBI+72
Score - (mm)
Thresholds


ETS Sibiu - 7-S-SW cyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 2416 to 2498
ETS+12
ETS+24
ETS+36
ETS+48
ETS+60
ETS+72
Score - (mm)
Thresholds


ETS Sibiu - 4-N-NW anticyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 484 to 530
ETS+12
ETS+24
ETS+36
ETS+48
ETS+60
ETS+72
Score - (mm)
Thresholds


ETS Sibiu - 12-Stationary Anticyclone - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 1063 to 1197
ETS+12
ETS+24
ETS+36
ETS+48
ETS+60
ETS+72
Score - (mm)
Thresholds


ETS Sibiu - 8-S-SW anticyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 954 to 993
ETS+12
ETS+24
ETS+36
ETS+48
ETS+60
ETS+72
Score - (mm)
Thresholds


ETS Sibiu - 3-N-NW cyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 1533 to 1618
ETS+12
ETS+24
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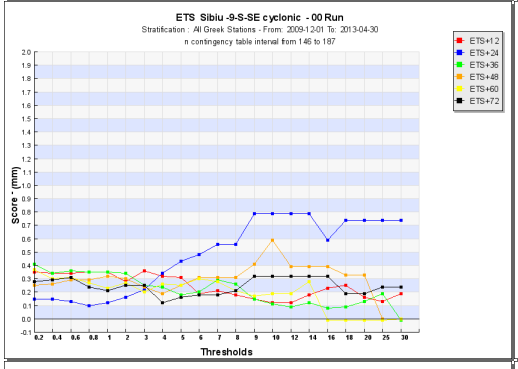
ETS+48
ETS+60
ETS+72
Score - (mm)
Thresholds


ETS Sibiu -9-S-SE cyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 146 to 187
ETS+12
ETS+24
ETS+36
ETS+48
ETS+60
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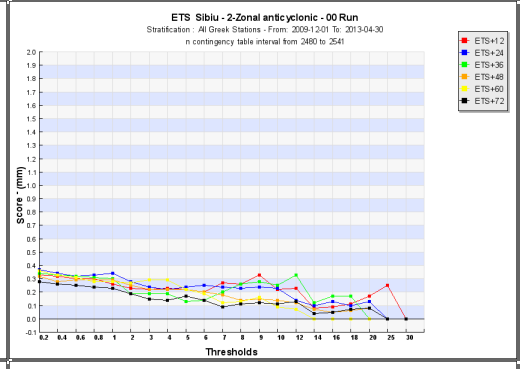
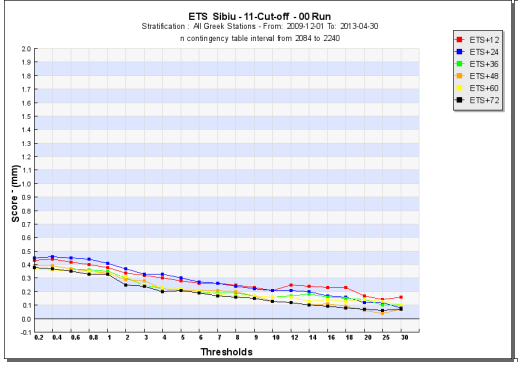
Score - (mm)
Thresholds


ETS Sibiu - 2-Zonal anticyclonic - 00 Run
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 2480 to 2541
ETS+12
ETS+24
ETS+36
ETS+48
ETS+60
ETS+72
Score - (mm)
Thresholds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Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 2084 to 2240
ETS+12
ETS+24
ETS+36
ETS+48
ETS+60
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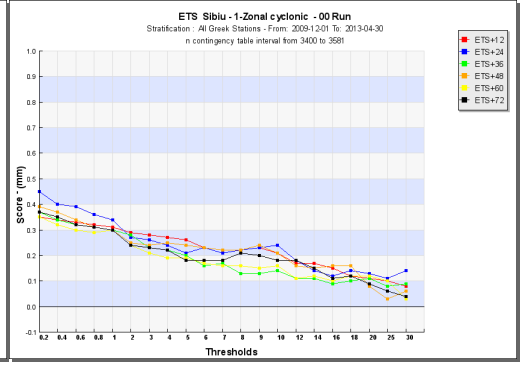
Score - (mm)
Thresholds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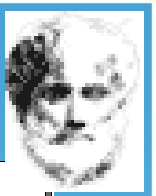
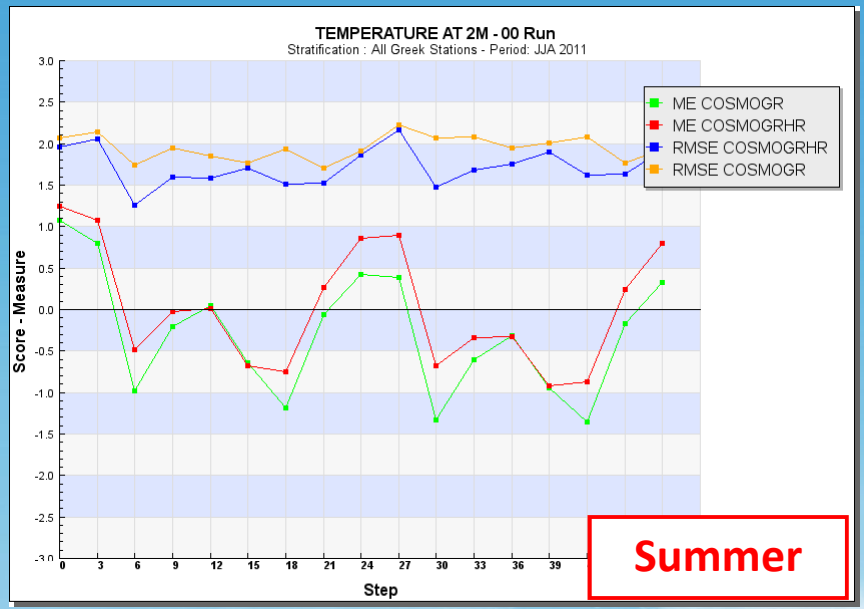
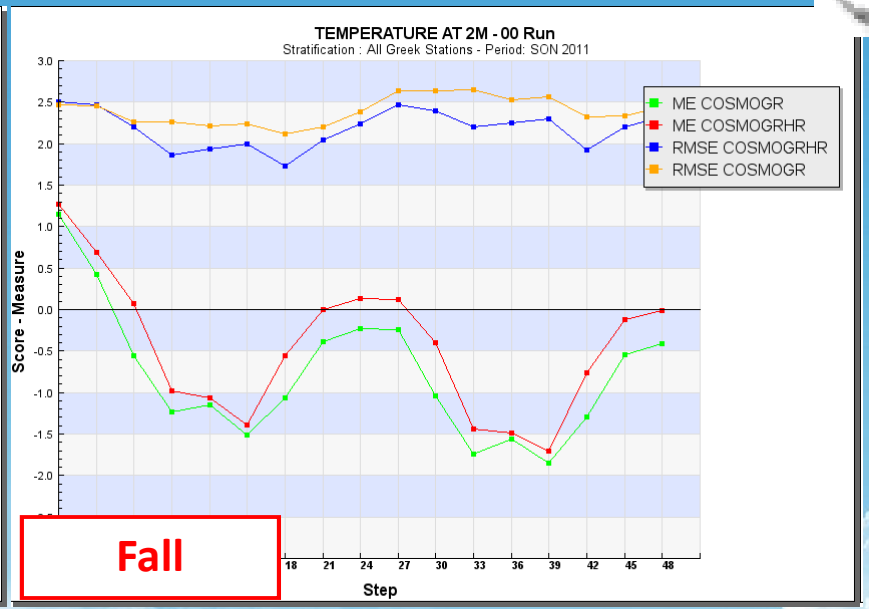
Stratification : All Greek Stations - From: 2009-12-01 To: 2013-04-30
n contingency table interval from 3400 to 3581
ETS+12
ETS+24
ETS+36
ETS+48
ETS+60
ETS+72
Score - (mm)
Thresholds

Temp 2m - 7km vs 3km

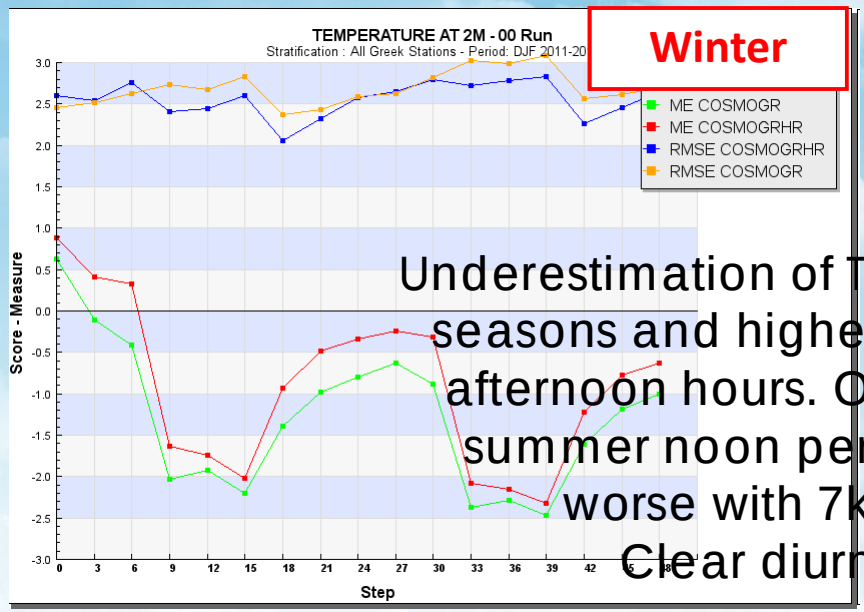




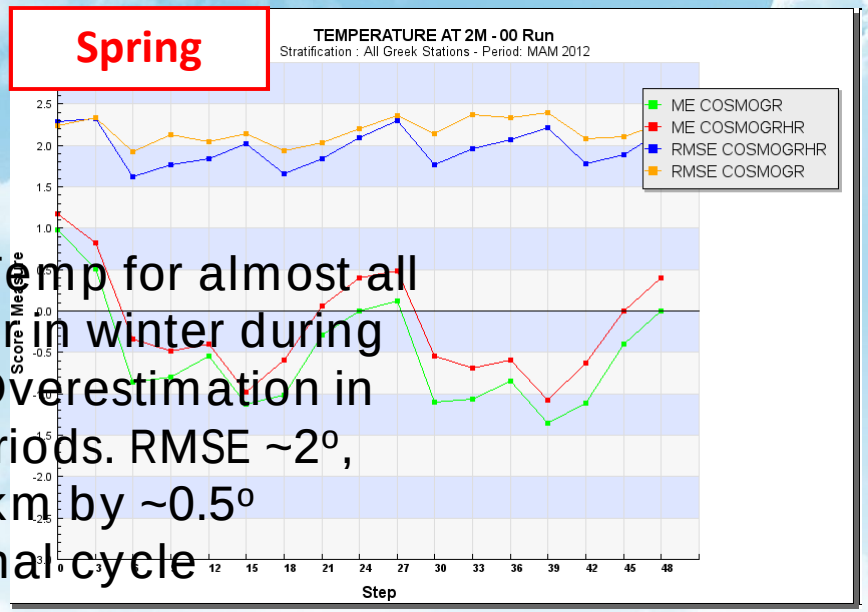
Summer



Fall



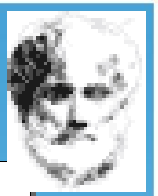
Winter

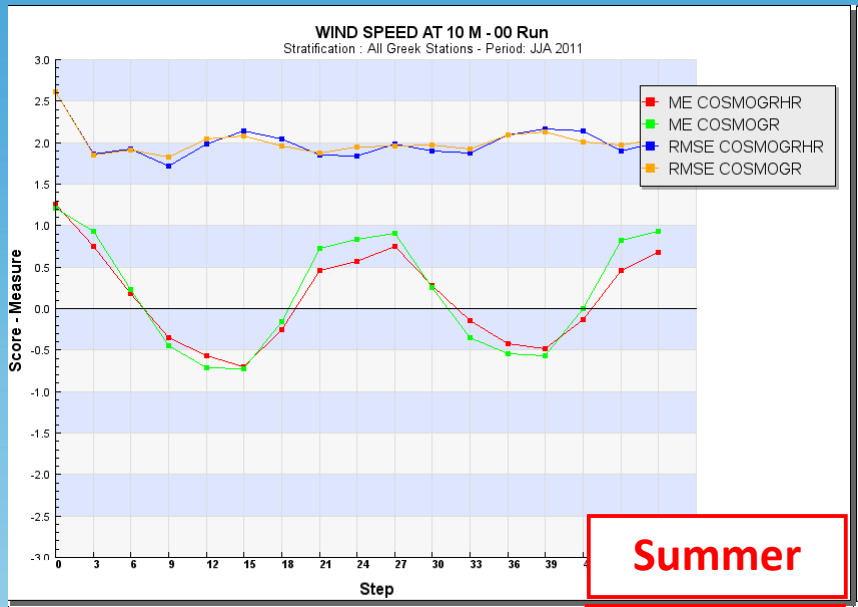


Spring

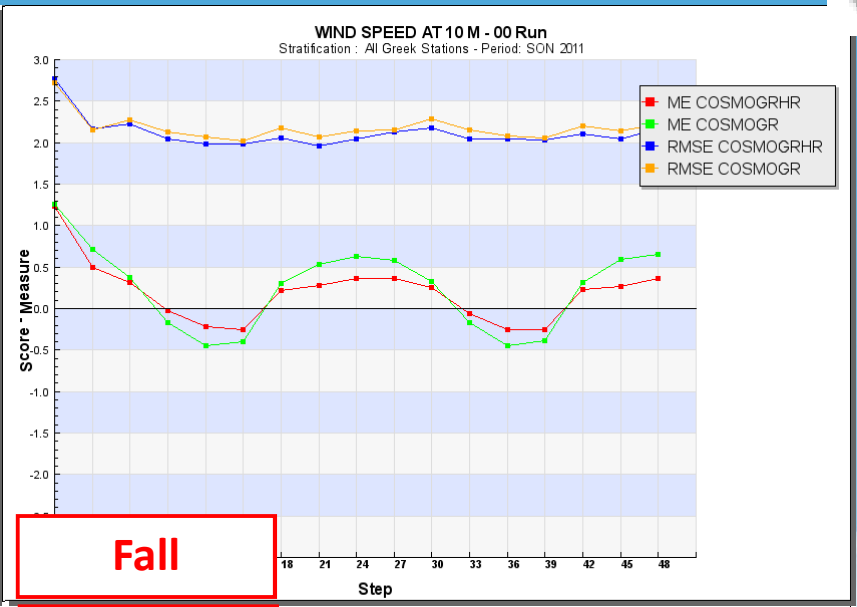
Underestimation of Temp for almost all seasons and higher in winter during afternoon hours. Overestimation in summer noon periods. RMSE ~2º, worse with 7km by ~0.5º
Clear diurnal cycle

Wind Speed - 7km vs 3km

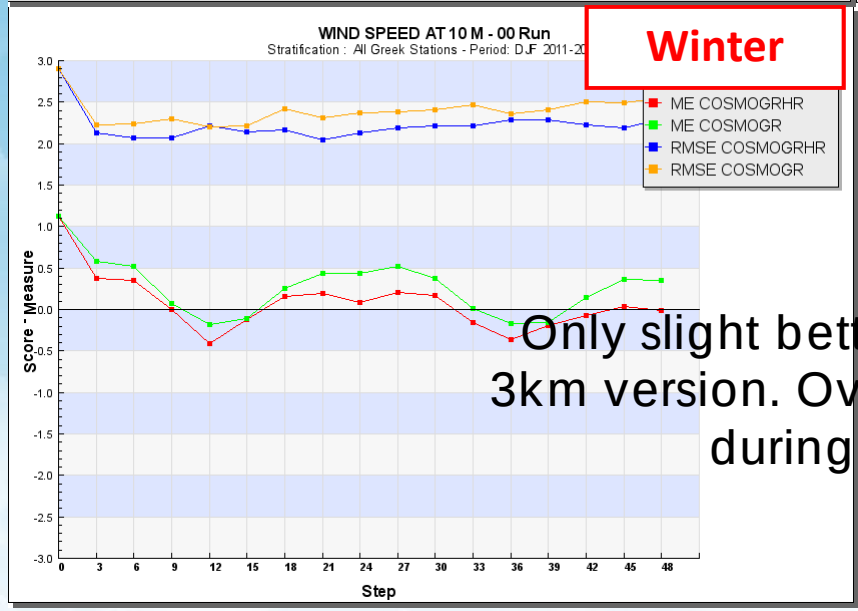




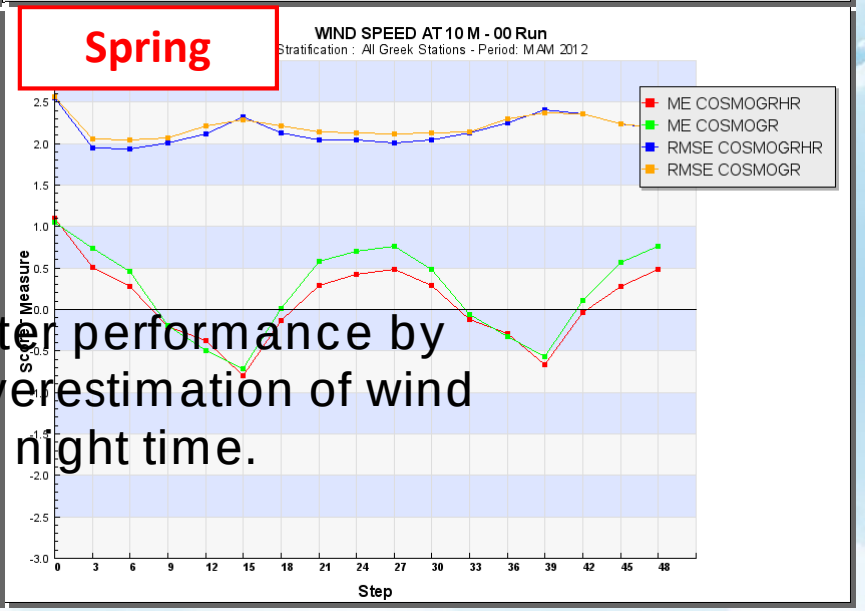
Summer



Fall



Winter

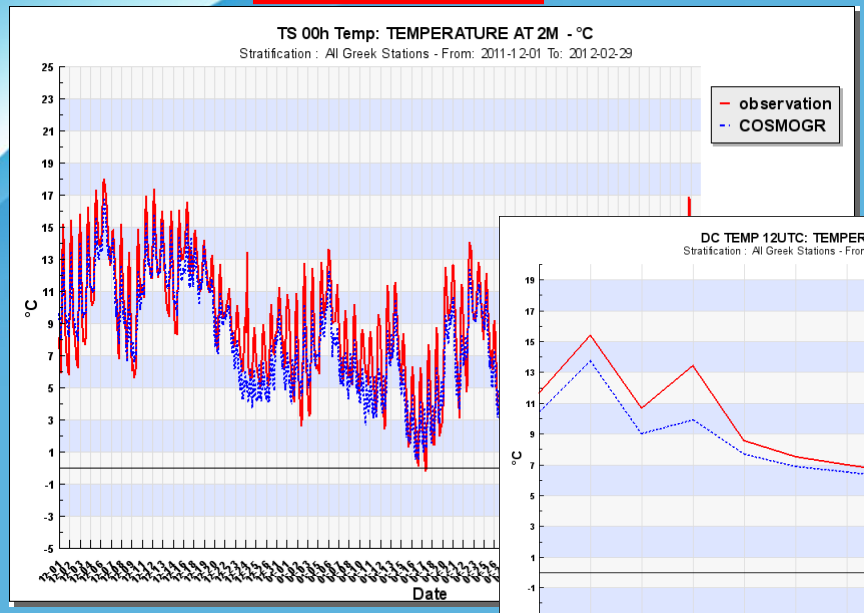


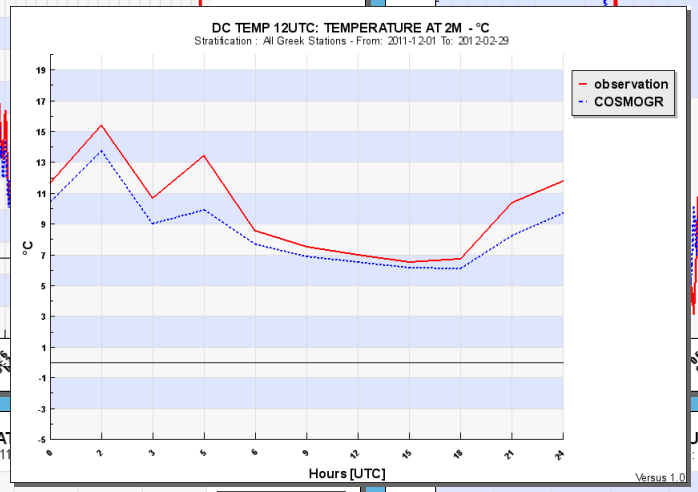
Spring

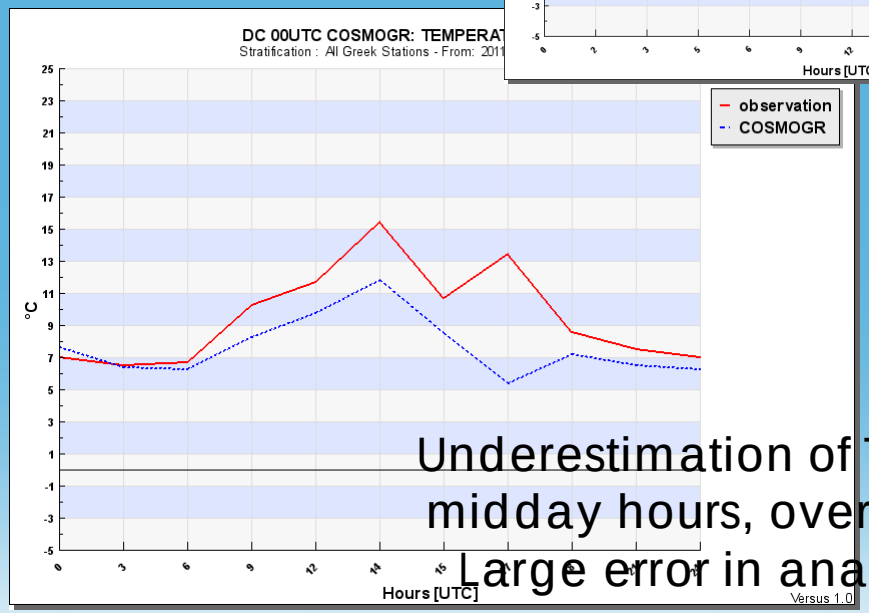
Only slight better performance by 3km version. Overestimation of wind during night time.

WINTER

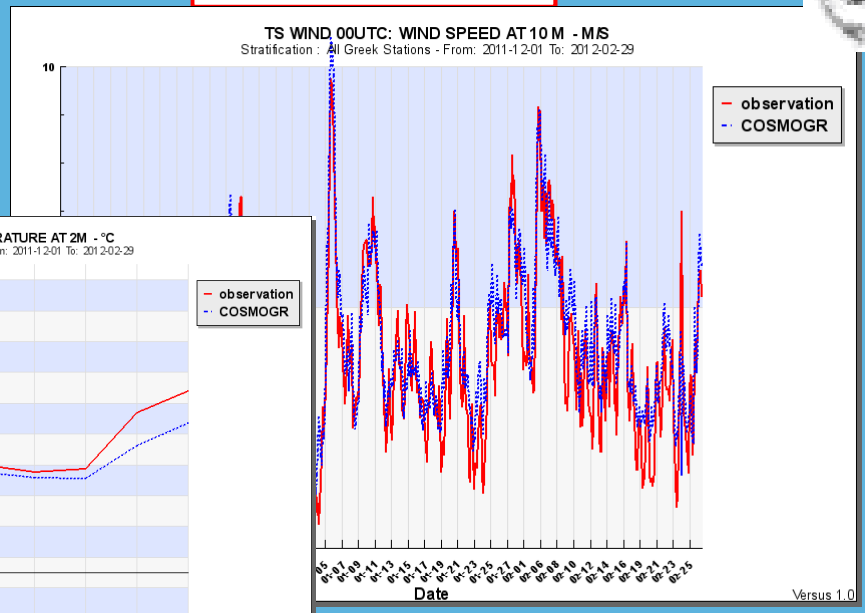
2m Temp

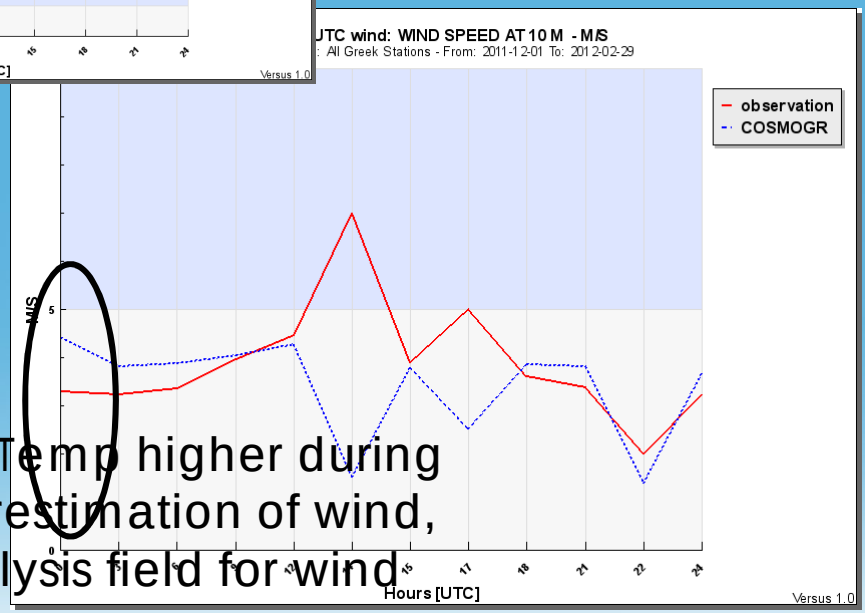






Wind Speed



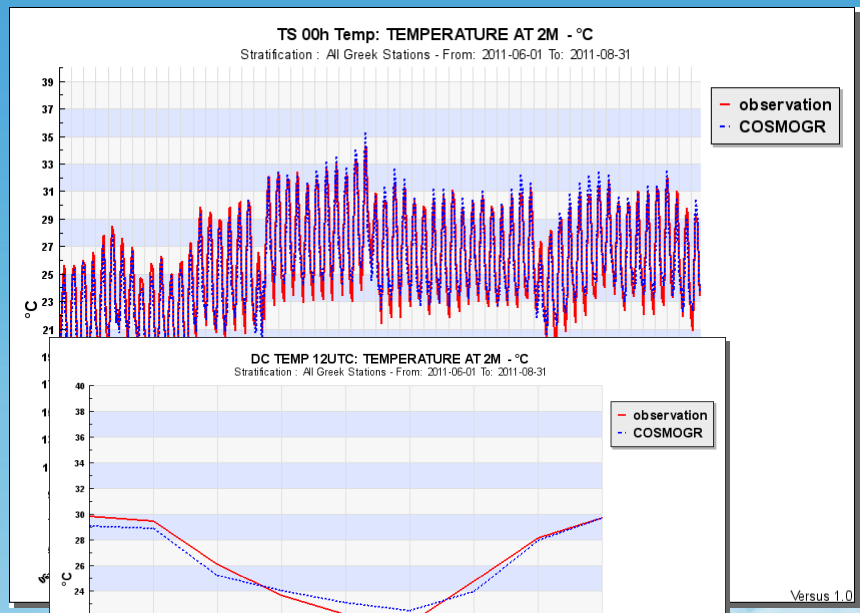


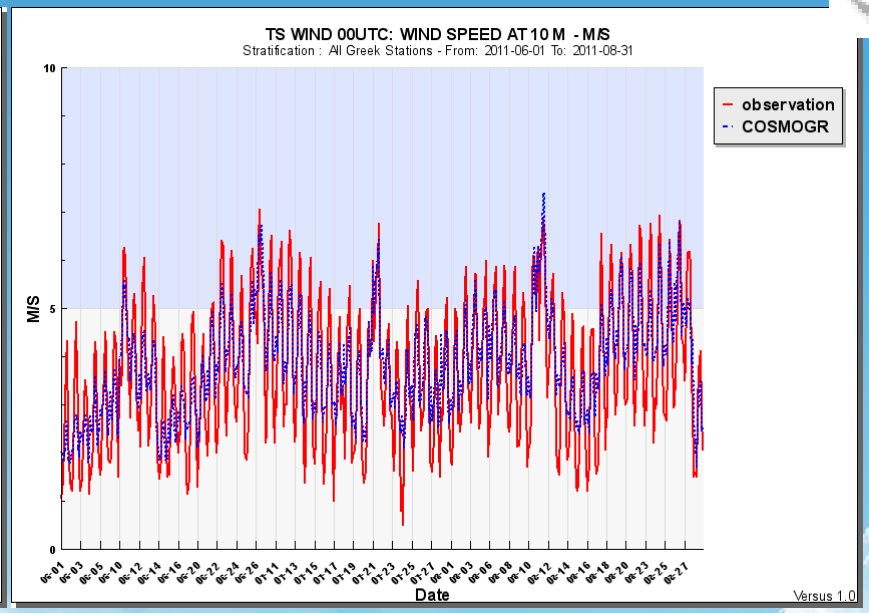
Underestimation of Temp higher during midday hours, overestimation of wind, Large error in analysis field for wind

