SRNWP-verification programme

Clive Wilson –Programme manger

32nd EWGLAM/17th SRNWP meetings – Exeter 4-7 October 2010

Contents

- Intercomparison
  - Progress
  - Results
- Other Deliverables
- Follow-on programme
- Proposed End of Programme workshop
  - Exeter/Reading/virtual participation ?
  - End Nov/early December 2010

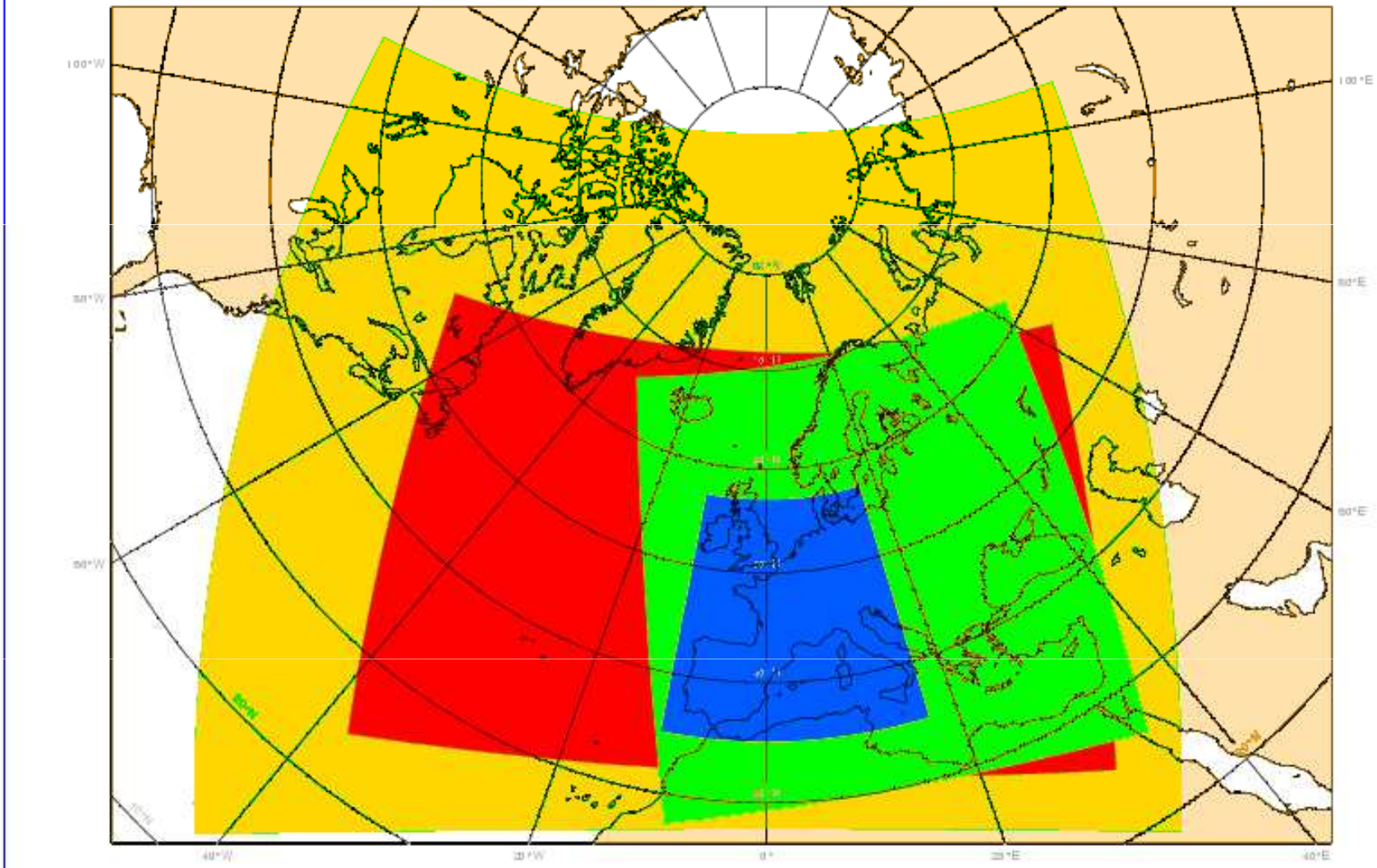
EUMETNET/SRNWP programme - Deliverables

- **D1: Operational verification comparison of deterministic forecasts from one version of each of the 4 regional models of Europe (available for all the participating members)**
- **D2: Additional intercomparison of other versions of the consortia models including high resolution models**
- **D3: Inventory and recommendations of "new" scale-selective verification methods.**
- **D4: Catalogue of sources of non-GTS data**
- **D5 Exchange methods and code for verification of severe weather forecasts**

Intercomparison

- Regular exchange of forecasts 00UTC only
  - Single forecast per day exposes diurnal effects
- Verification
  - MSLP
  - 2m temperature and relative humidity
  - 10m wind
  - 6h accumulated precipitation
- Compared to station observations

Domains of 4 consortia reference models