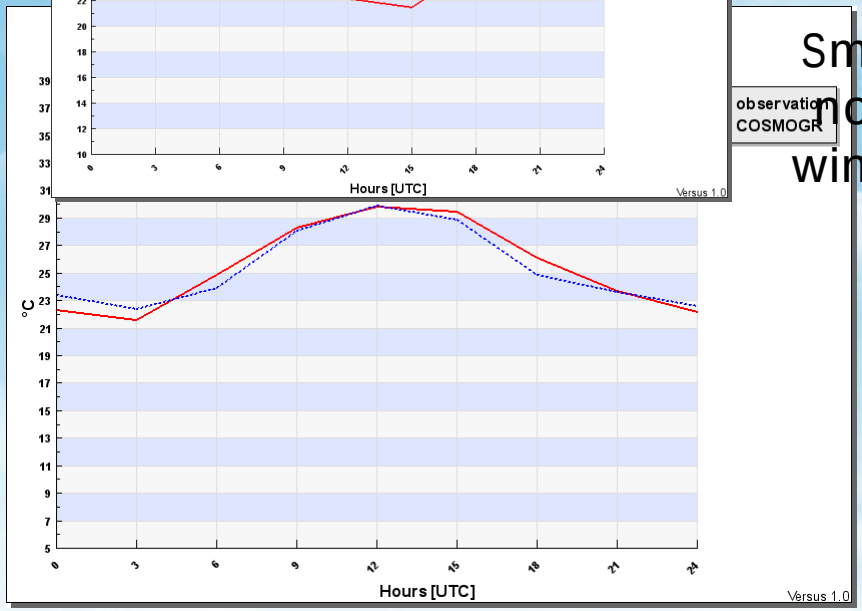
2m Temp

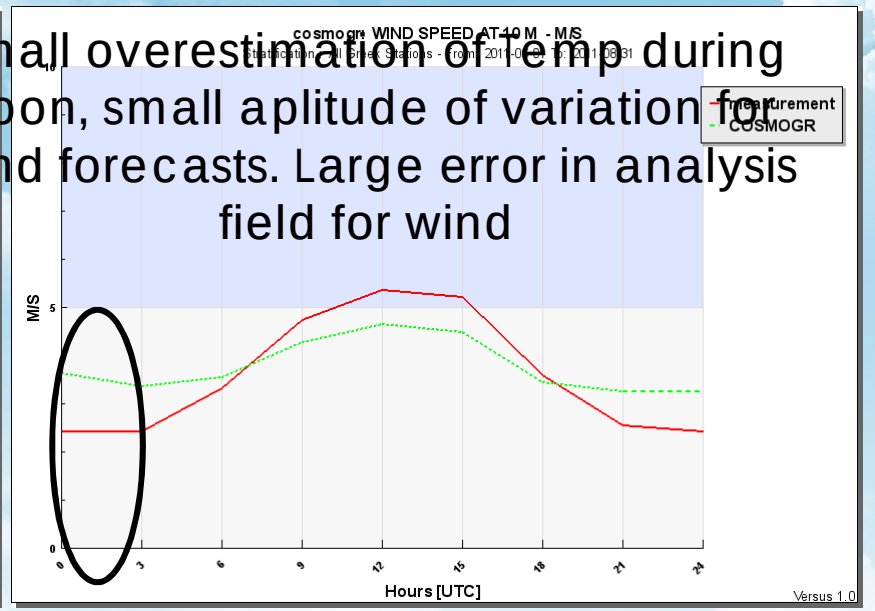
SUMMER

Wind Speed



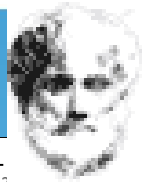


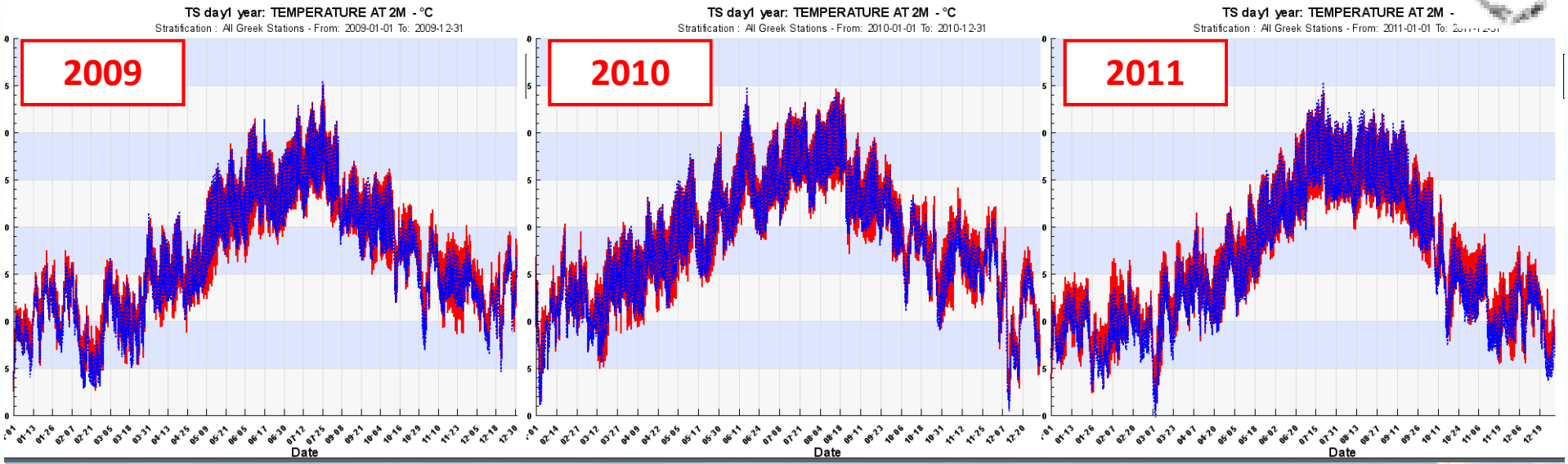




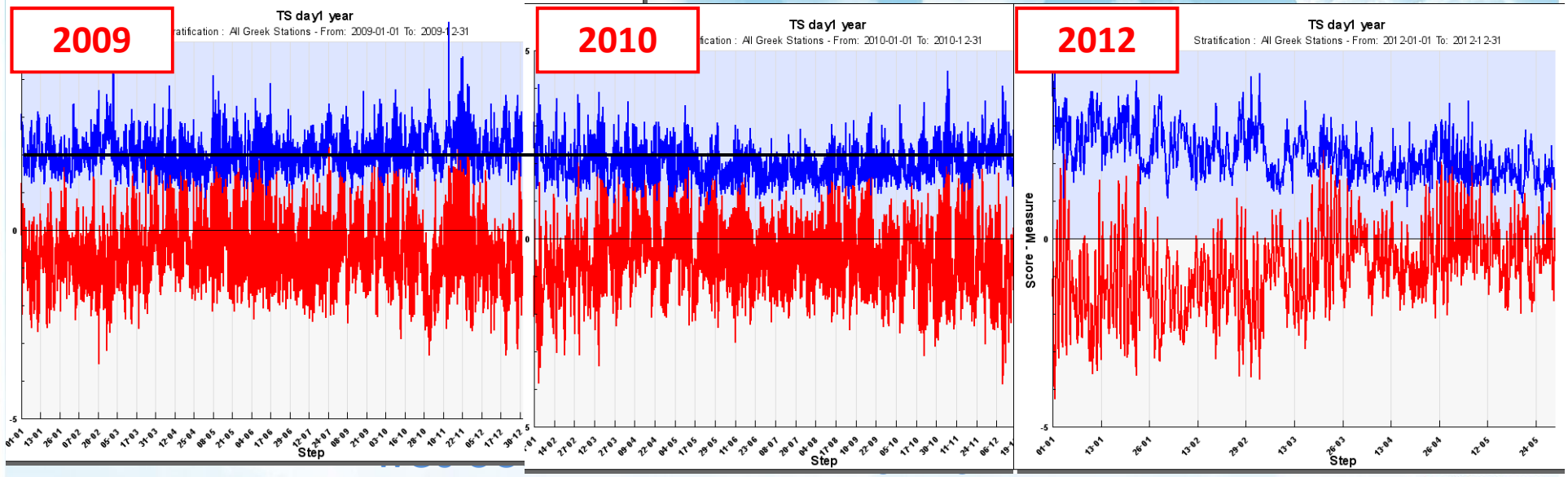
Small overestimation of Temp during noon, small aplitude of variation for wind forecasts. Large error in analysis field for wind

2M TEMP day1: fcs-obs TS

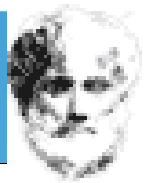


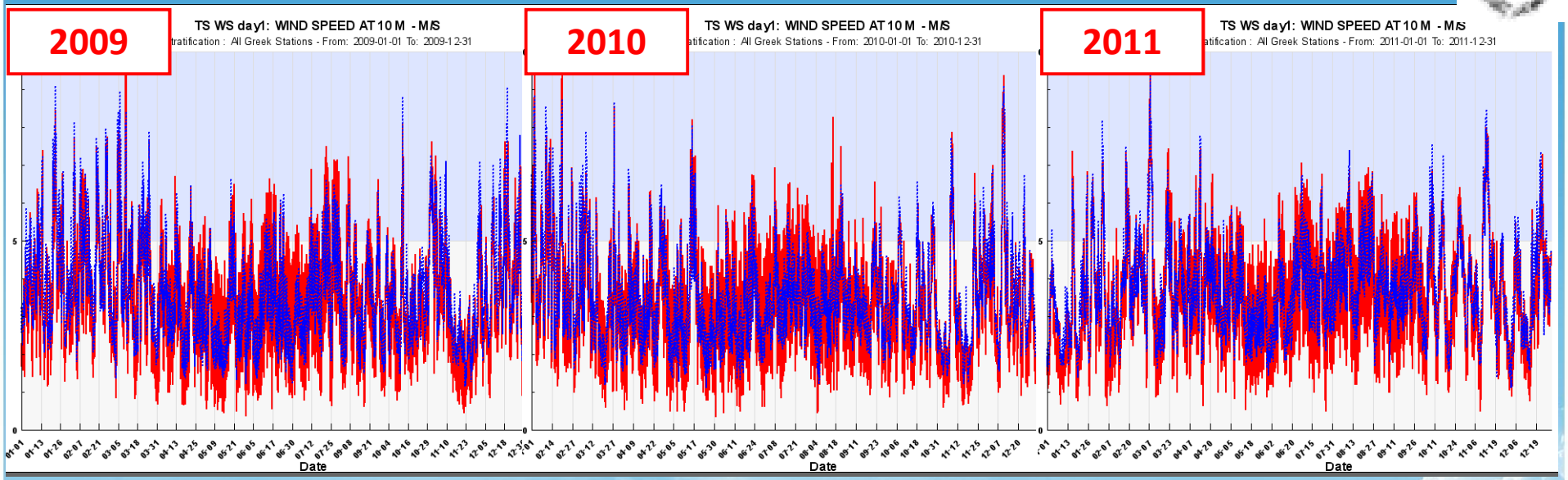


2M TEMP day1: RMSE-ME TS

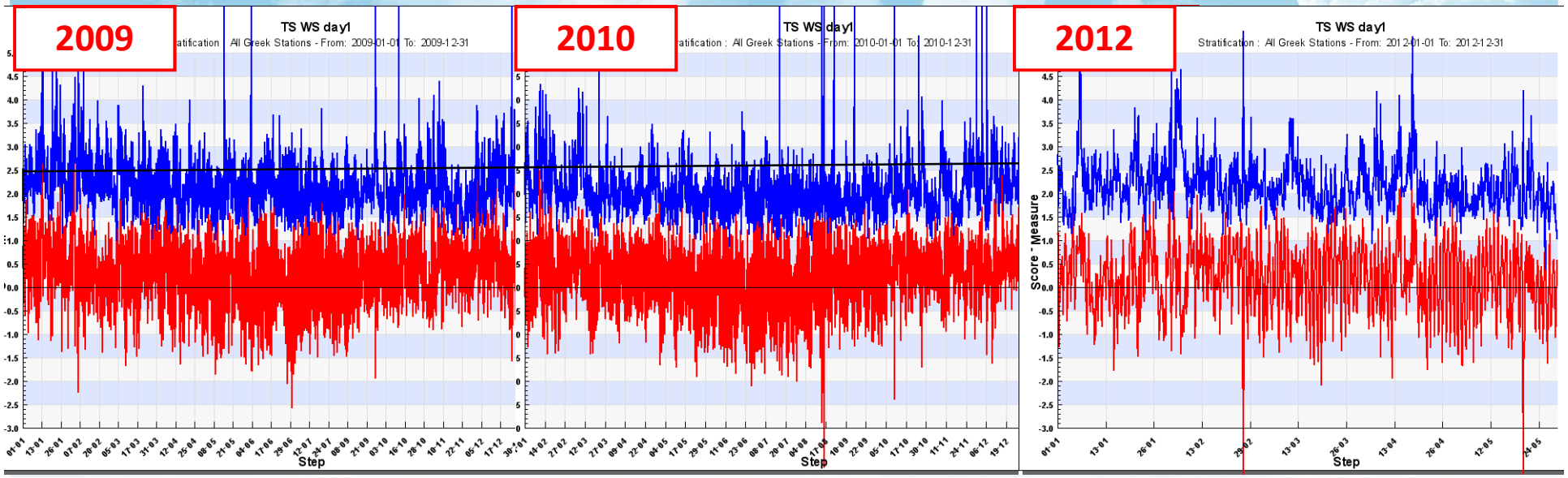


Wind speed day1: fct-obs TS

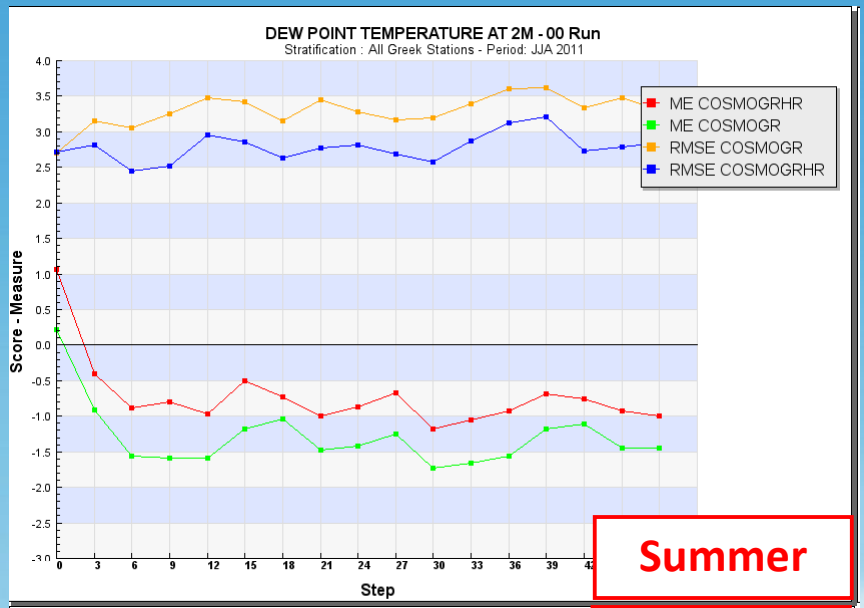




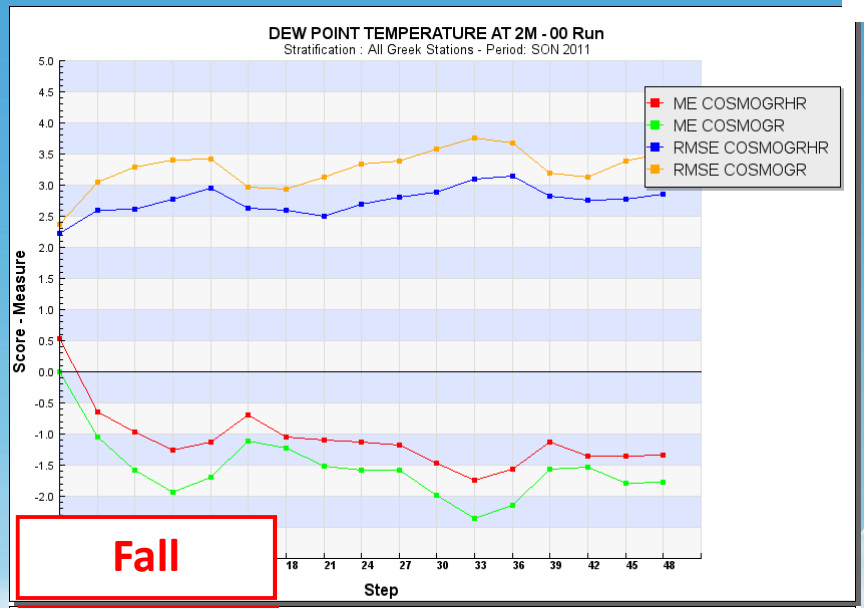
Wind speed day1: RMSE-ME TS



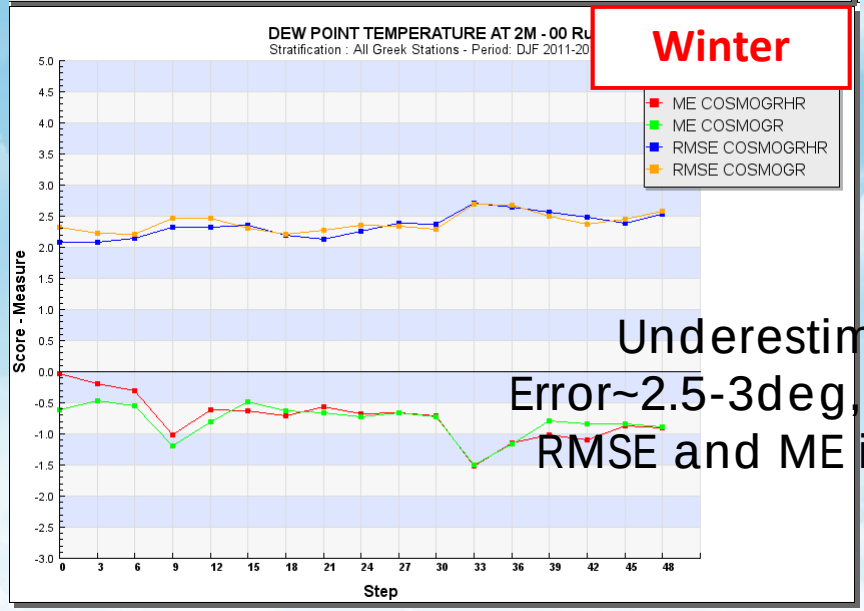
DewP Temp - 7km vs 3km



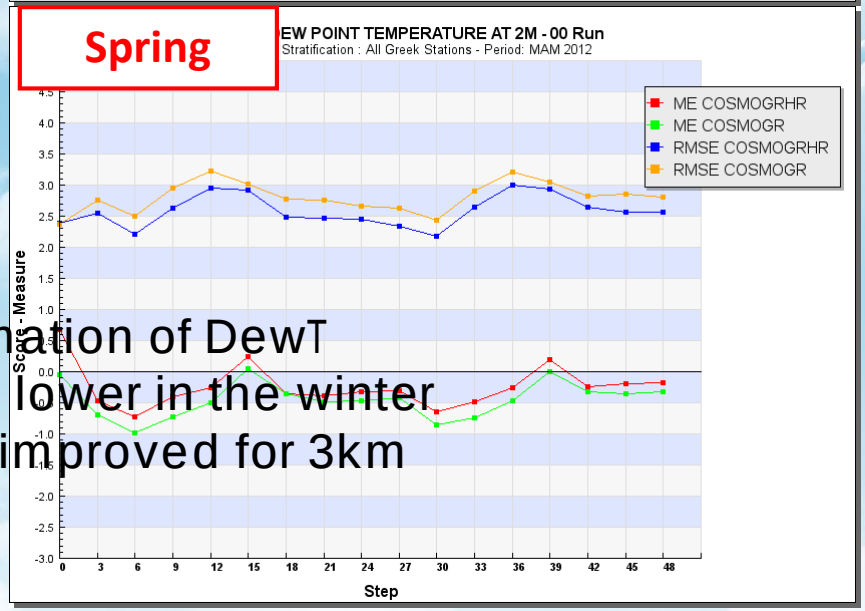
Summer



Fall



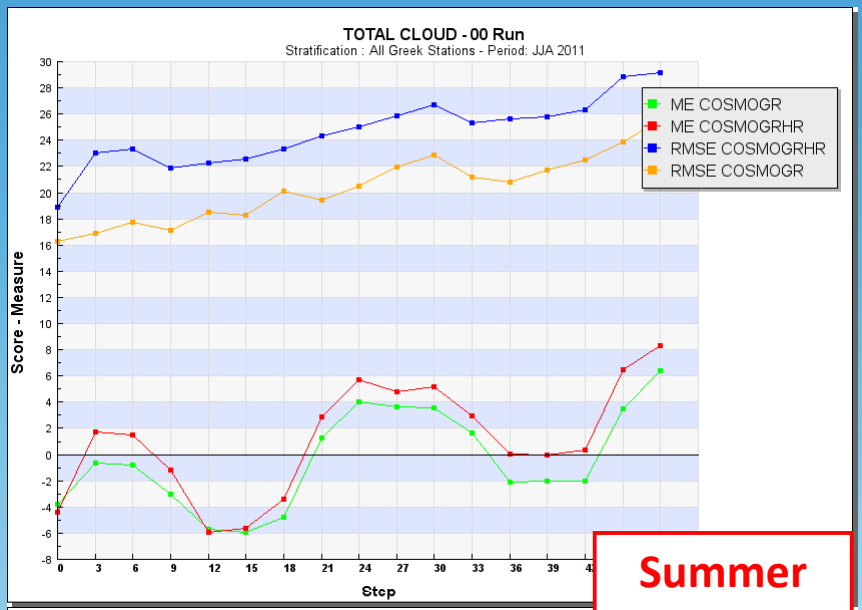
Winter



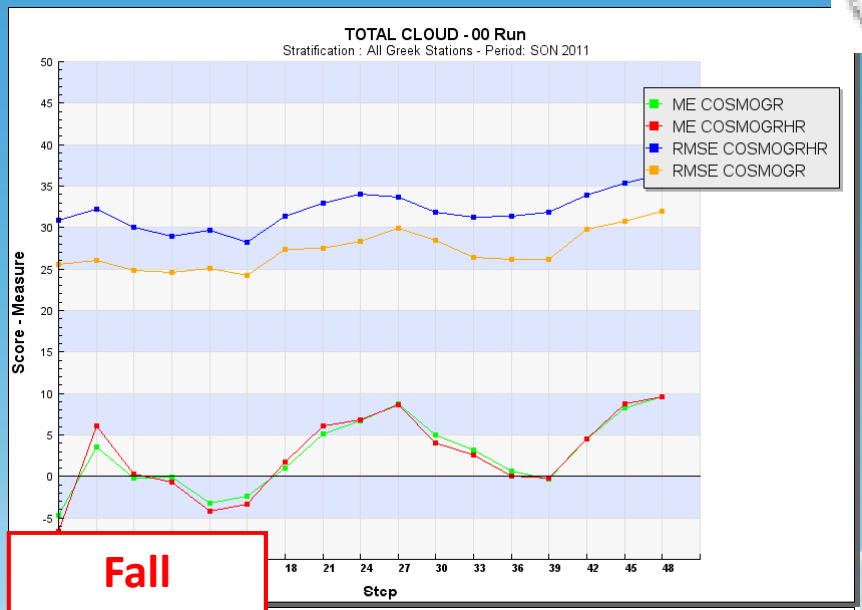
Spring

Underestimation of DewT
Error~2.5-3deg, lower in the winter
RMSE and ME improved for 3km

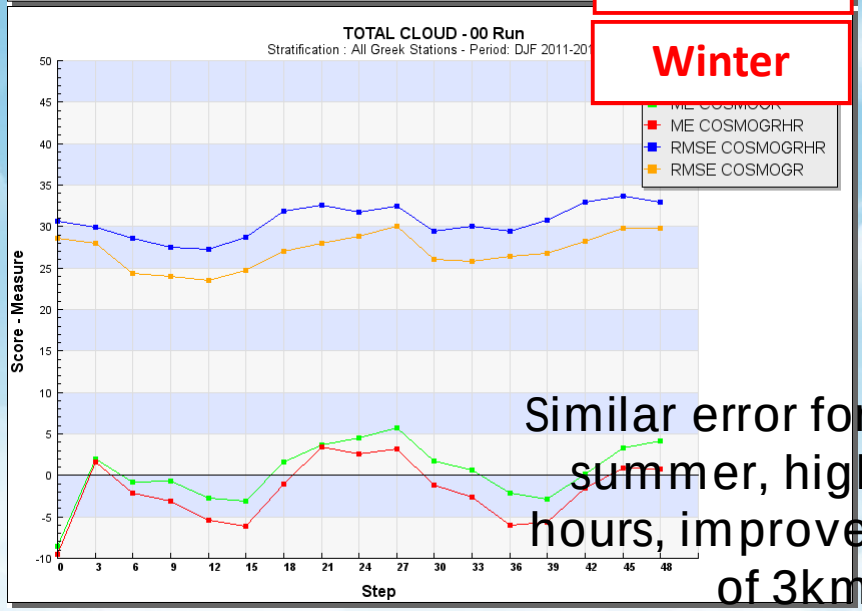
Cloud Cover - 7km vs 3km



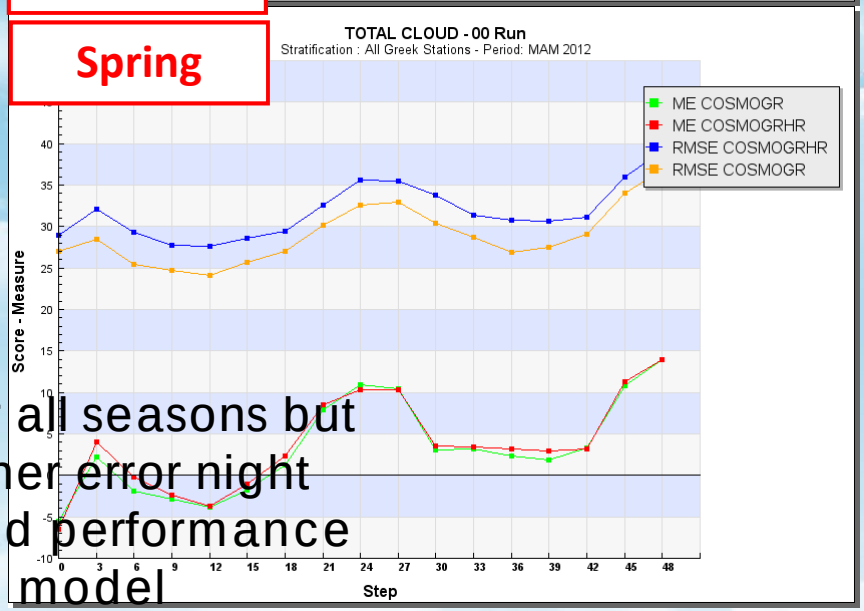
Summer



Fall



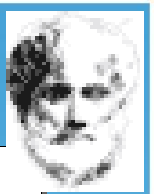
Winter

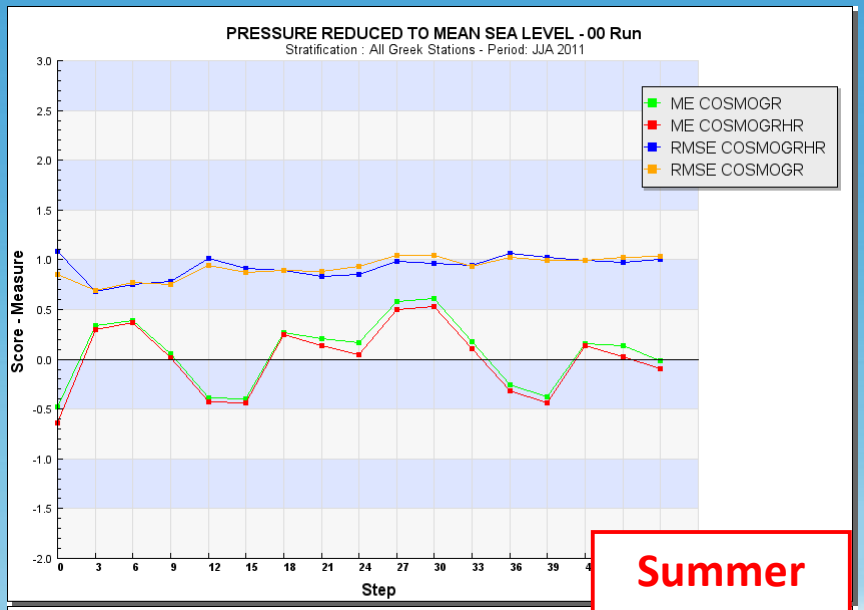


Spring

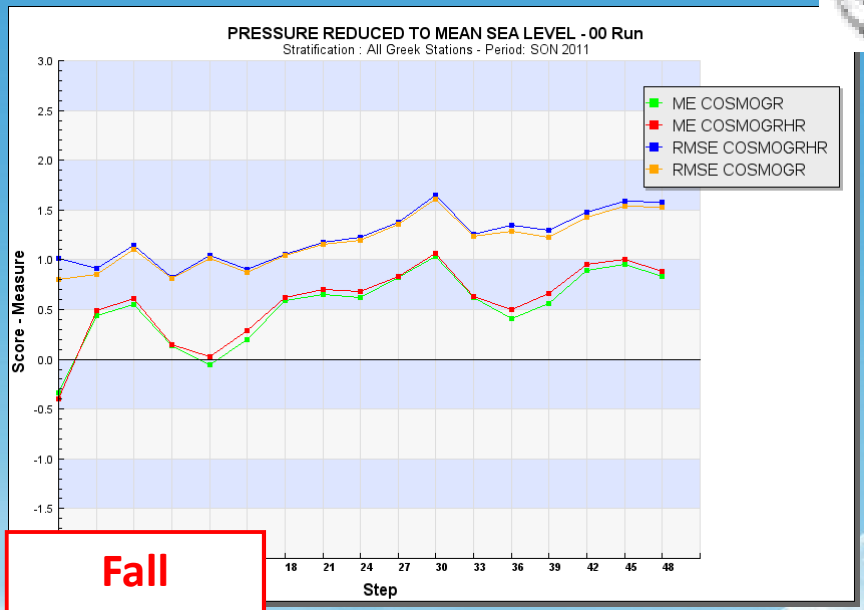
Similar error for all seasons but summer, higher error night hours, improved performance of 3km model

MSLP - 7km vs 3km

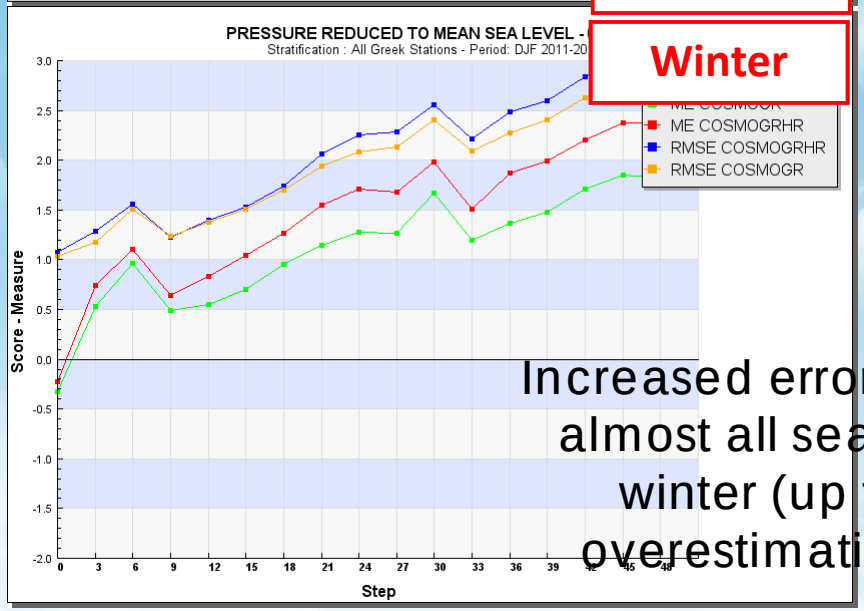




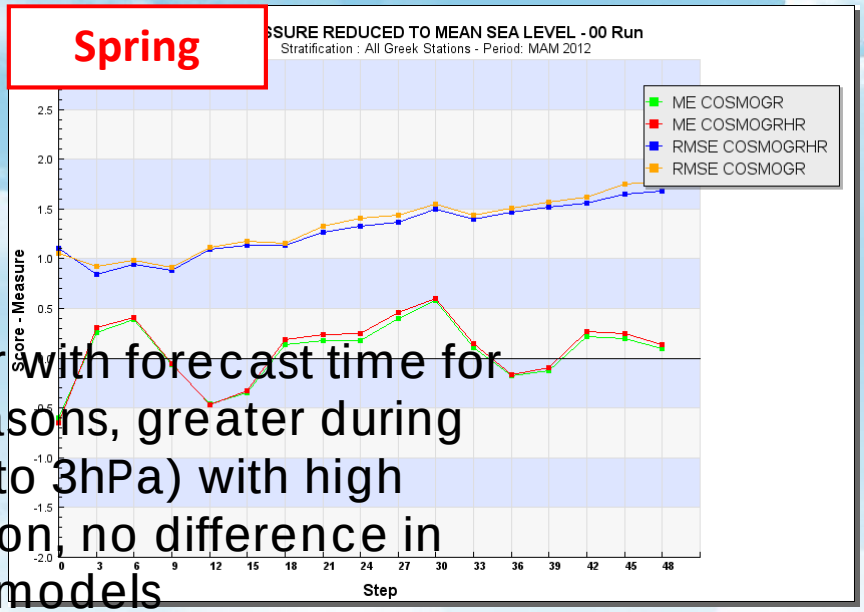
Summer



Fall



Winter



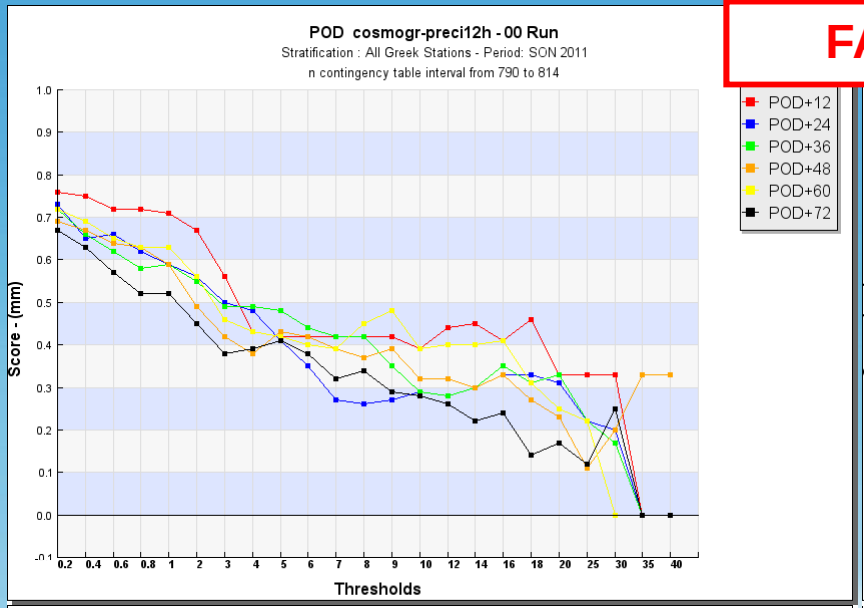
Spring

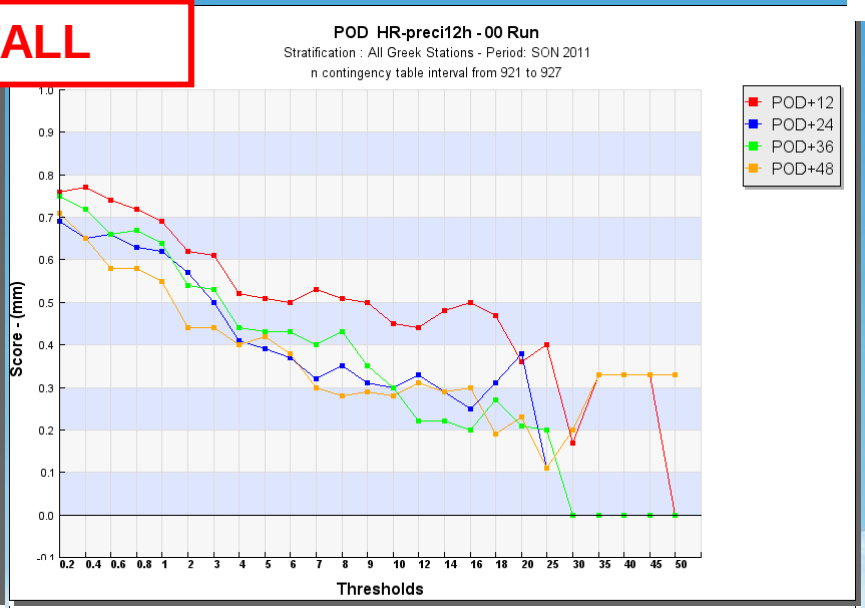
Increased error with forecast time for almost all seasons, greater during winter (up to 3hPa) with high overestimation, no difference in models

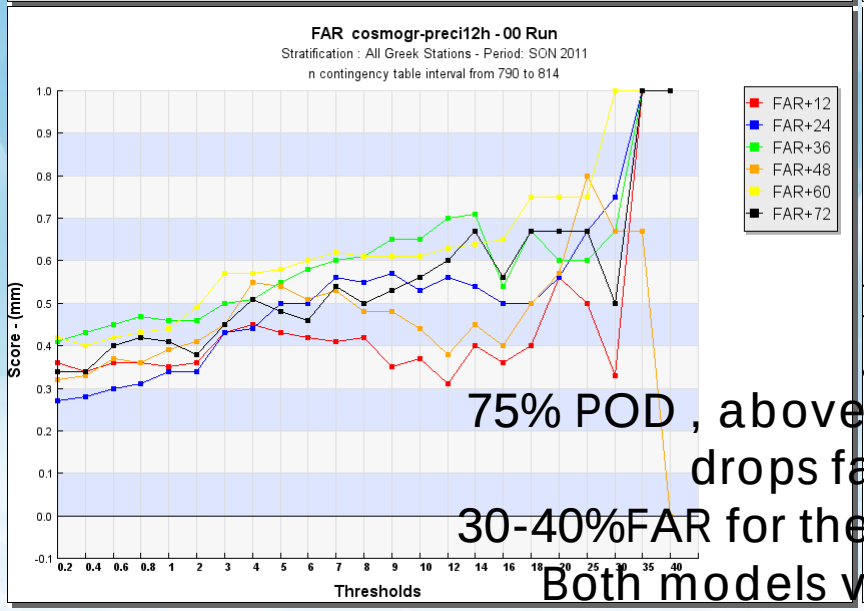
FG6

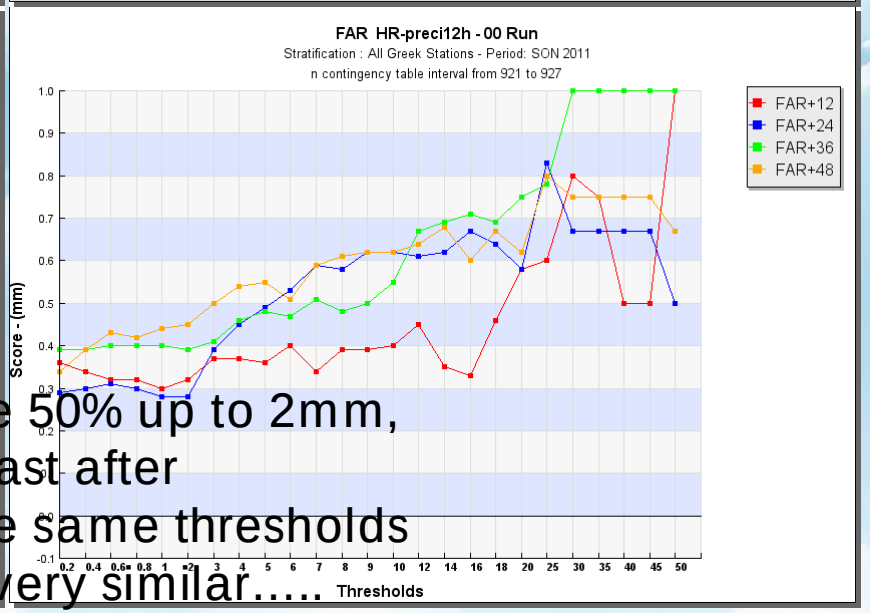
12h Precipitation - 7km vs 3km

FALL









75% POD , above 50% up to 2mm,
drops fast after
30-40%FAR for the same thresholds
Both models very similar…..

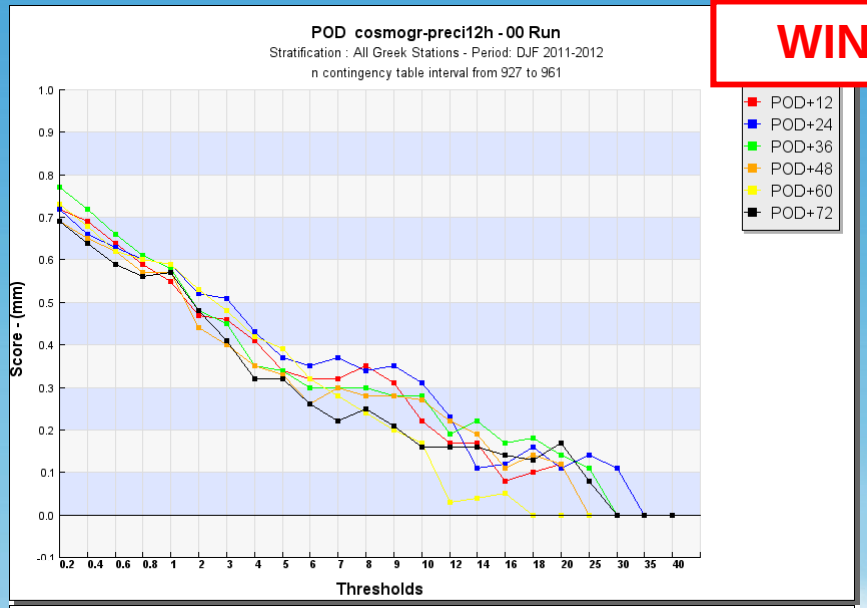
FG6

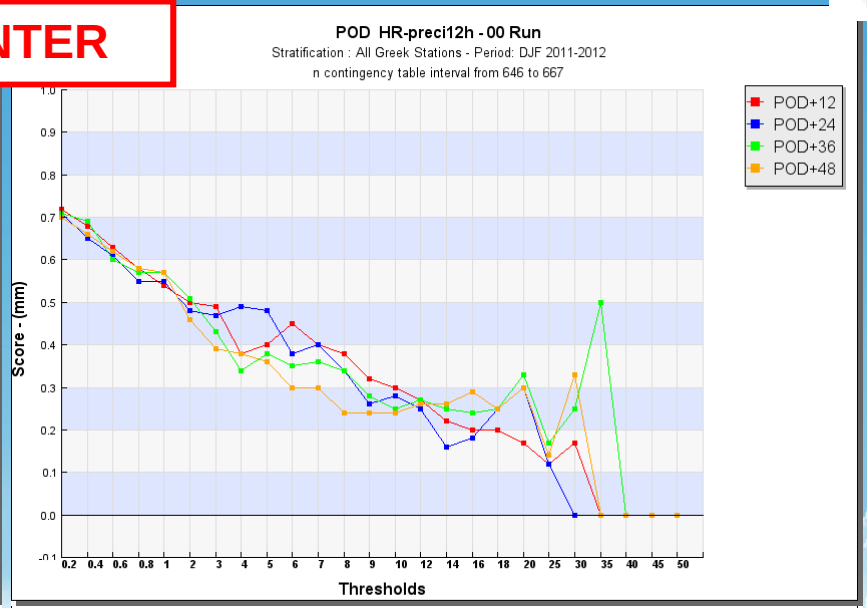
ETS - range: -1/3 to 1, ps=1
fraction of observed and/or forecast events correctly predicted, adjusted for hits associated with random chance

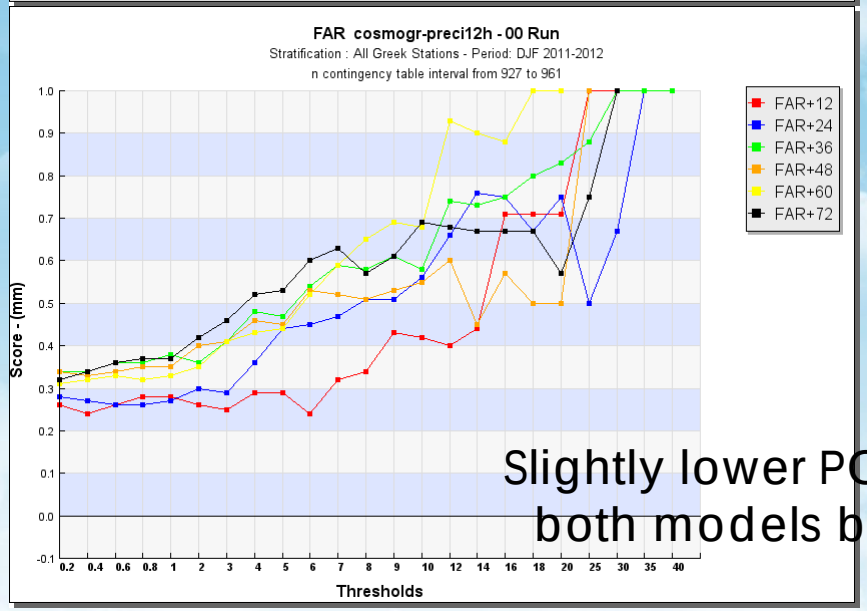
FBI - range: 0 to ∞, unbiased score=1
Indicates tendency to underforecast (BIAS<1) or
overforecast (BIAS>1) events.
70-80% POD , above 50% up to 2mm, drops fast after
Higher FAR for HR model
Flora Gofa, 02/09/2010

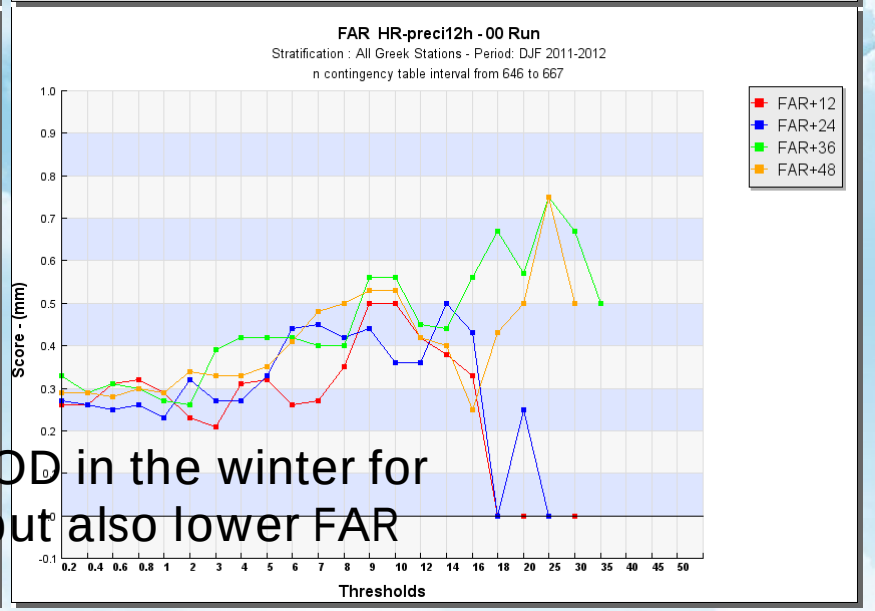
12h Precipitation - 7km vs 3km

WINTER





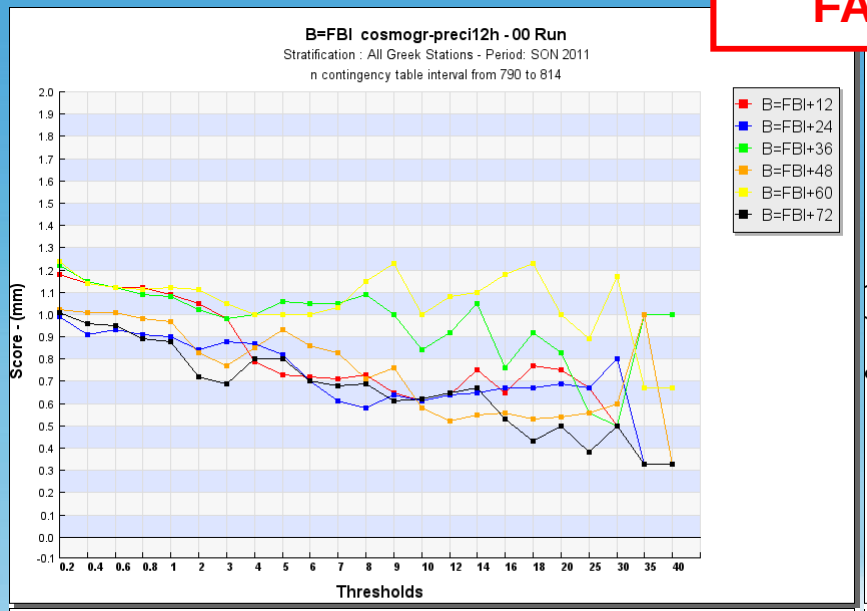


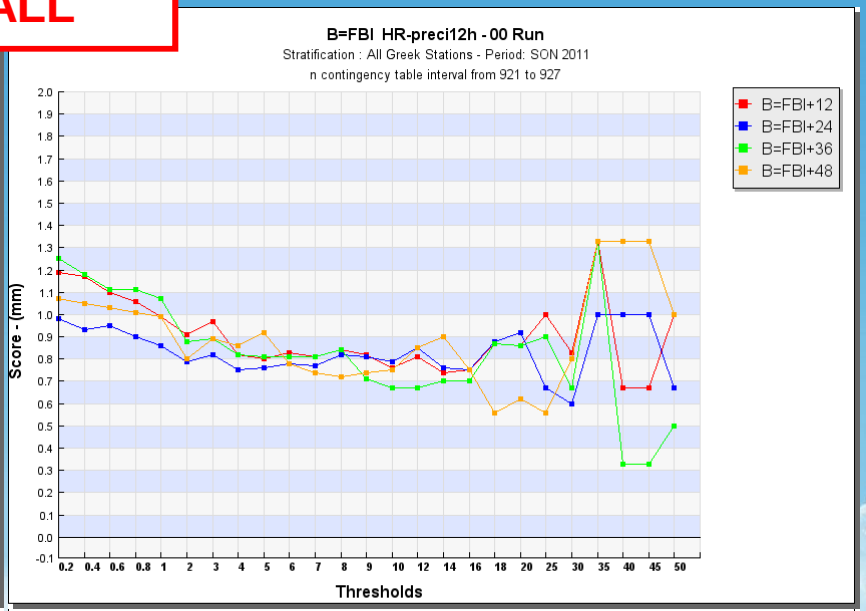


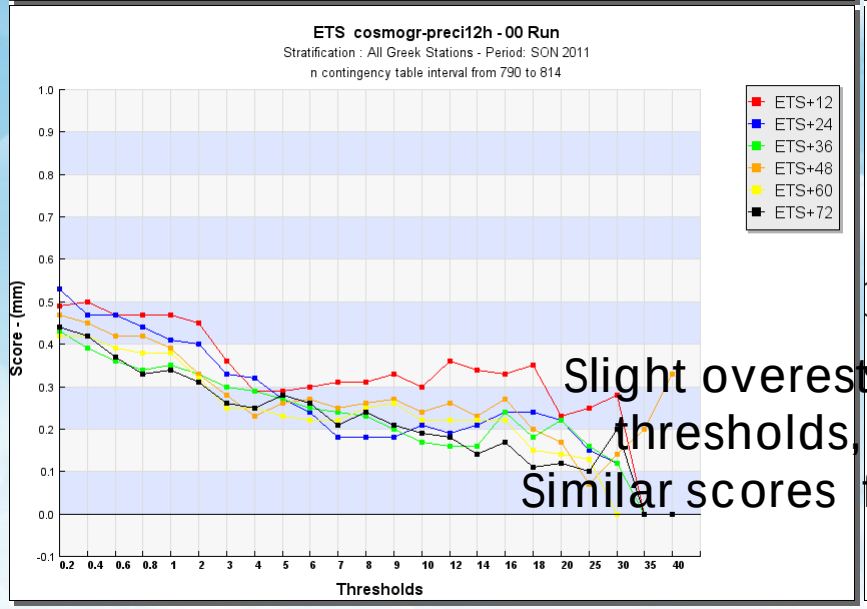
Slightly lower POD in the winter for both models but also lower FAR

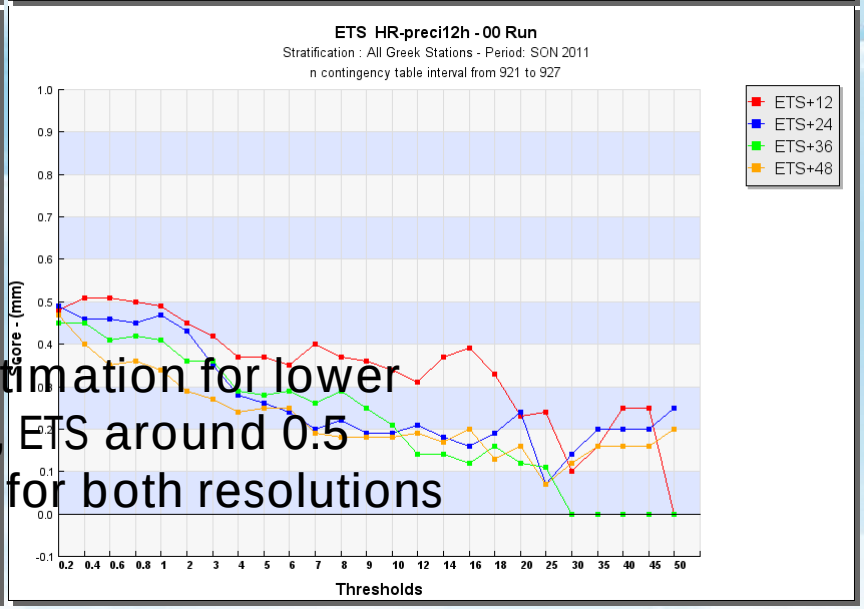
12h Precipitation - 7km vs 3km

FALL







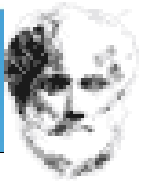


Slight overestimation for lower thresholds, ETS around 0.5

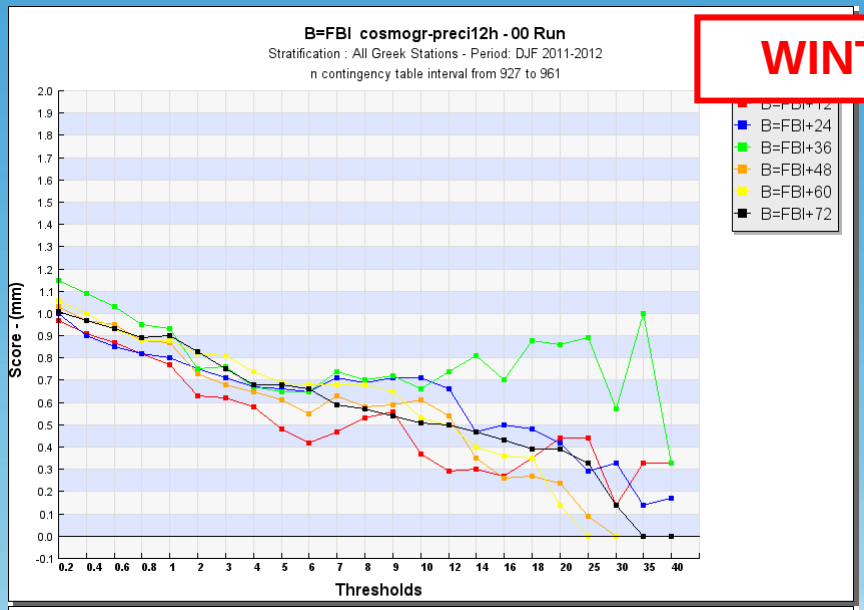
Similar scores for both resolutions

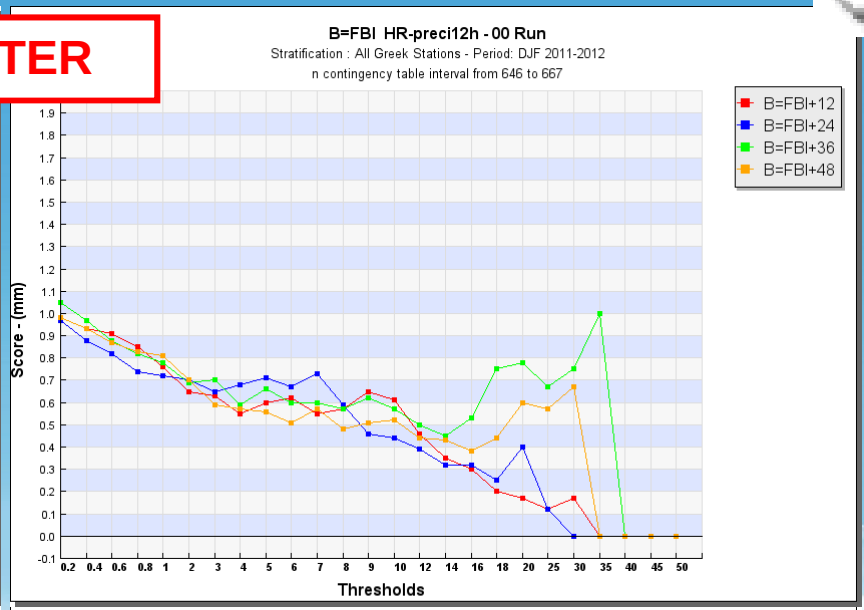
FG9

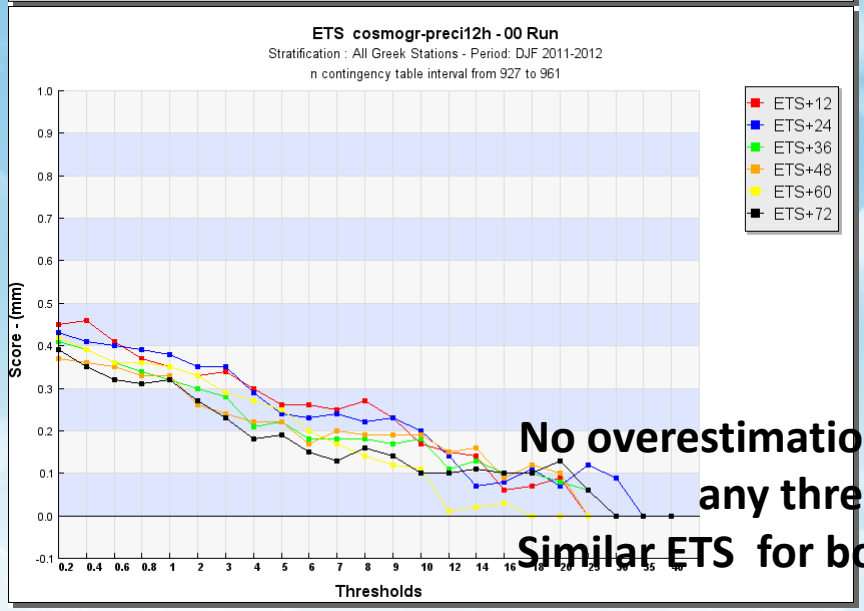
12h Precipitation - 7km vs 3km

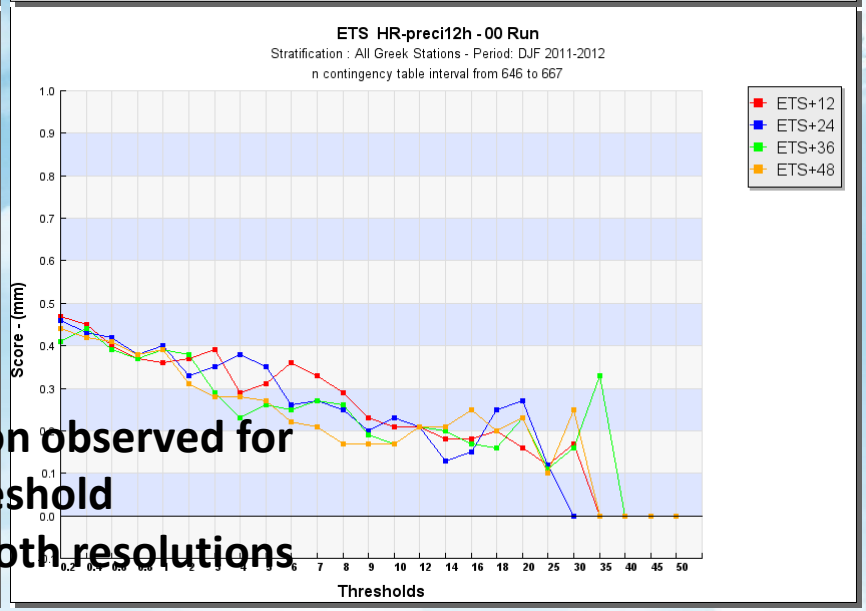


WINTER





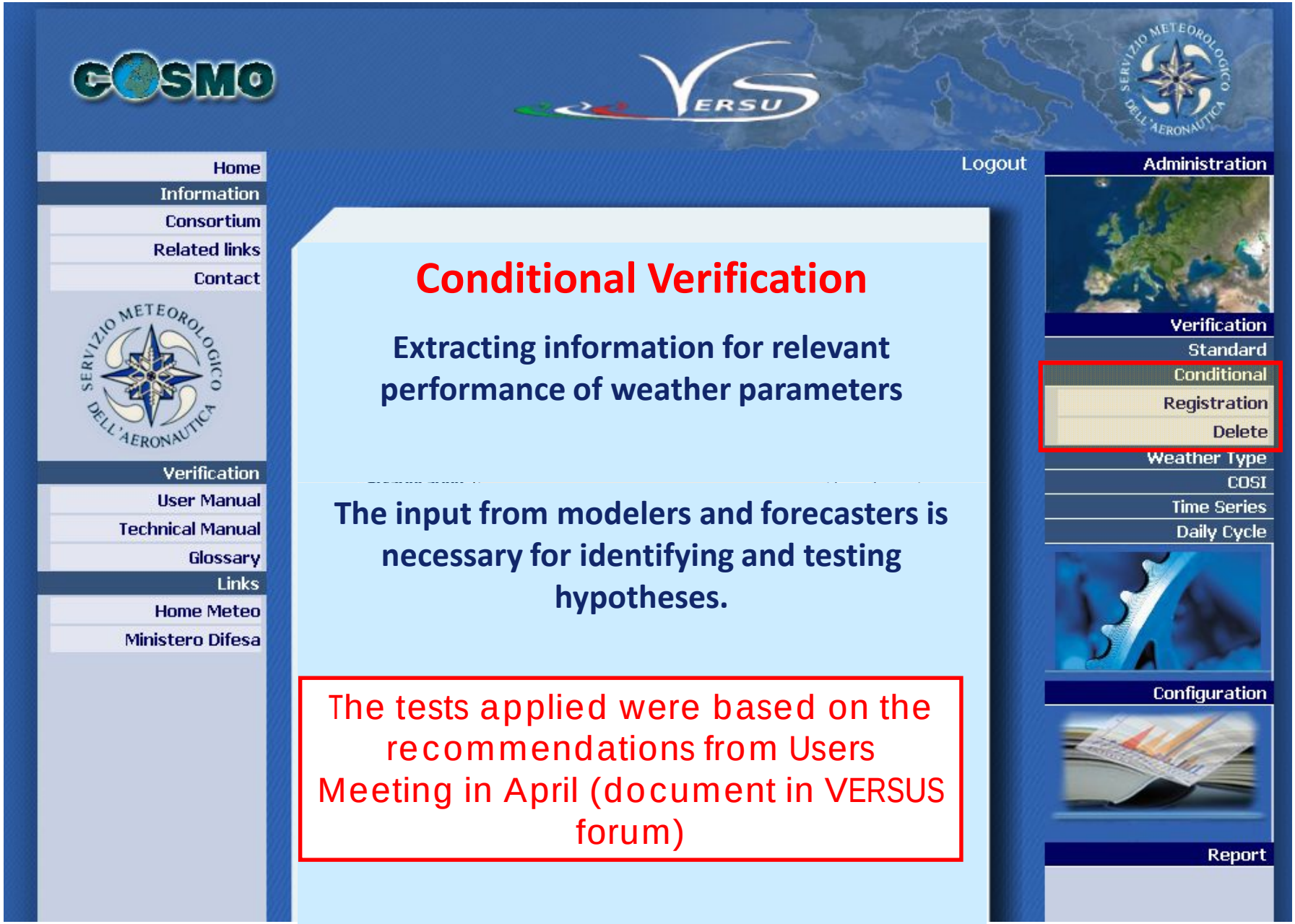




No overestimation observed for any threshold

Similar ETS for both resolutions

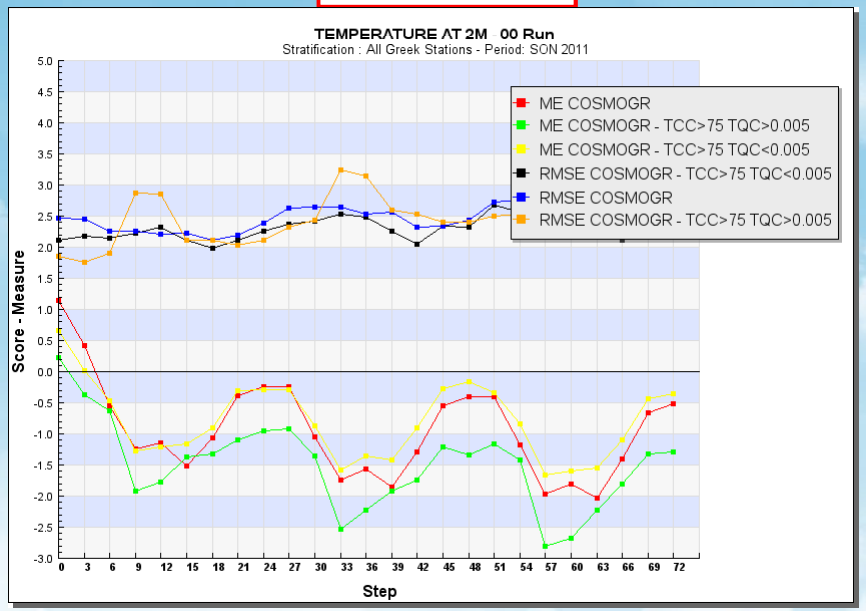
FG9 Flora Gofa, 02/09/2010


COSMO
VERSUS
Home
Information
Consortium
Related links
Contact
Verification
User Manual
Technical Manual
Glossary
Links
Home Meteo
Ministero Difesa
Logout
Administration
Verification
Standard
Conditional
Registration
Delete
Weather Type
COSI
Time Series
Daily Cycle
Configuration
Report
Conditional Verification
Extracting information for relevant performance of weather parameters
The input from modelers and forecasters is necessary for identifying and testing hypotheses.
The tests applied were based on the recommendations from Users Meeting in April (document in VERSUS forum)

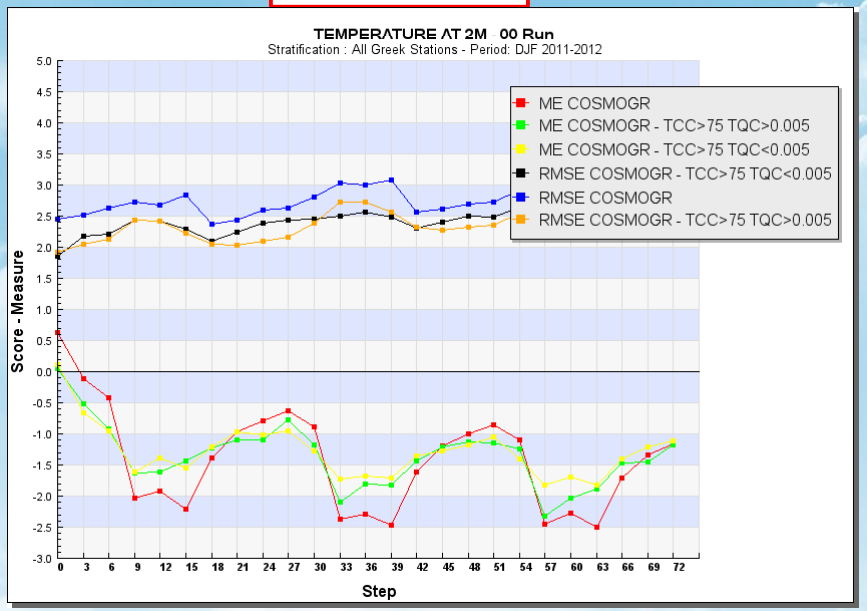
2mT vs 2mT, overcast, TQC >0.005 (cond on fct space)

No effect on 2mT forecasts has the TQC threshold compared to the big effect that Cloud Coverage has

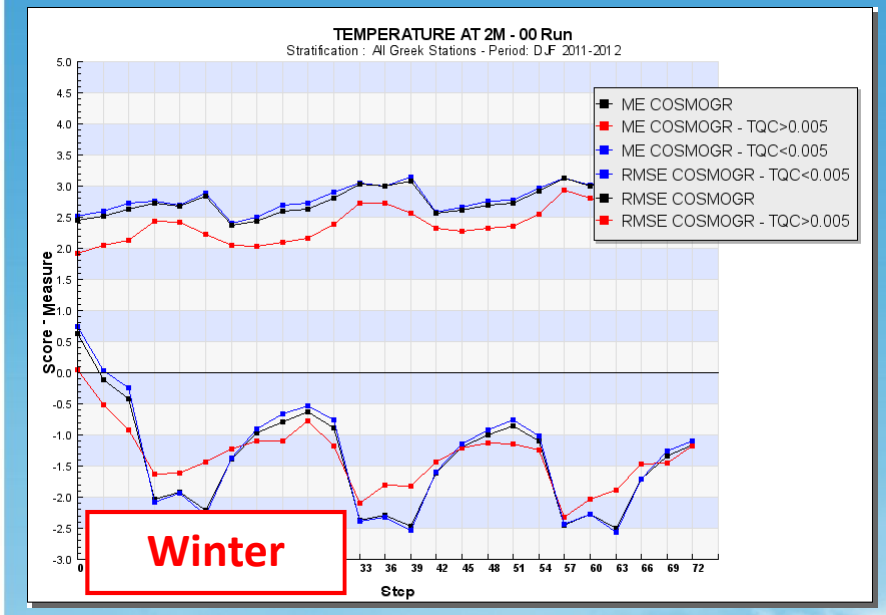
Fall



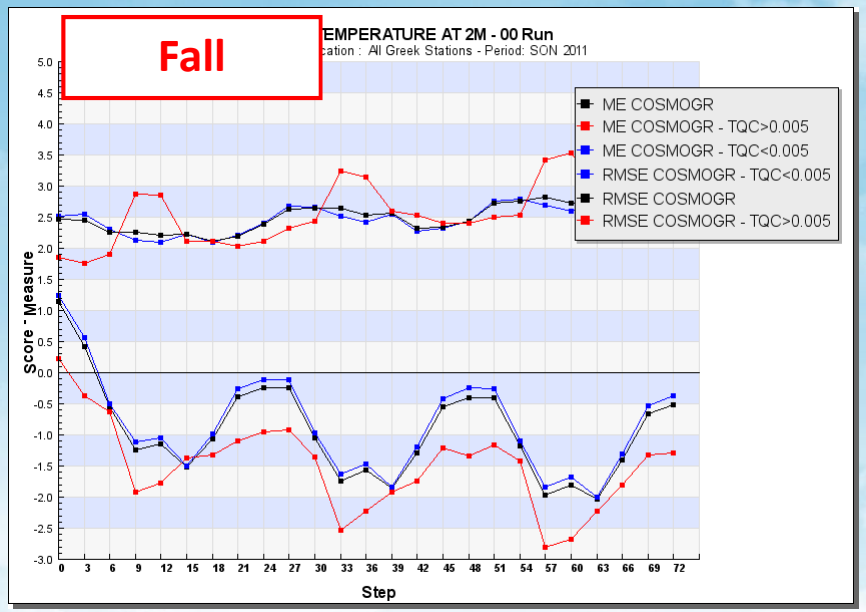
Winter

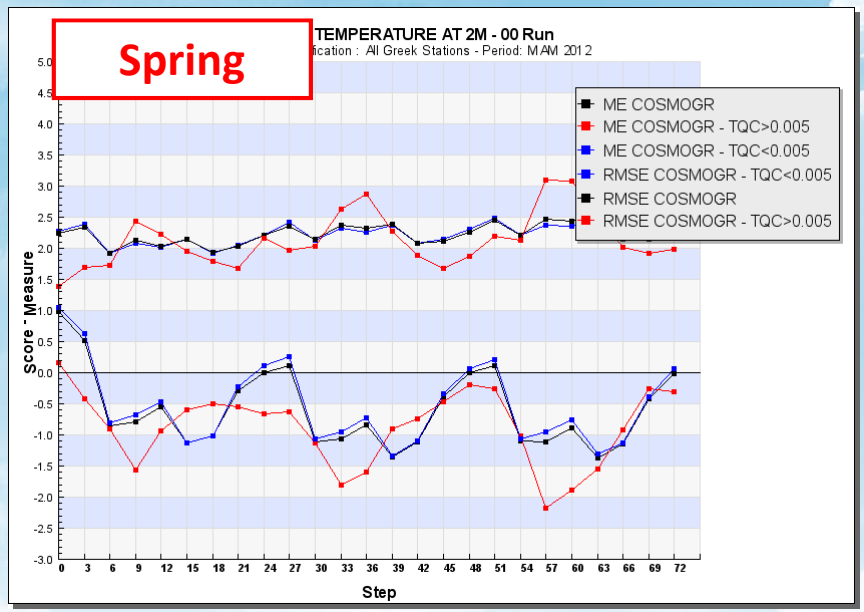


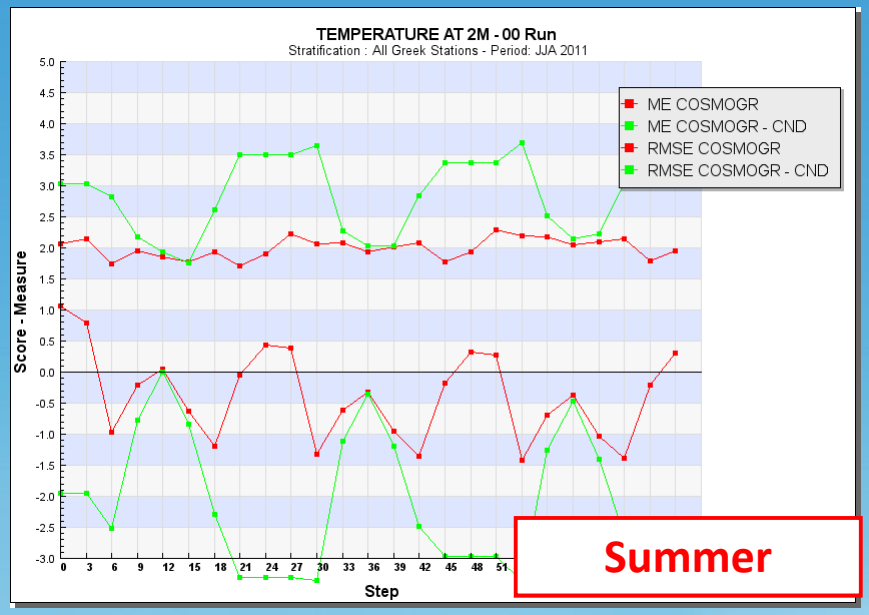
2mT vs 2mT under variable TQC (cond on fct space)



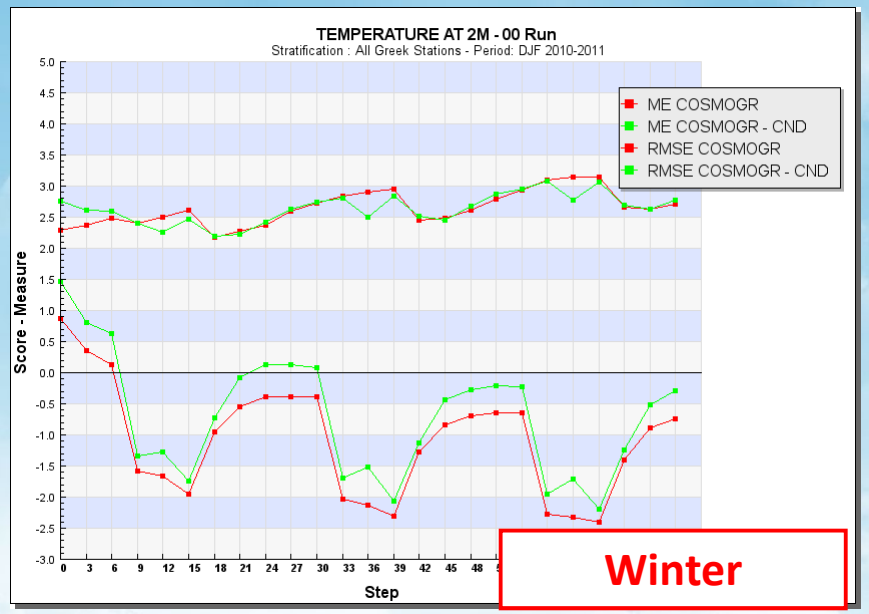
Similar effect with cloudiness, higher TQC values match with better performance in 2mT predictions







Summer

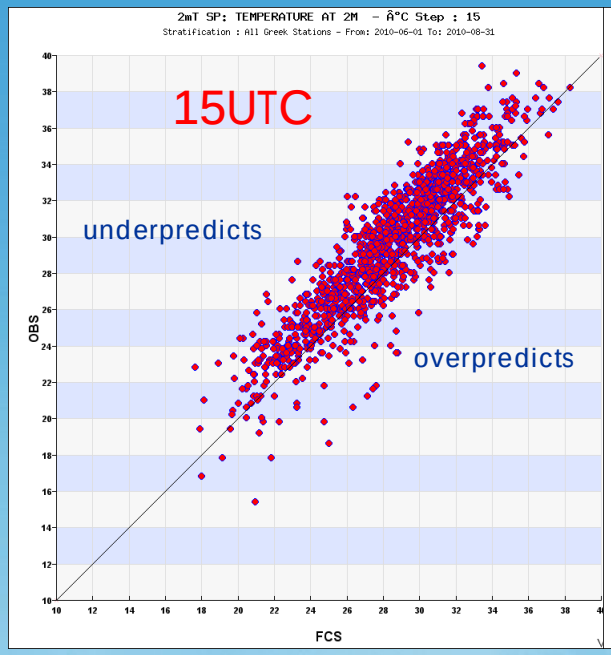


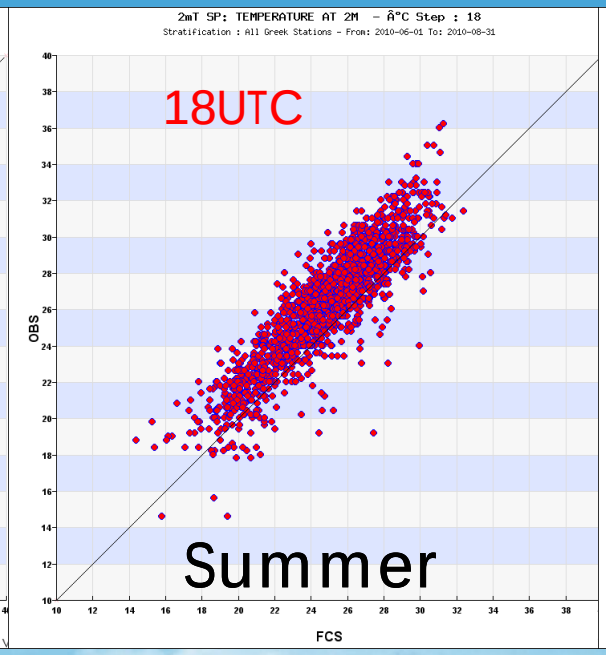
Winter

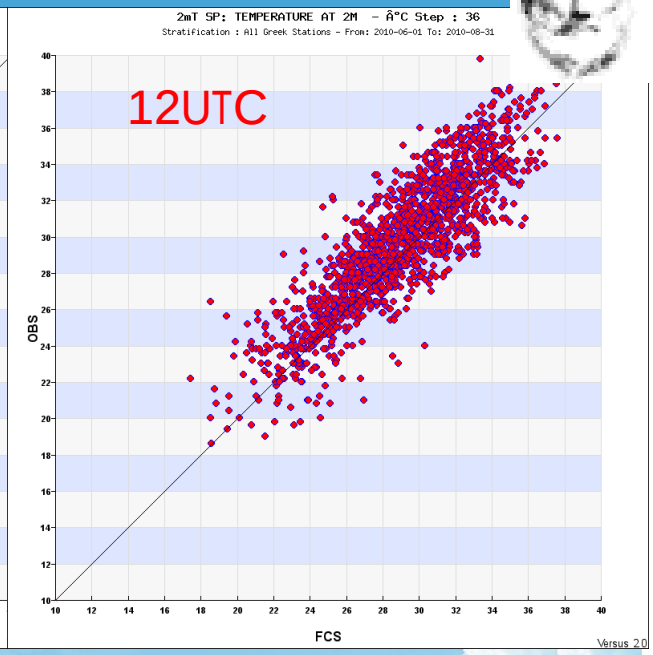
2mT vs 2mT for T>30ºC

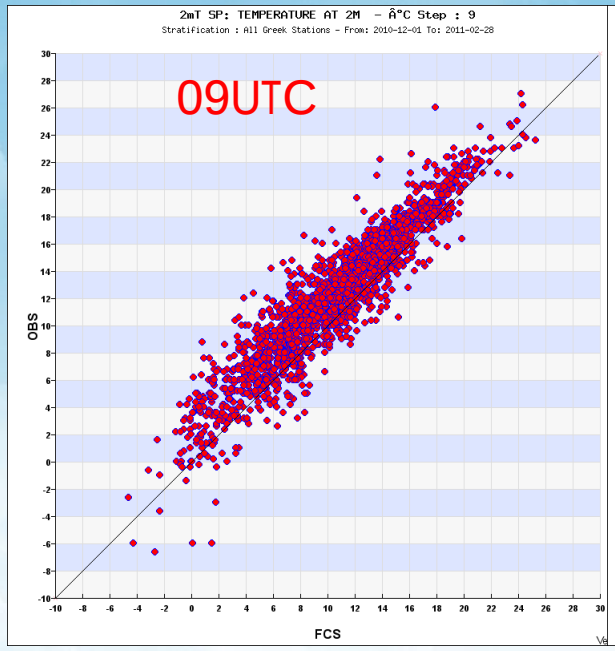
2mT vs 2mT for T<10ºC

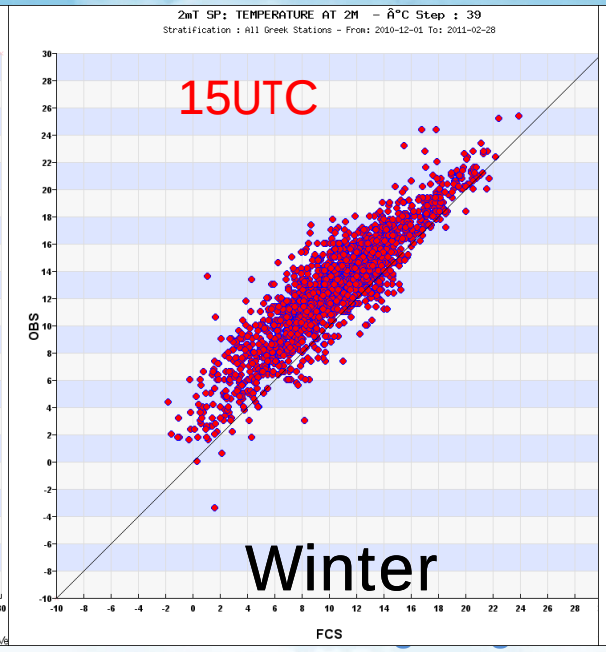
Scatter Plots for 2mT

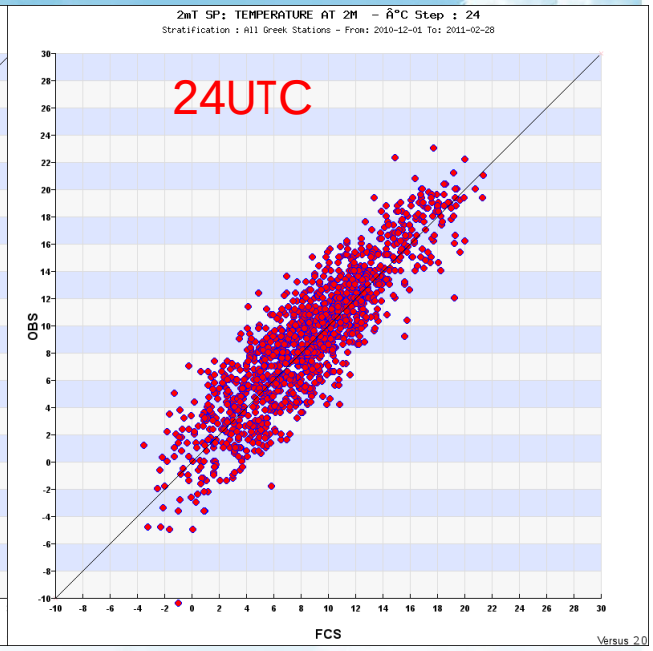






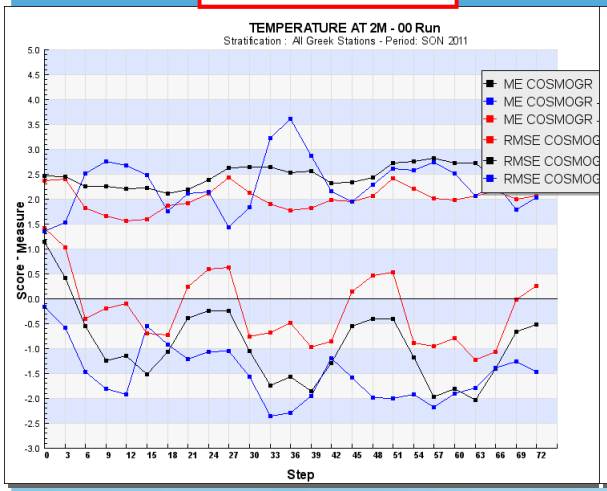




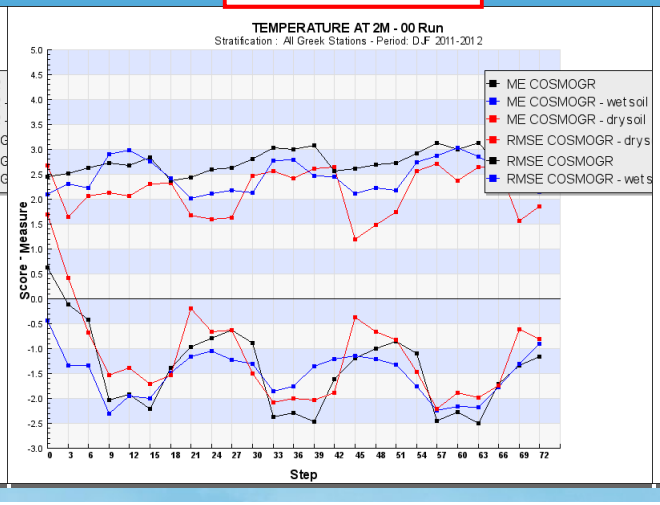


DewP T, 2mT with dry or wet soil conditions

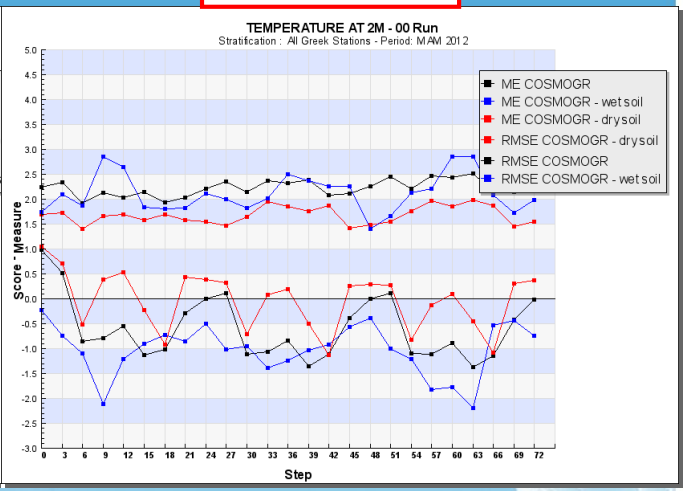
Fall



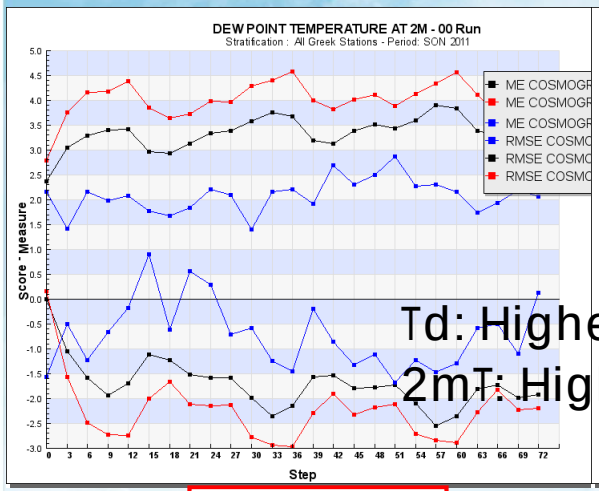
Winter

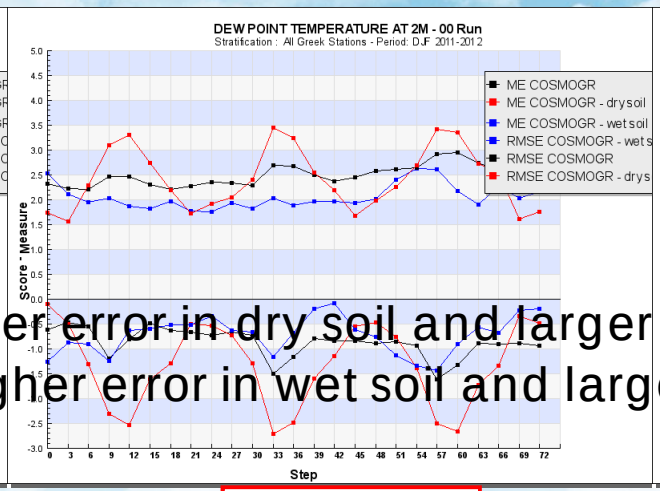


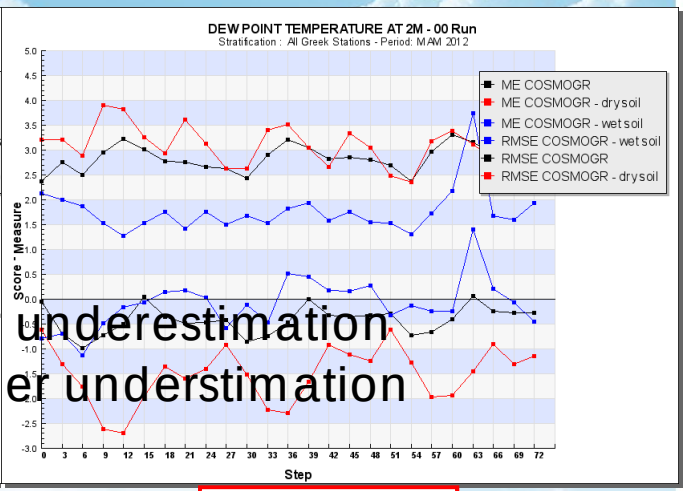
Spring



W_SO Water content of first soil layer(kg/m2) **1cm.**







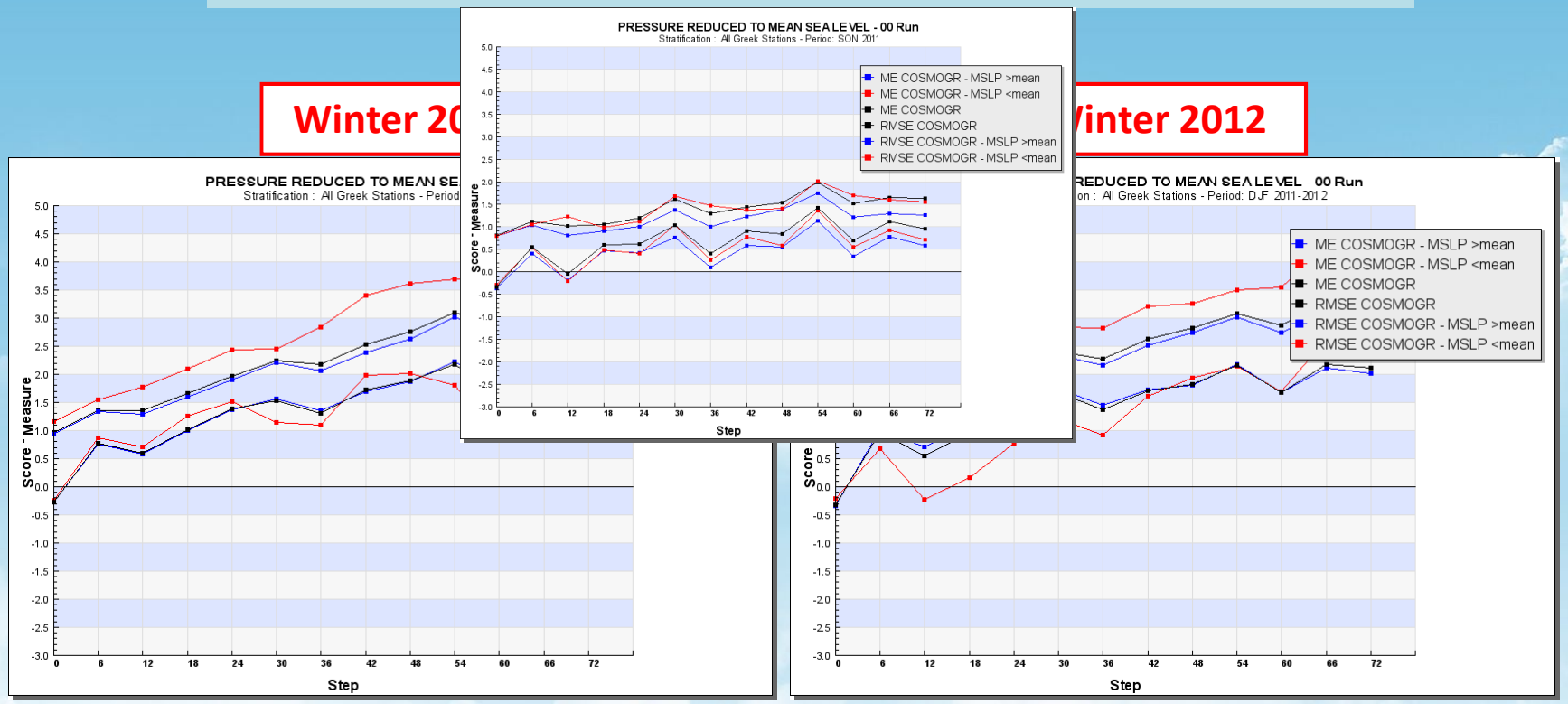
Td: Higher error in dry soil and larger underestimation

2mT: Higher error in wet soil and larger understimation

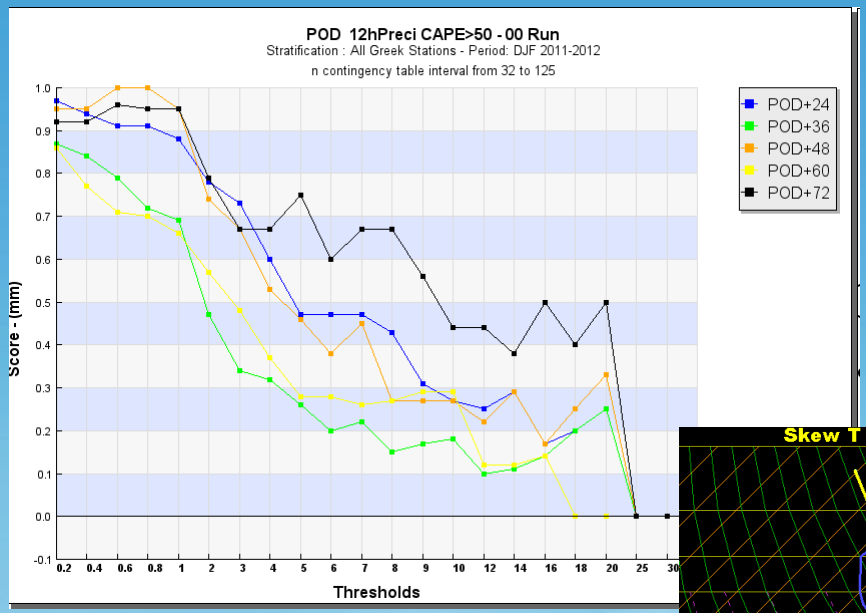
Fall **Winter** **Spring**

MSLP for winter with comparison to cases when higher – lower Mean

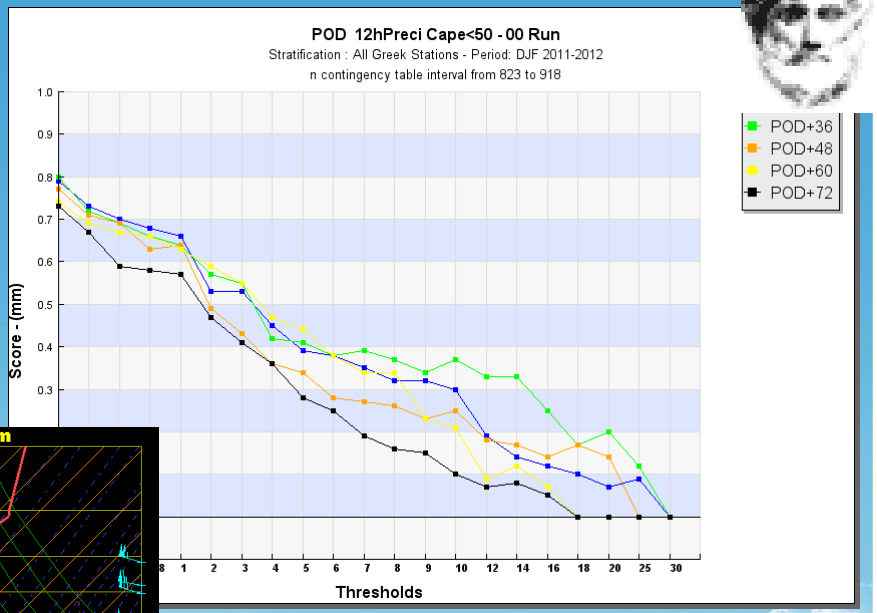
For the cases that MSLP is lower than mean in the winter (possible passage of low pressure system), the model underpredicts more MSLP values and the error is higher.

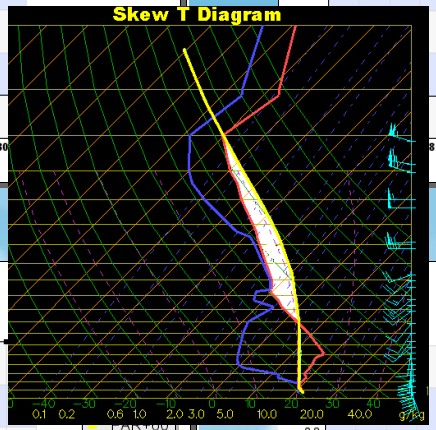


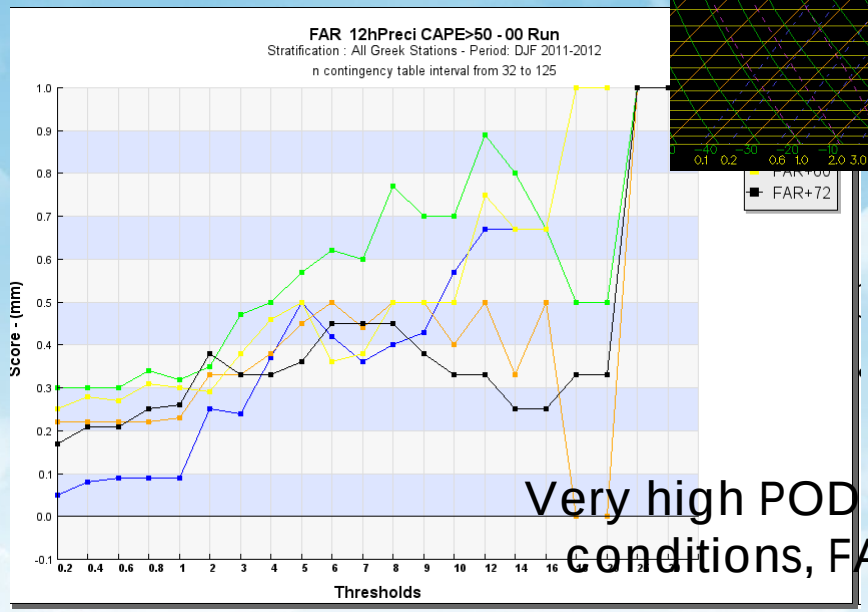
CAPE>50

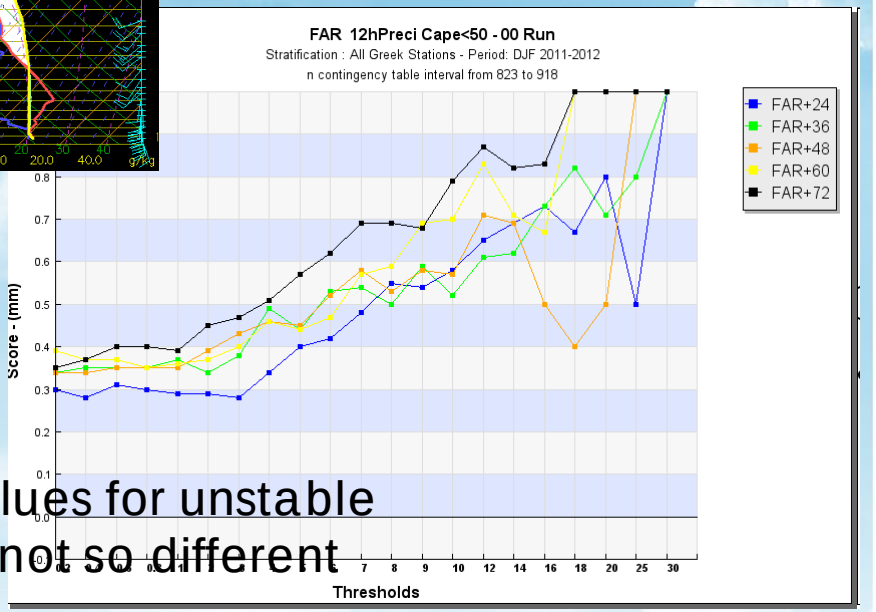


CAPE<50



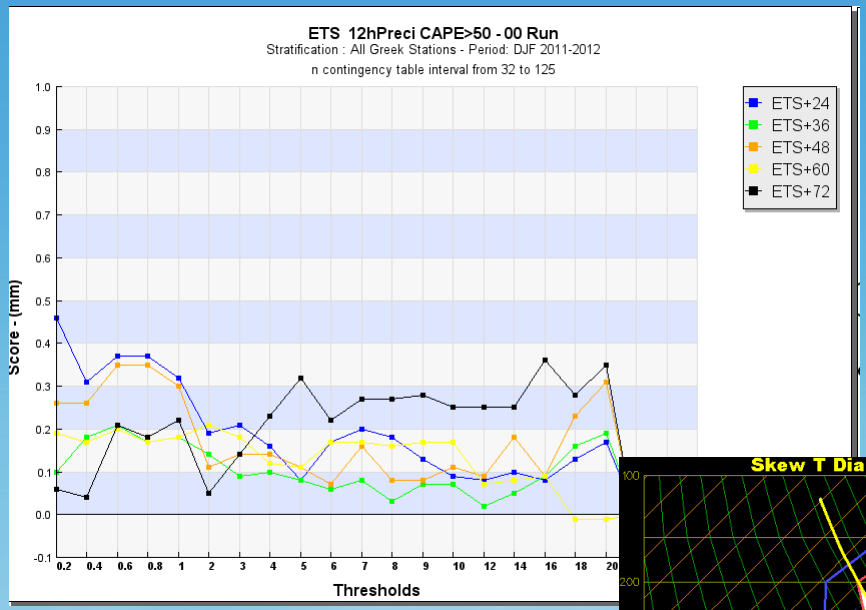




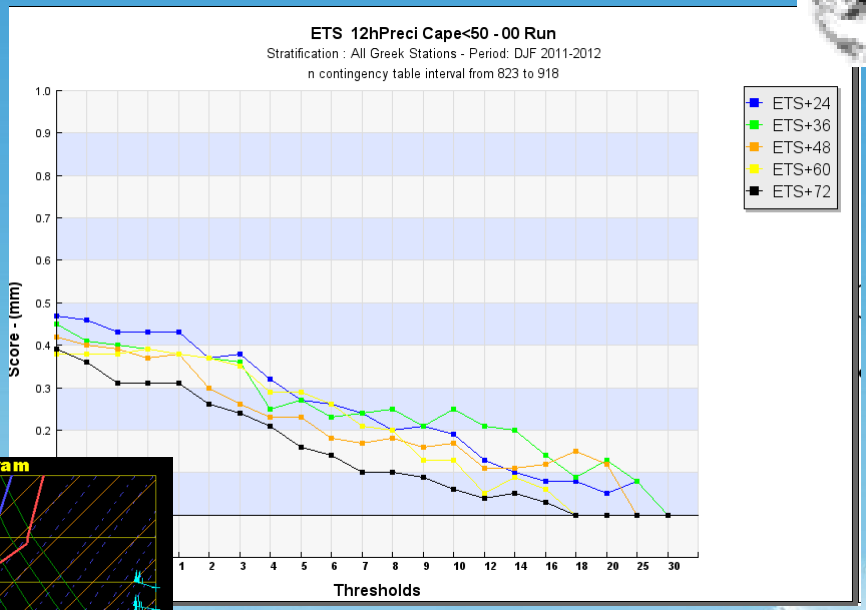


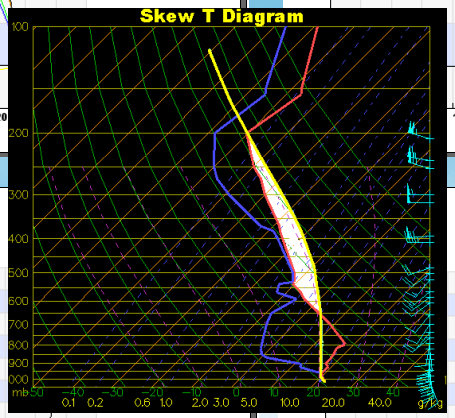
Very high POD values for unstable conditions, FAR not so different

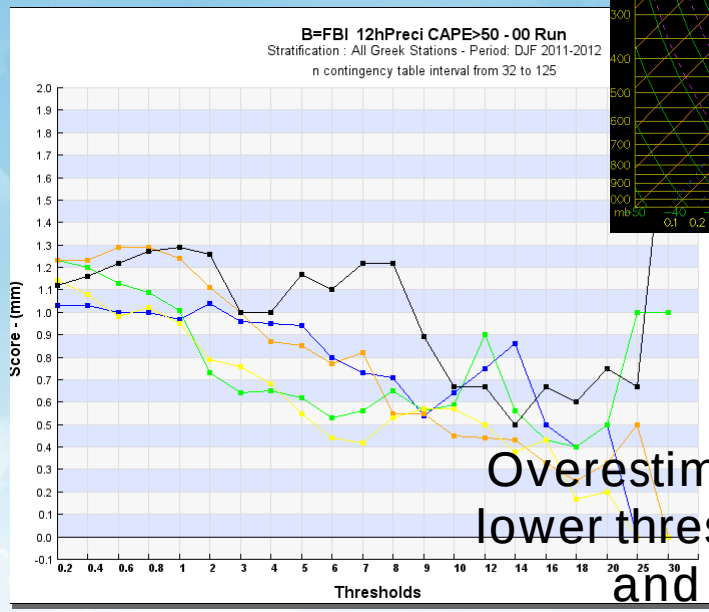
CAPE>50

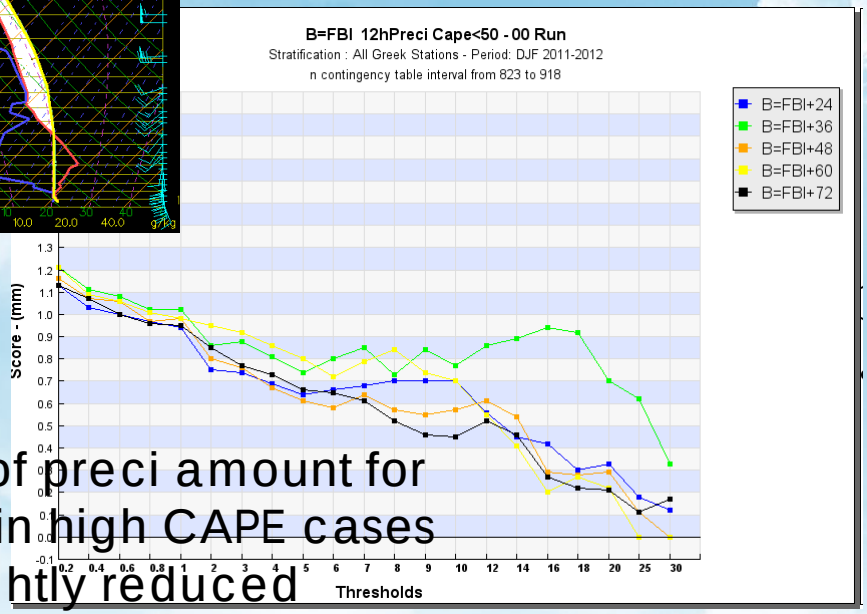


CAPE<50









Overestimation of preci amount for lower thresholds in high CAPE cases and ETS slightly reduced

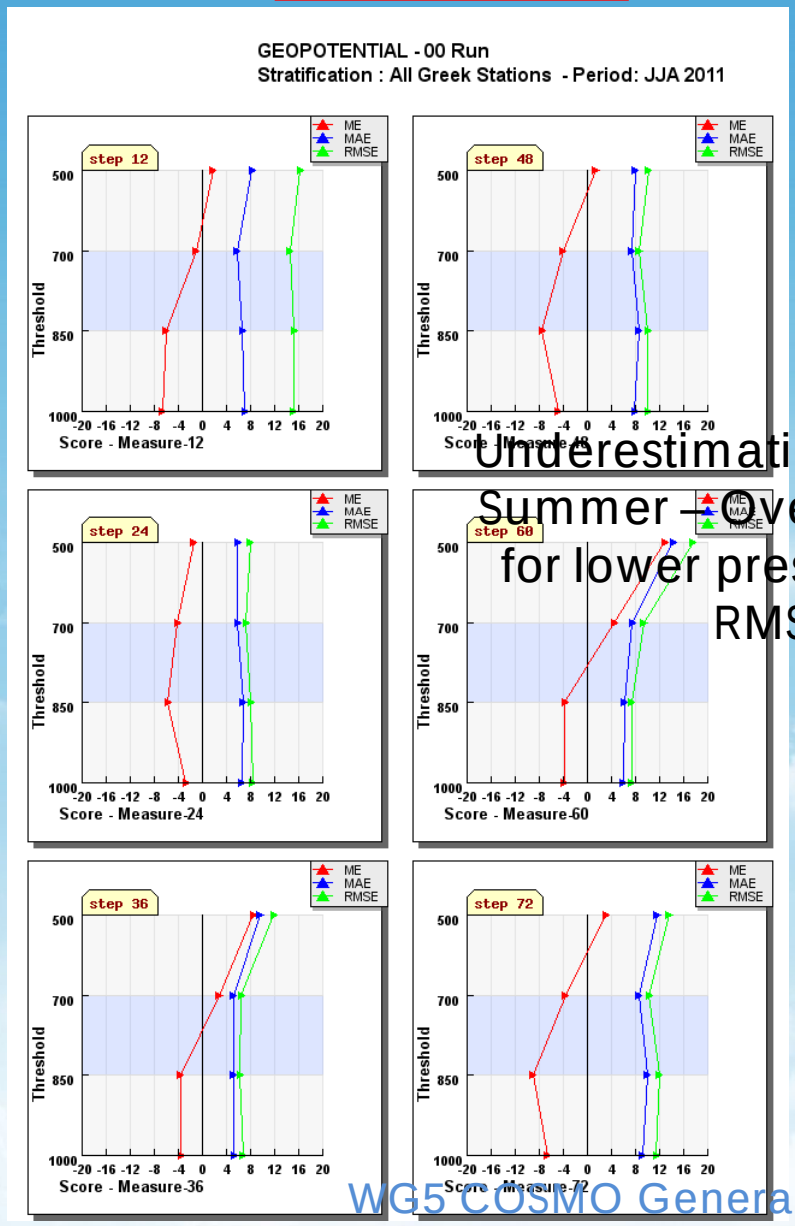
Upper Air Verification

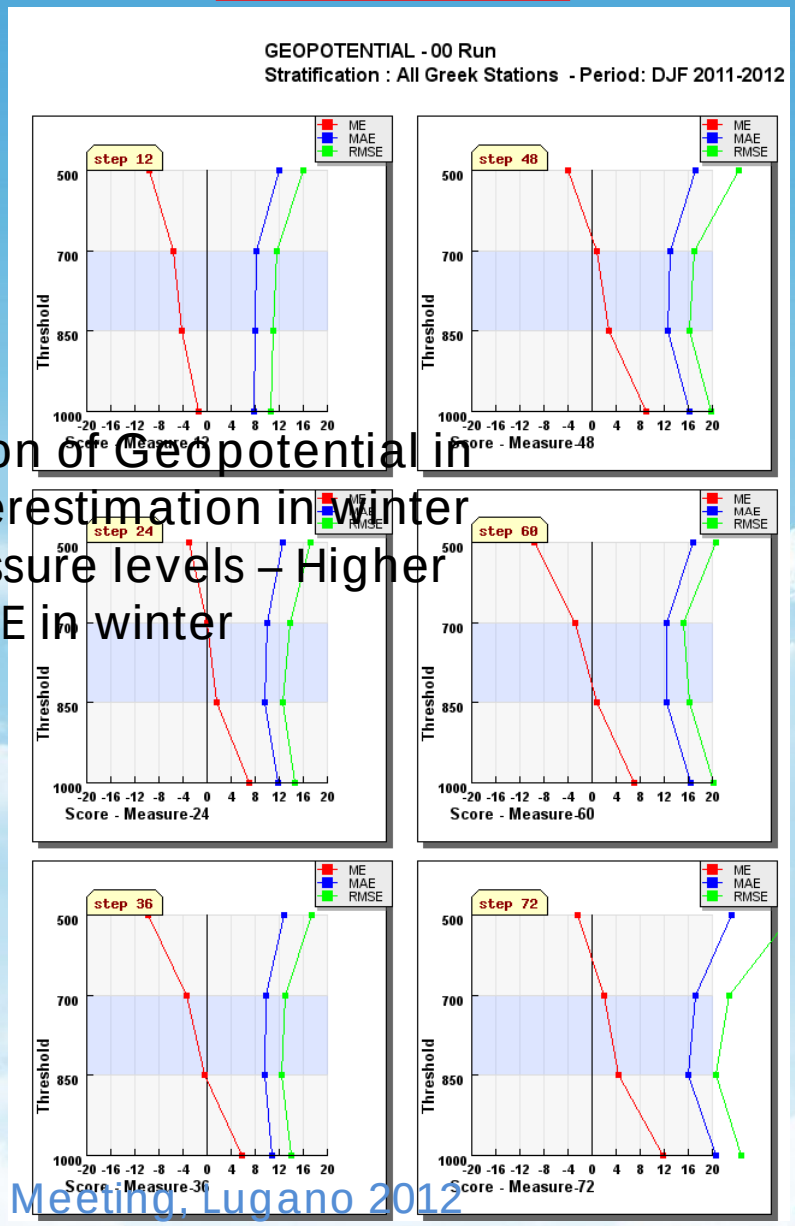
WG5 COSMO General Meeting, Lugano 2012

GEOPOTENTIAL

Summer

Winter



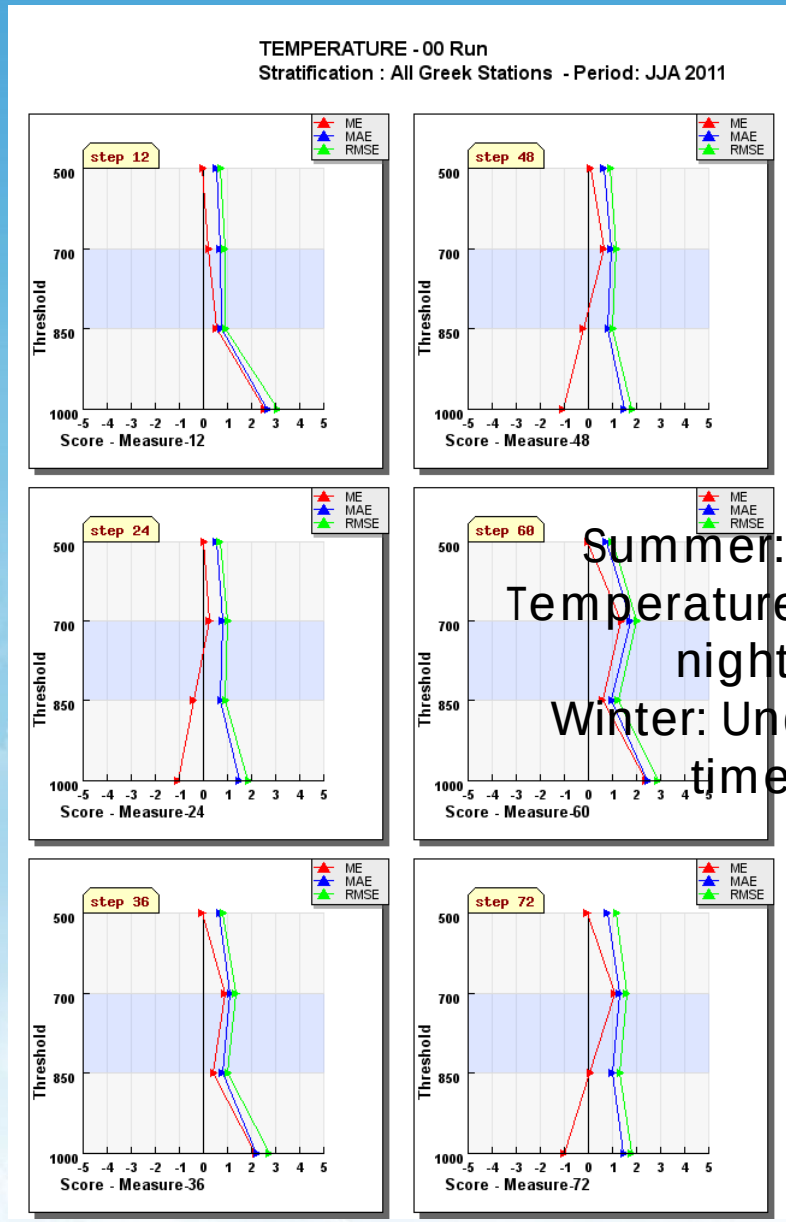


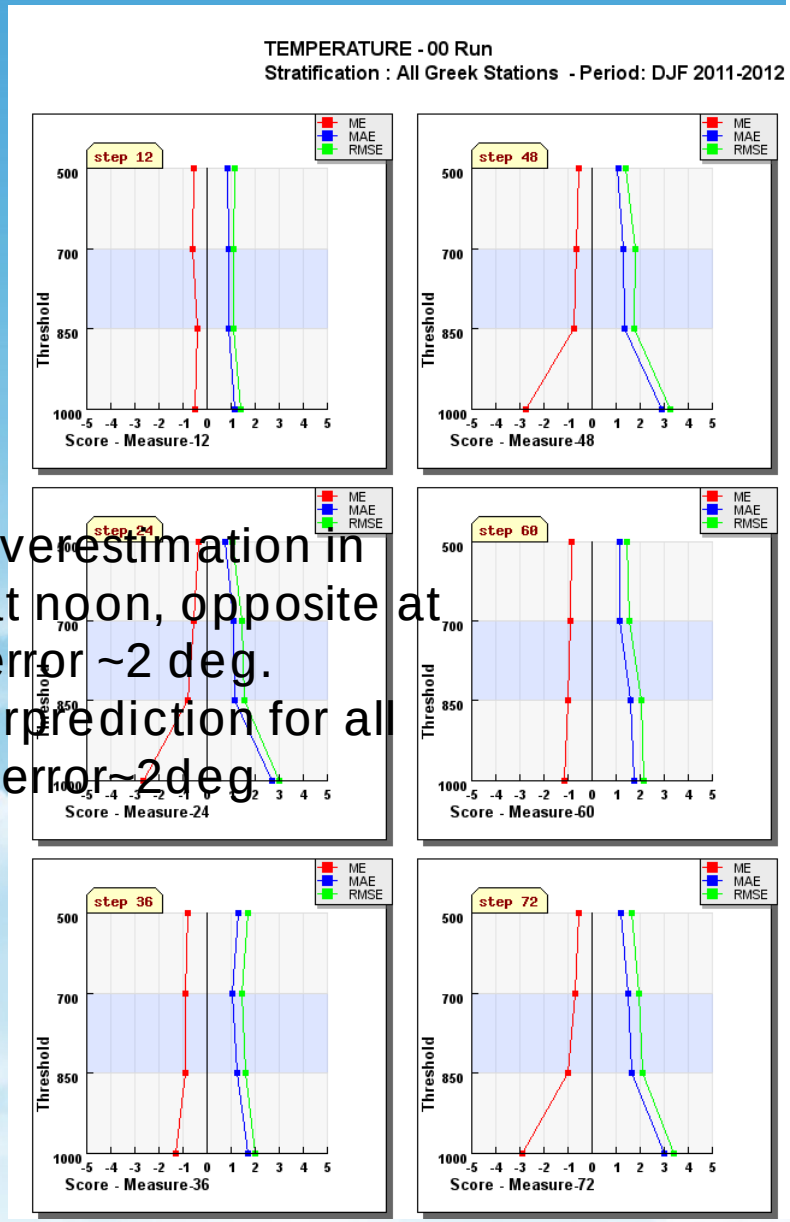
Underestimation of Geopotential in Summer – Overestimation in winter for lower pressure levels – Higher RMSE in winter

TEMPERATURE

Summer

WInter

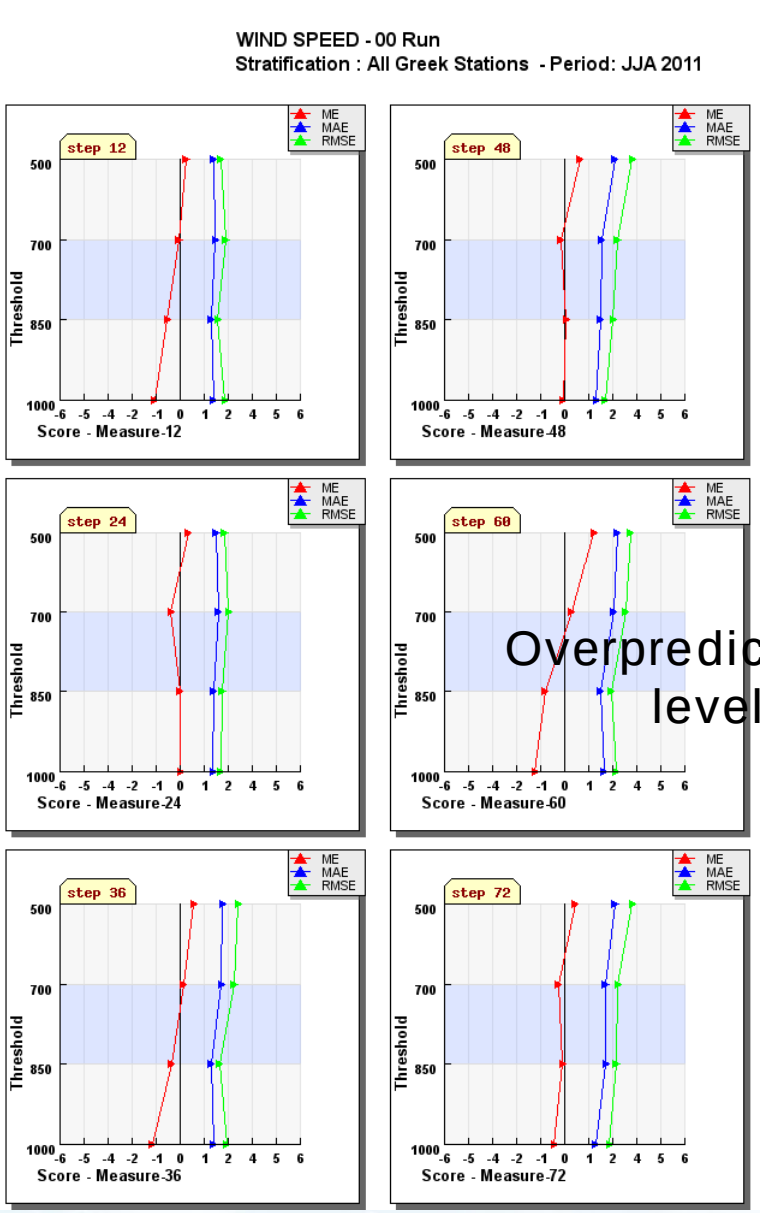




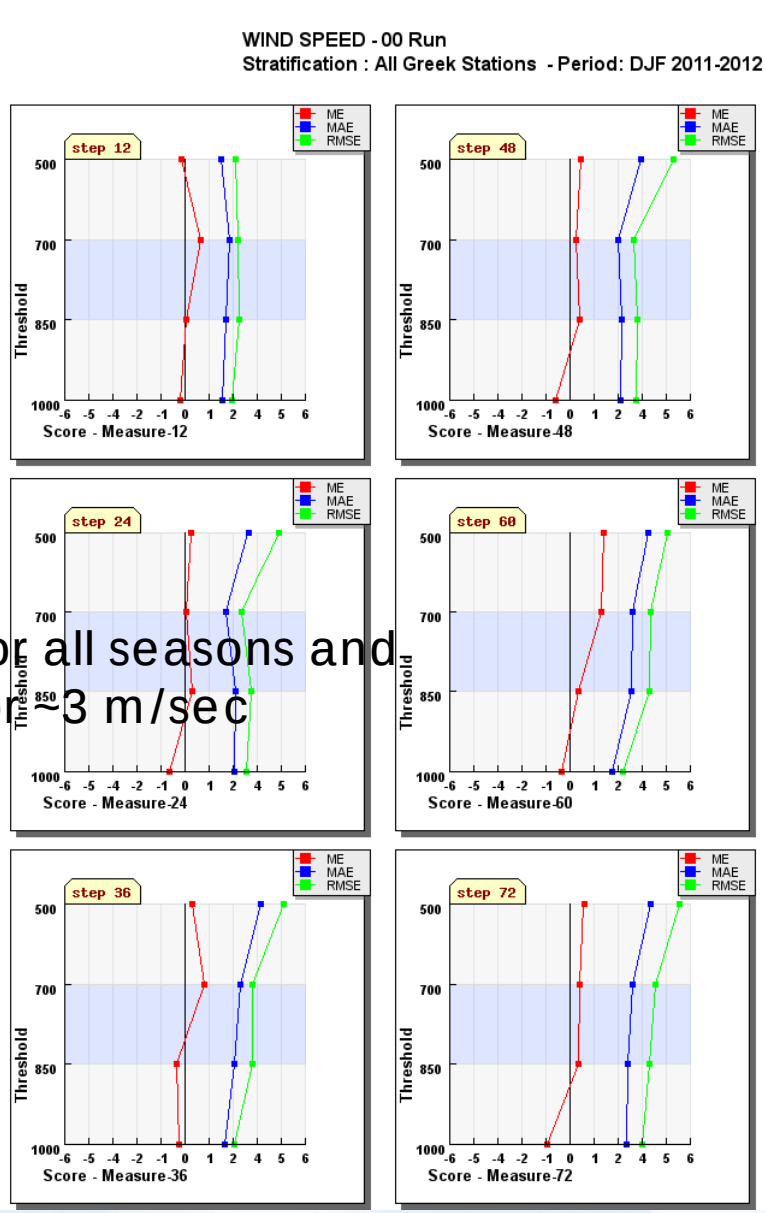
Summer: Overestimation in Temperature at noon, opposite at night, error ~2 deg.
Winter: Underprediction for all times, error~2deg

Wind Speed

Summer



WInter



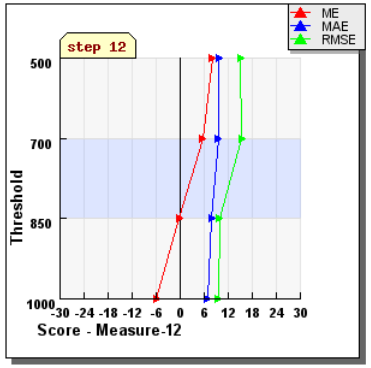
Overprediction for all seasons and levels, error ~3 m/sec

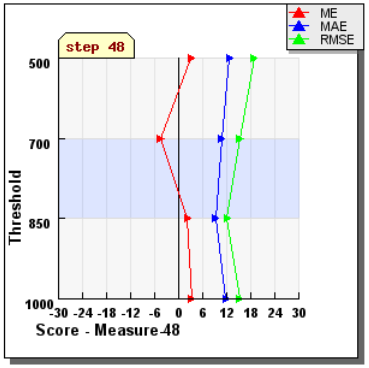
Relative Humidity

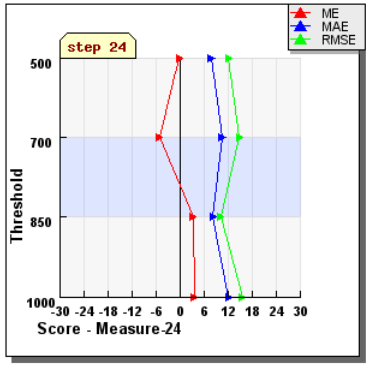
Summer

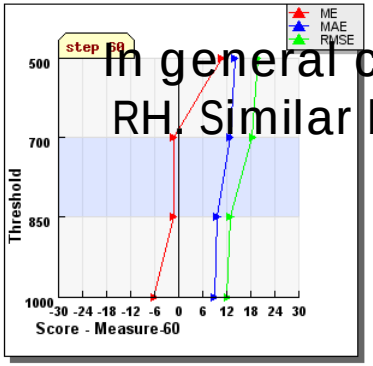
WInter

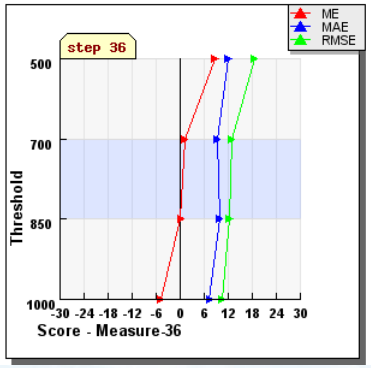
RH - 00 Run
Stratification : All Greek Stations - Period: JJA 2011

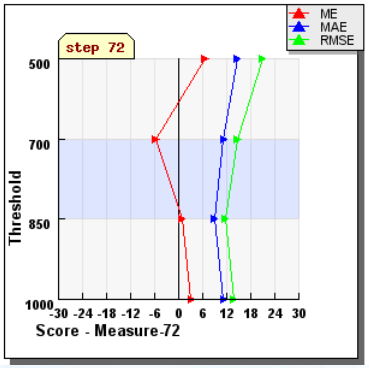




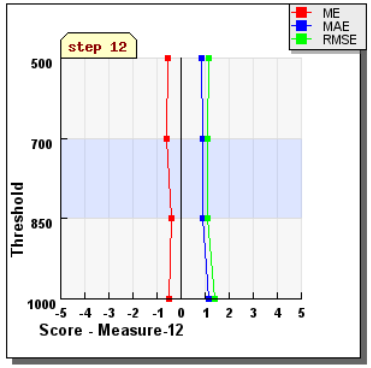


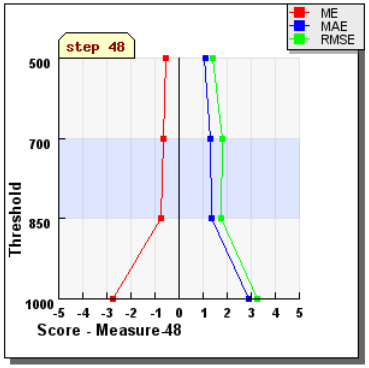


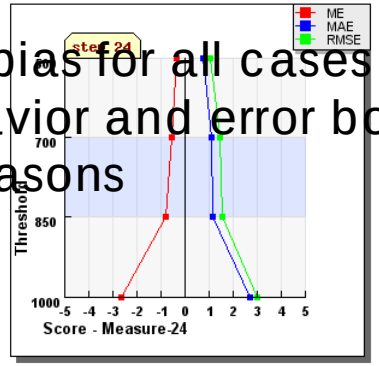


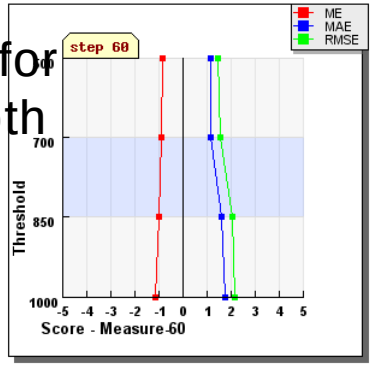


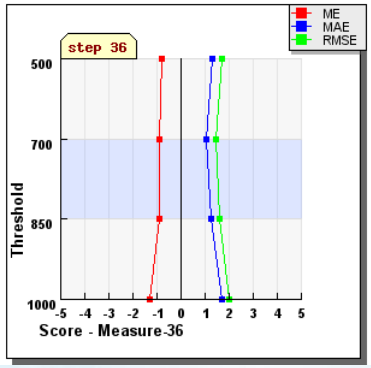
TEMPERATURE - 00 Run
Stratification : All Greek Stations - Period: DJF 2011-2012

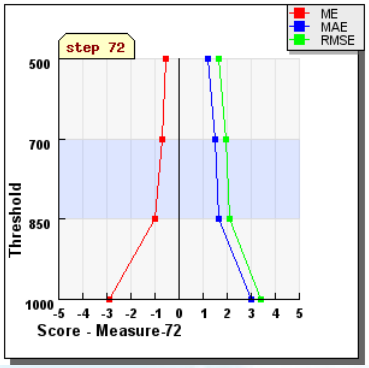




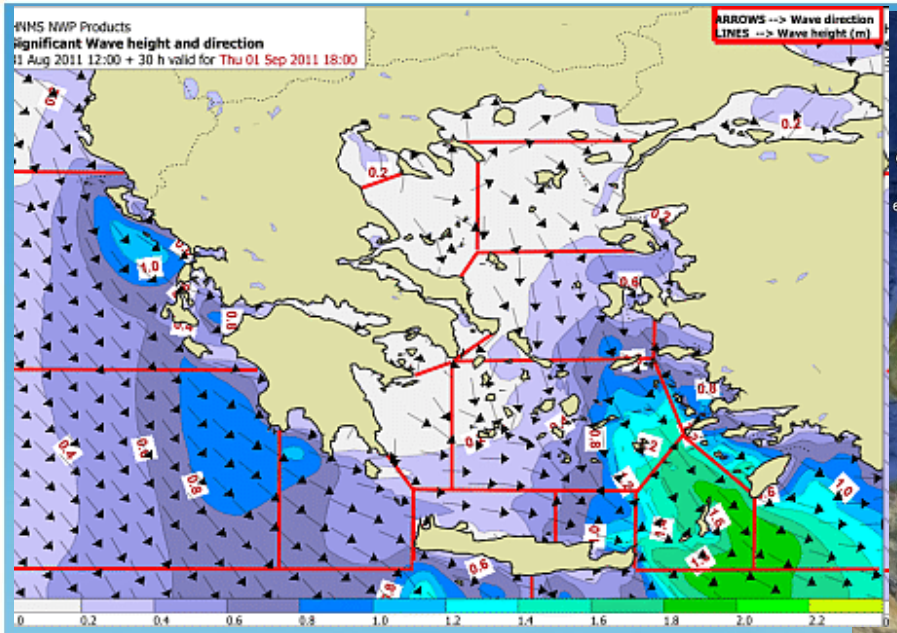






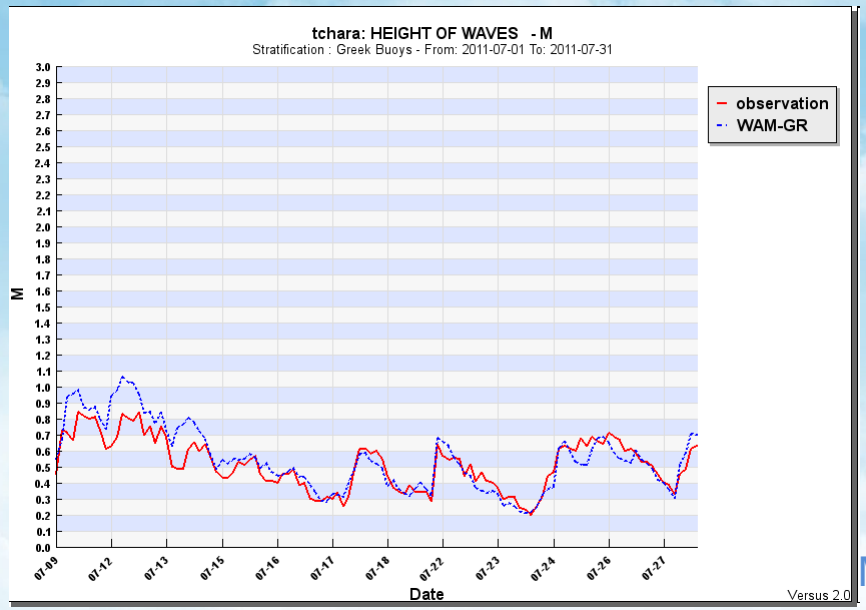


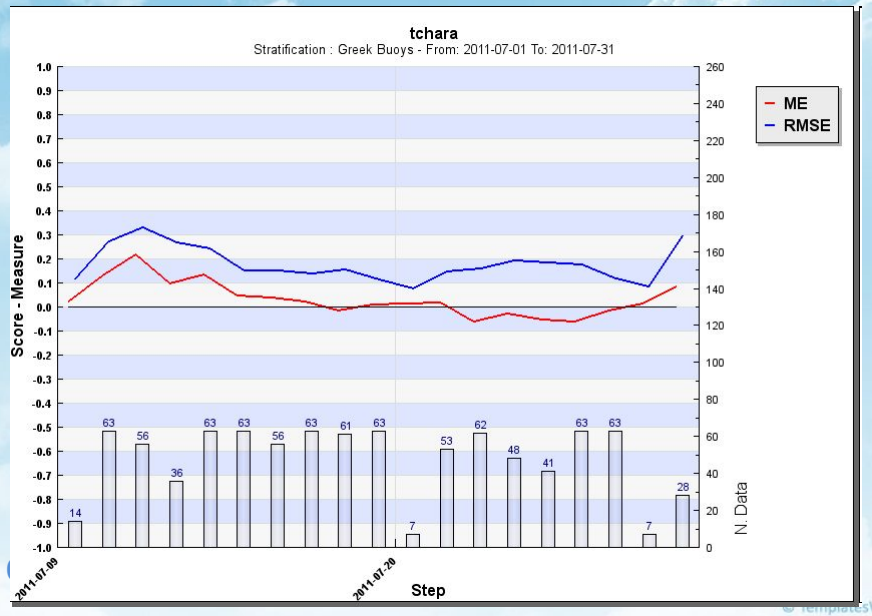
In general cold bias for all cases for RH. Similar behavior and error both seasons

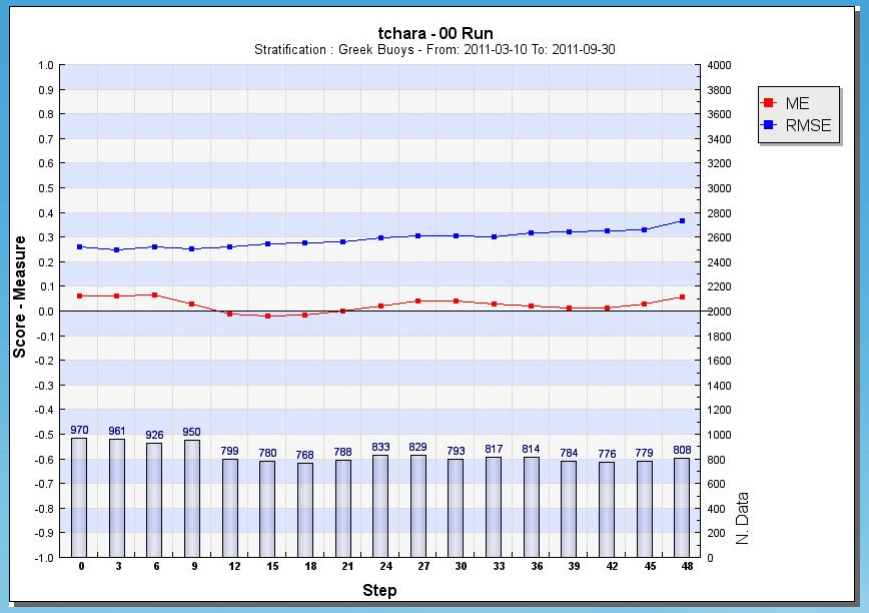


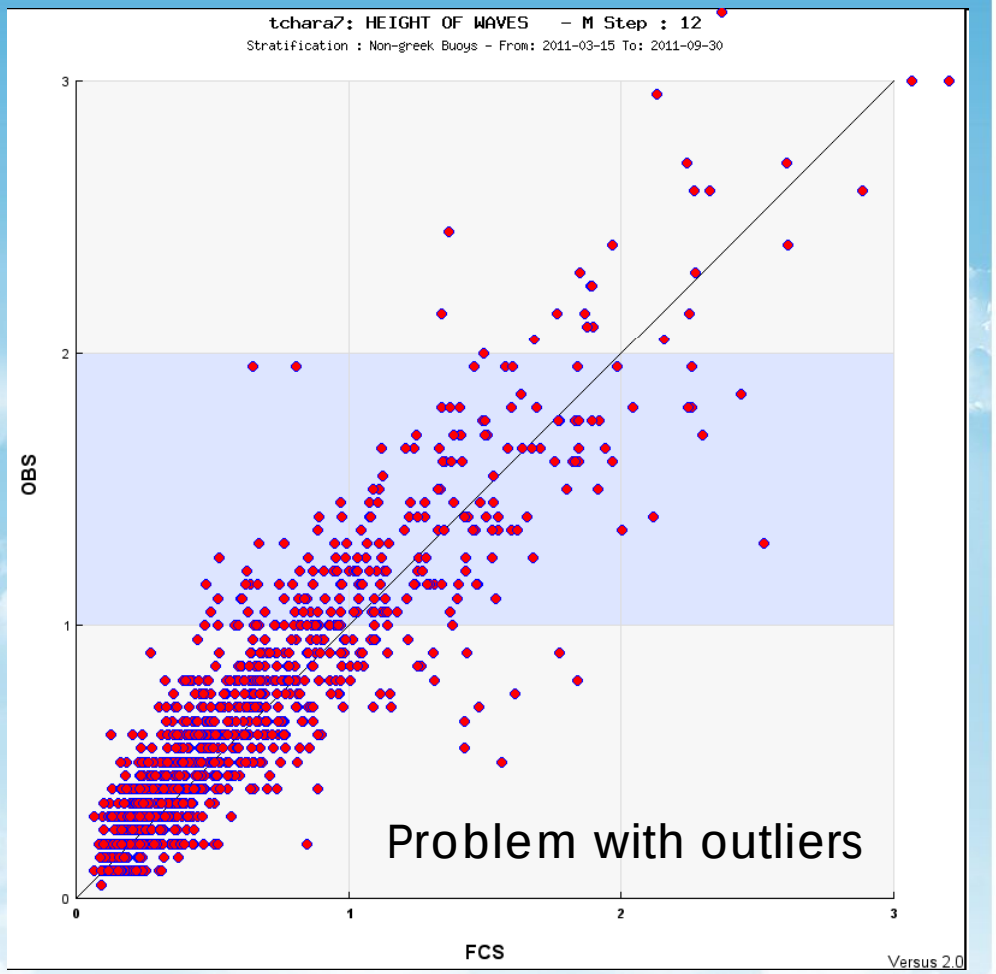
Wave Atmospheric Model

Driven by COSMOGR (7km) output - Verification of significant wave height/direction



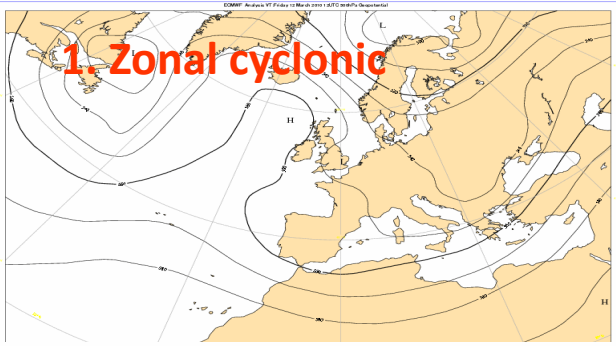


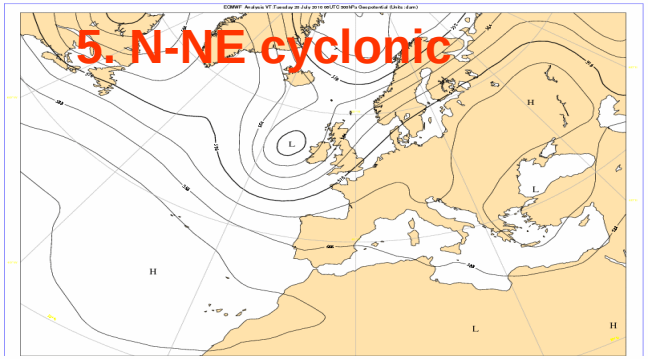


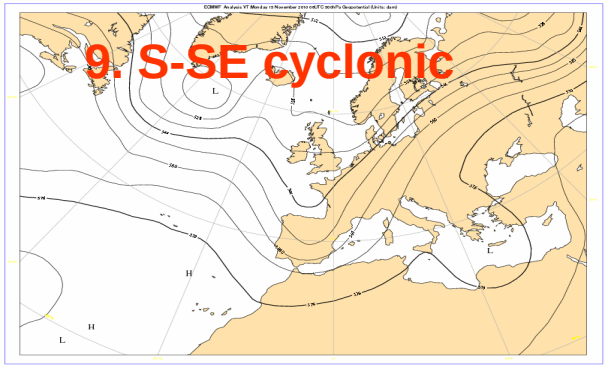


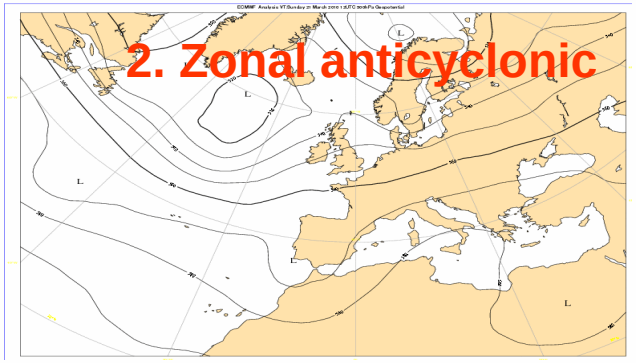
Weather Defined Verification

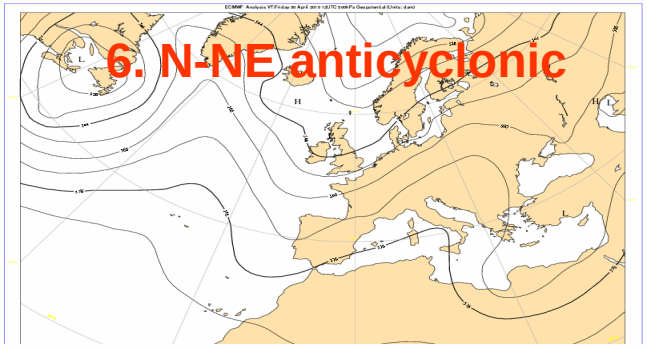
WG5 COSMO General Meeting, Lugano 2012

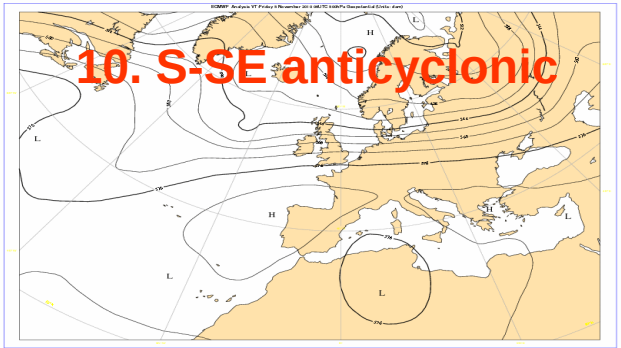

1. Zonal cyclonic

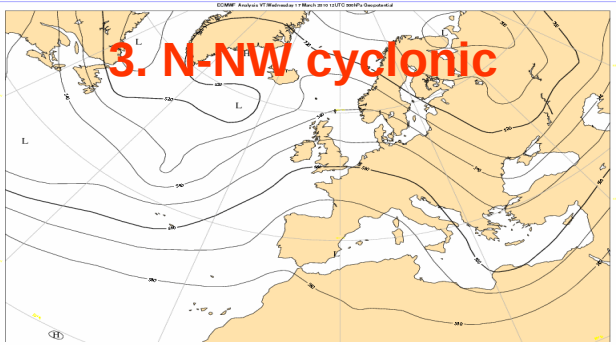

5. N-NE cyclonic

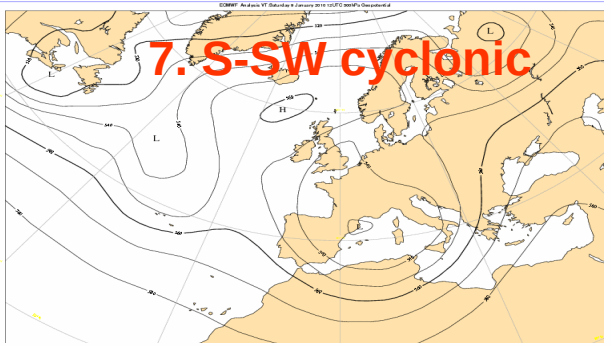

9. S-SE cyclonic

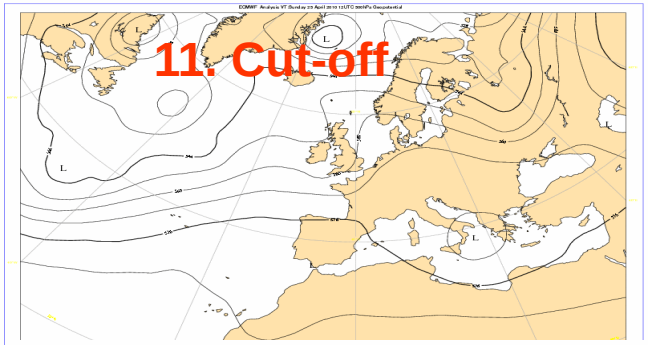

2. Zonal anticyclonic

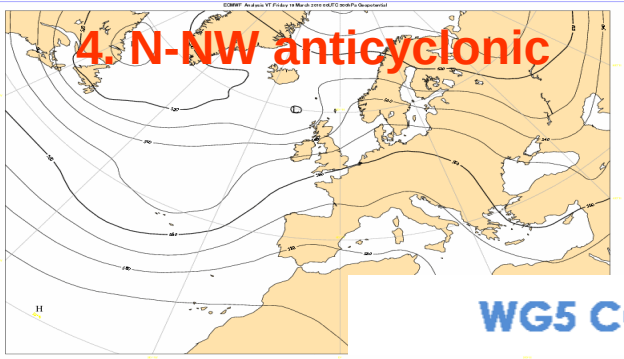

6. N-NE anticyclonic

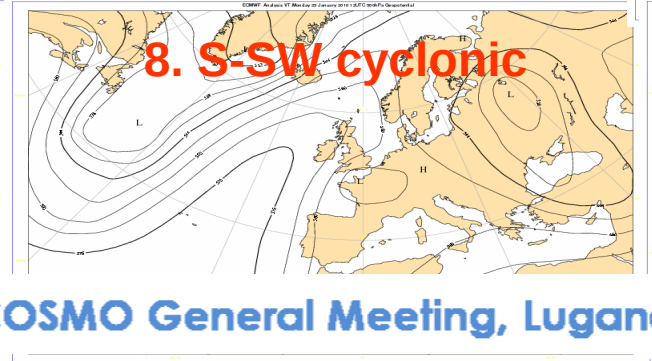

10. S-SE anticyclonic

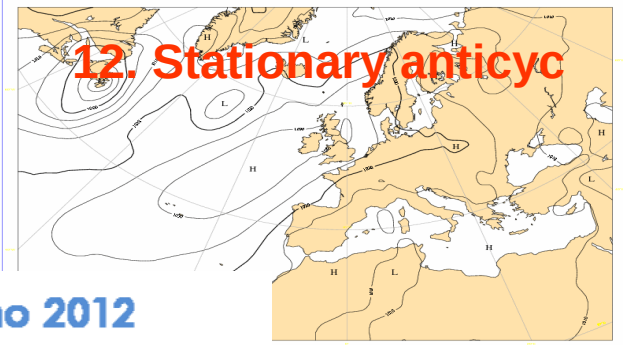

3. N-NW cyclonic


7. S-SW cyclonic


11. Cut-off

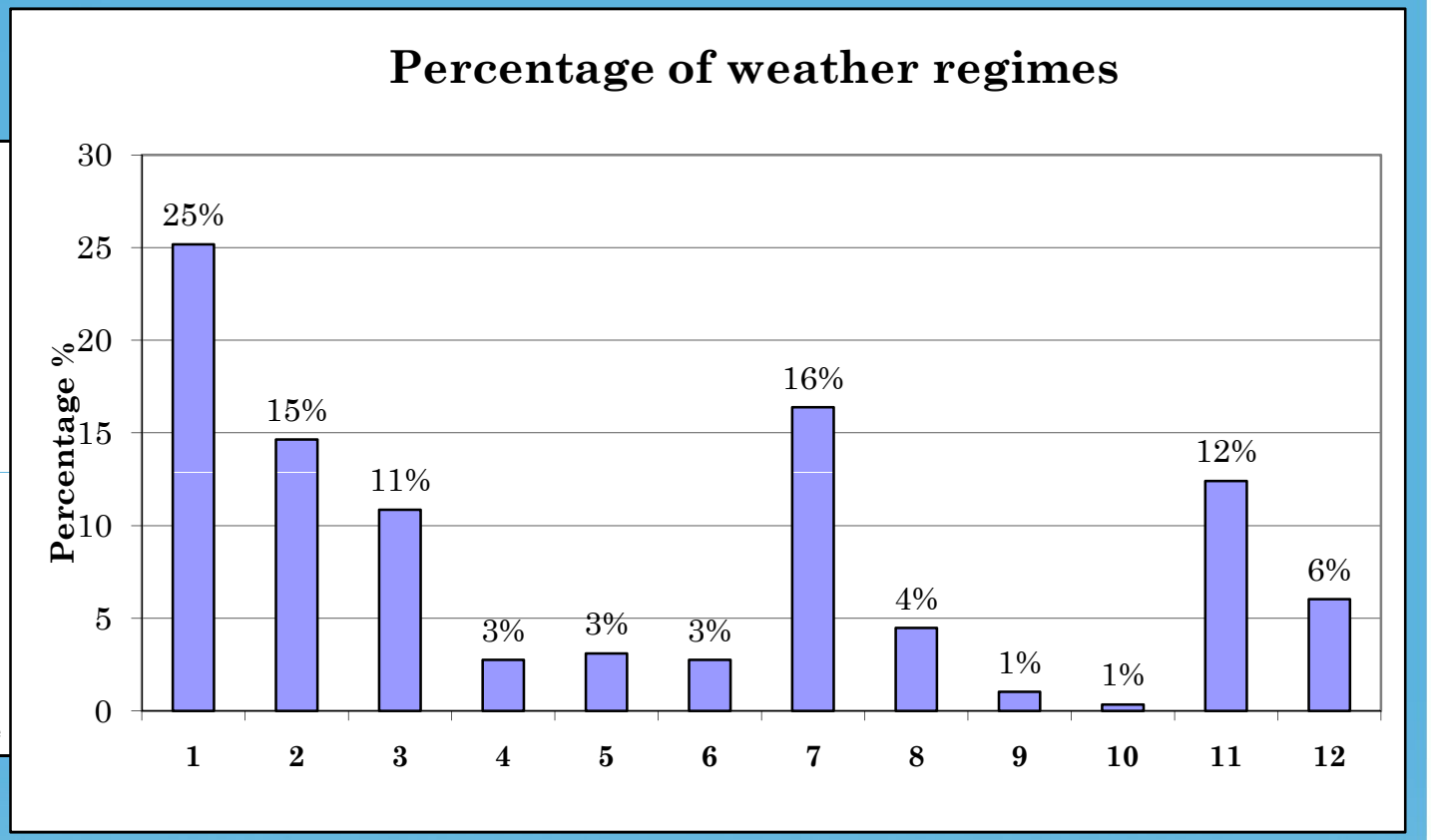

4. N-NW anticyclonic


8. S-SW cyclonic

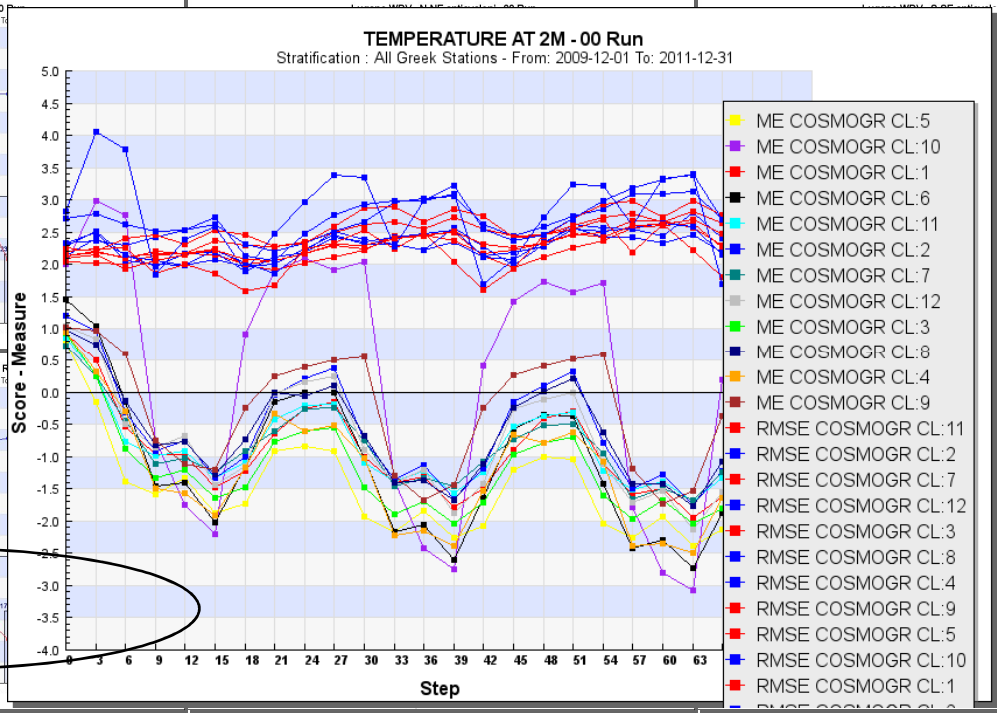

12. Stationary anticyc

Weather Classification: 01/09/2009-31/12/2011=580day

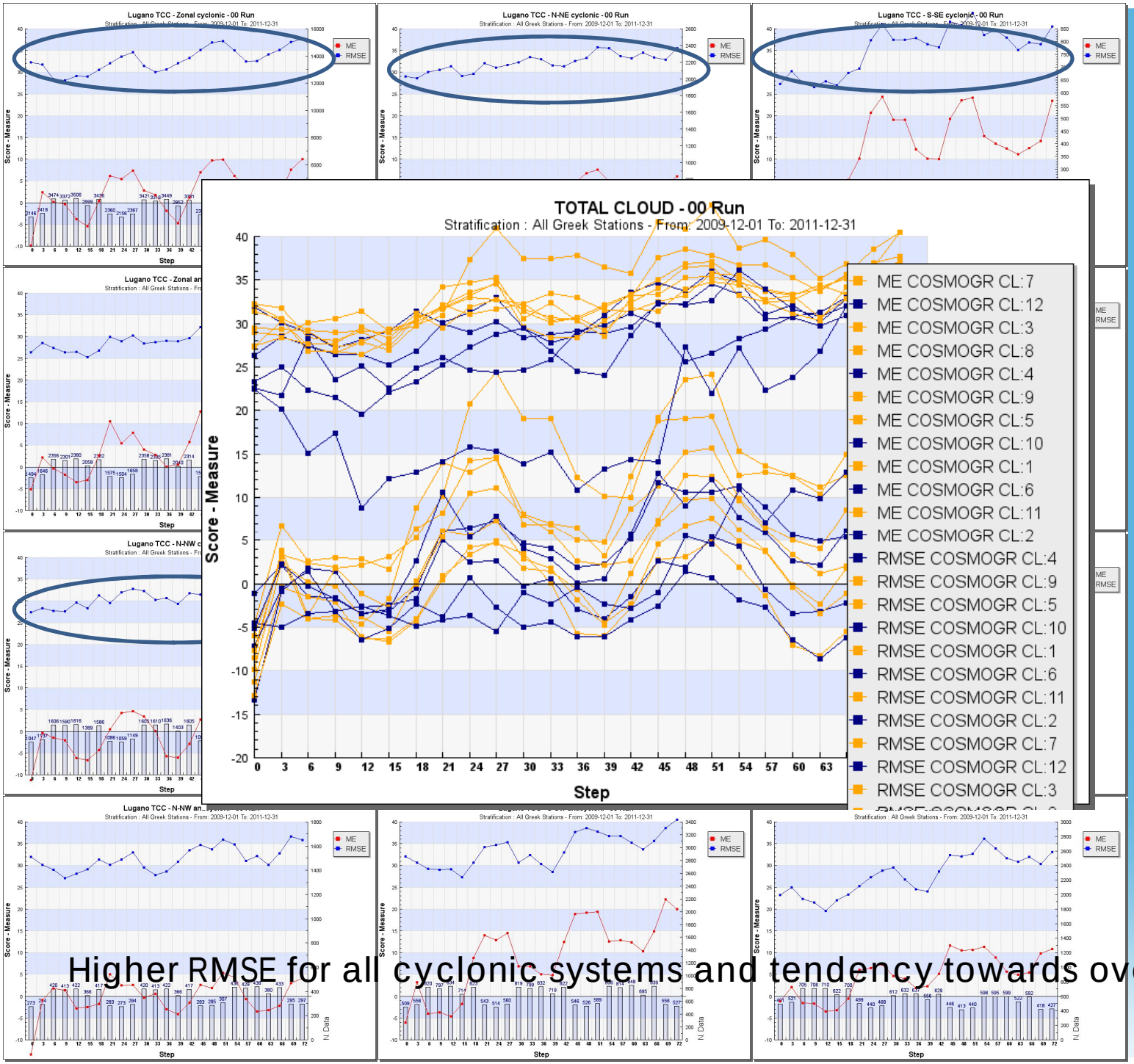
1	Zonal cyclonic
2	Zonal anticyclonic
3	N-NW cyclonic
4	N-NW anticyclonic
5	N-NE cyclonic
6	N-NE anticyclonic
7	S-SW cyclonic
8	S-SW anticyclonic
9	S-SE cyclonic
10	S-SE anticyclonic
11	Cut-off
12	Stationary Anticyclone



Temp 2m

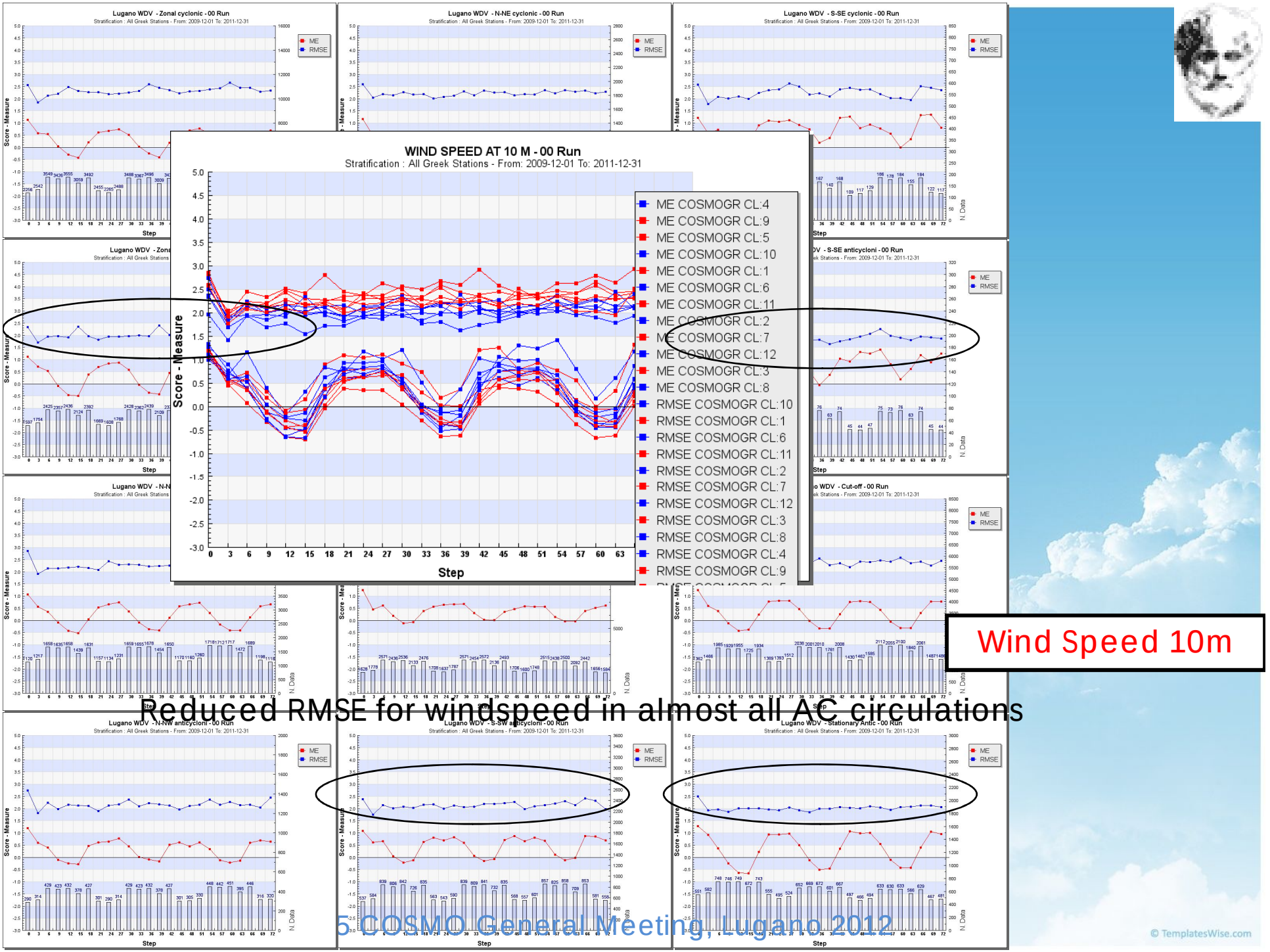


Higher underprediction of T2m for northern systems (NW, NE) and lower for southern systems



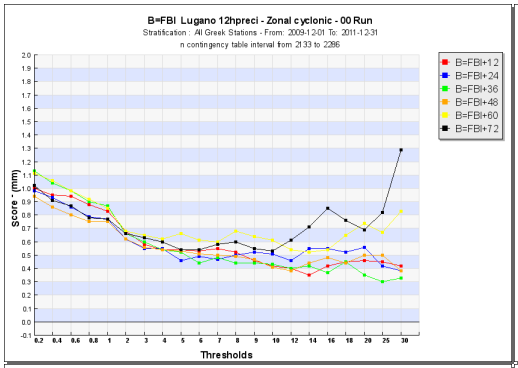
TCC

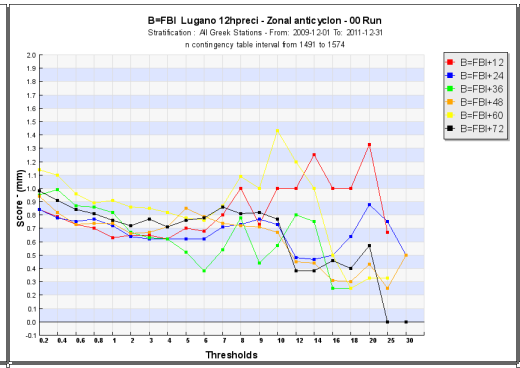
Higher RMSE for all cyclonic systems and tendency towards overprediction

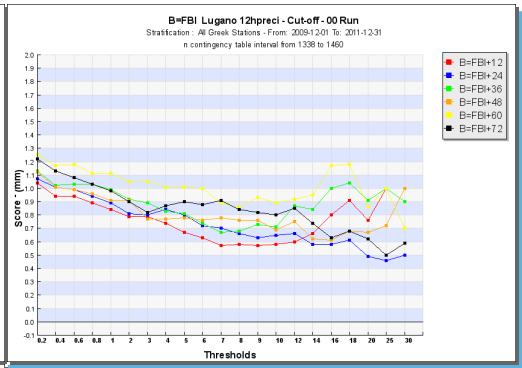


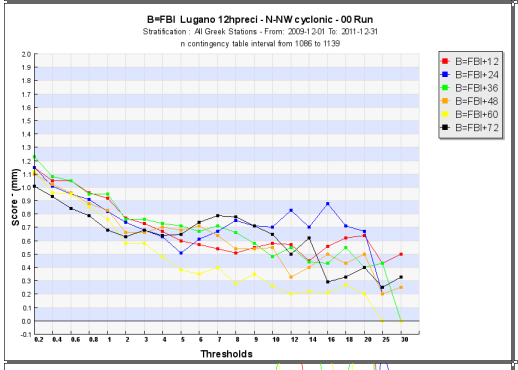
Wind Speed 10m

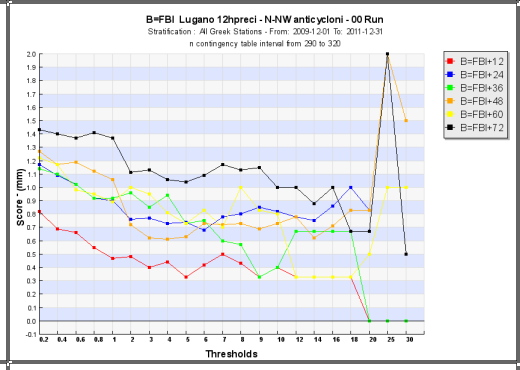
Reduced RMSE for windspeed in almost all AC circulations

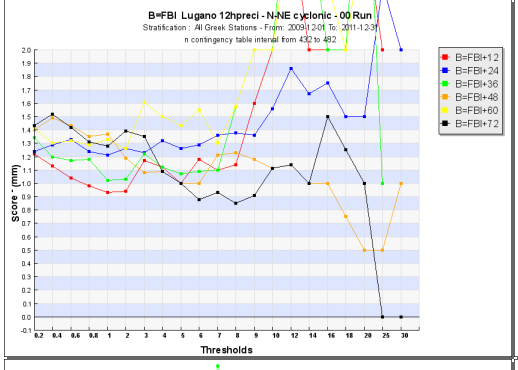


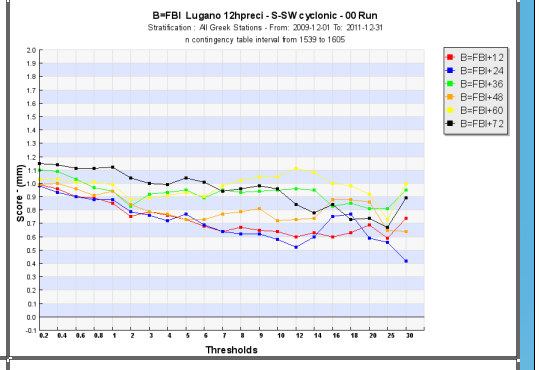


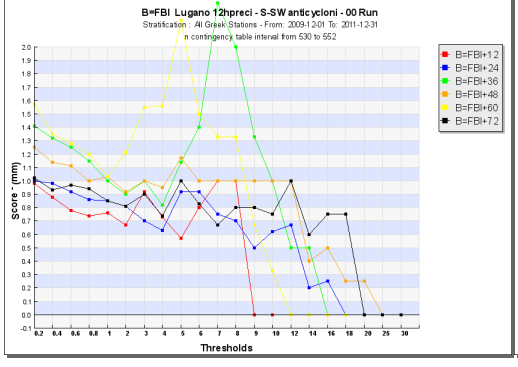


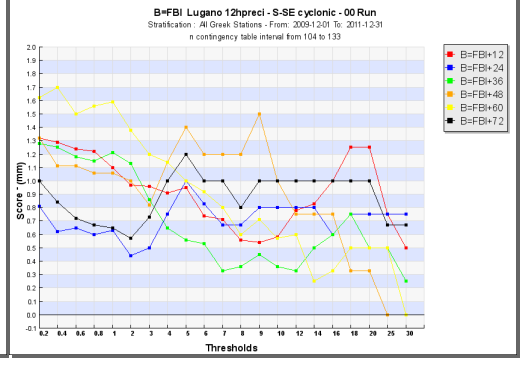




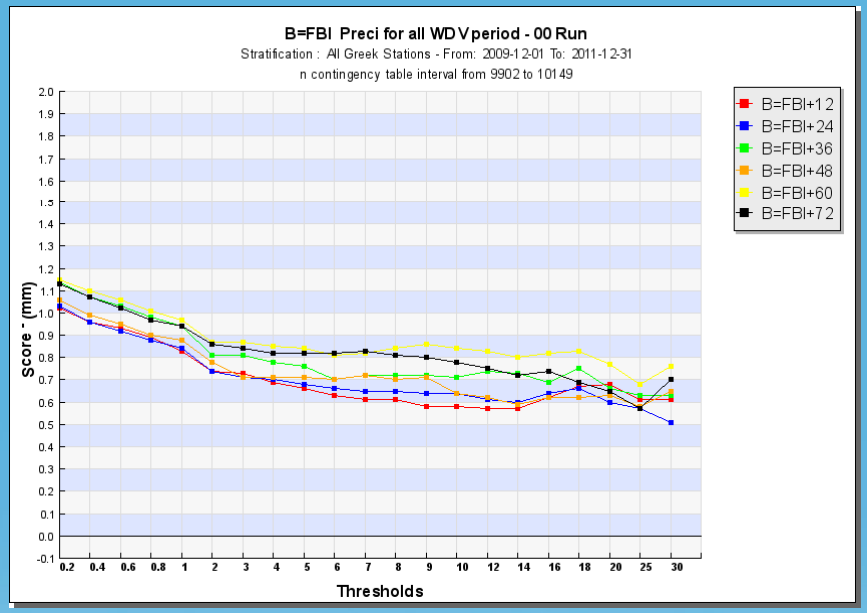




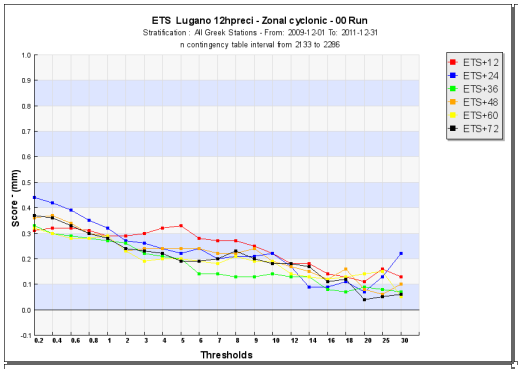


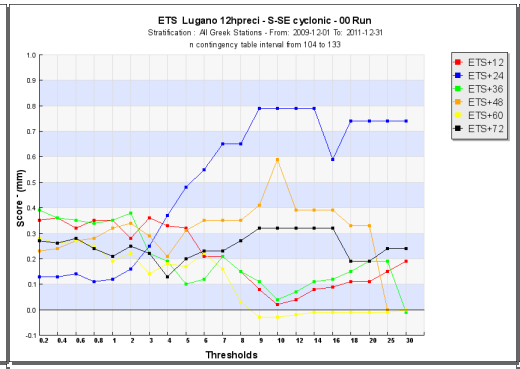


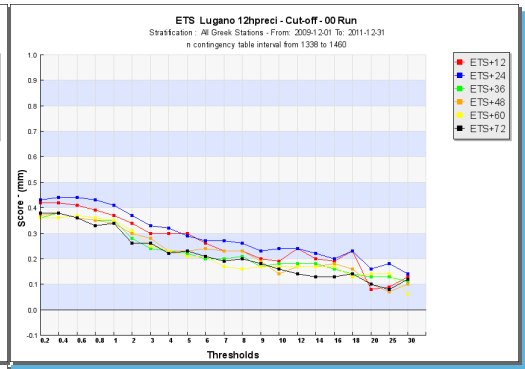
TOTAL

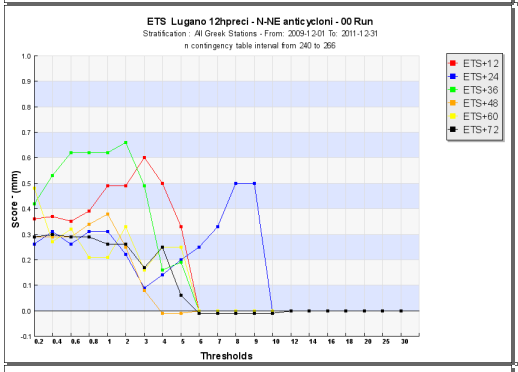


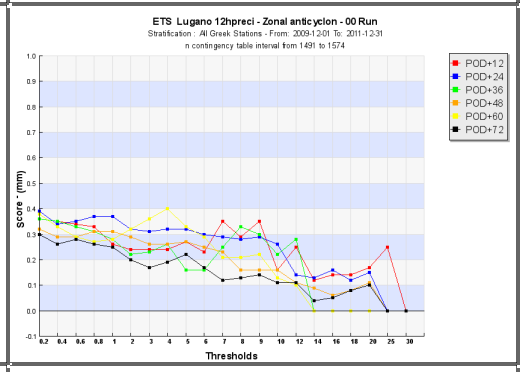
FBI exhibits underpretection in the lower precipitation thresholds when present is an anticyclonic circulation



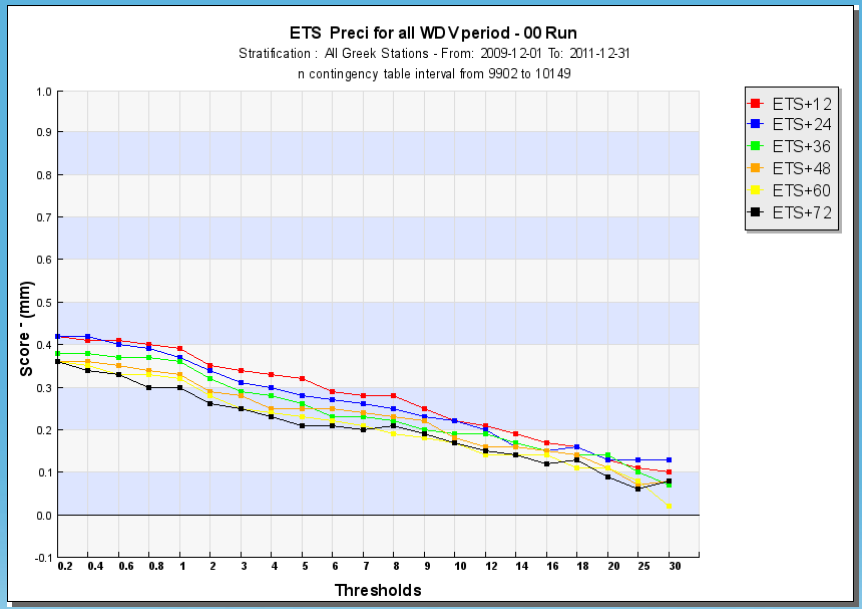


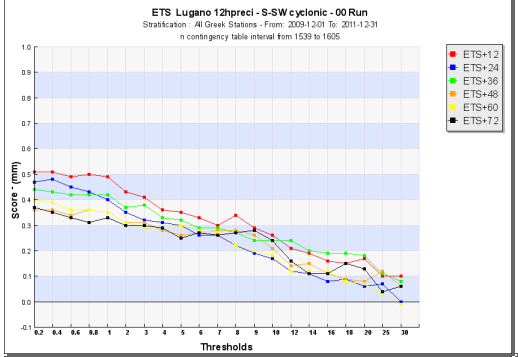


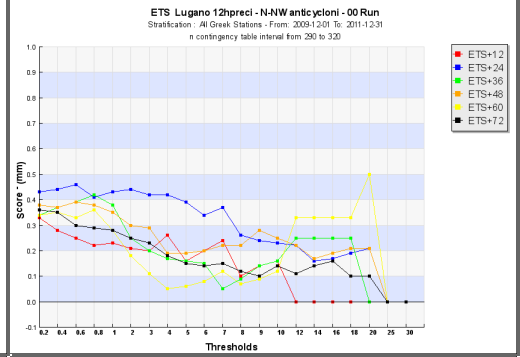


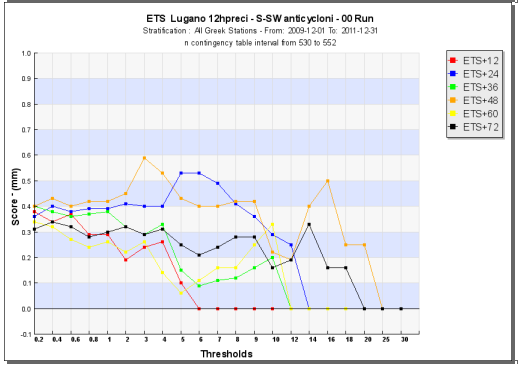


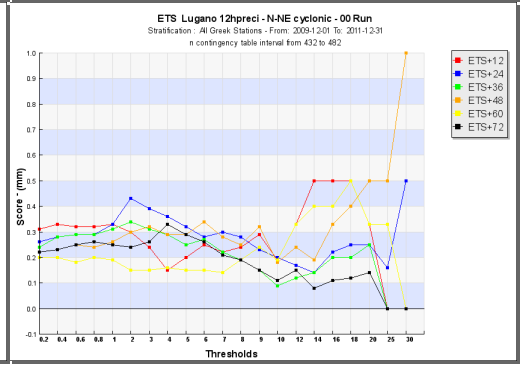
TOTAL











ETS scores slightly
better for SW systems

Thank you!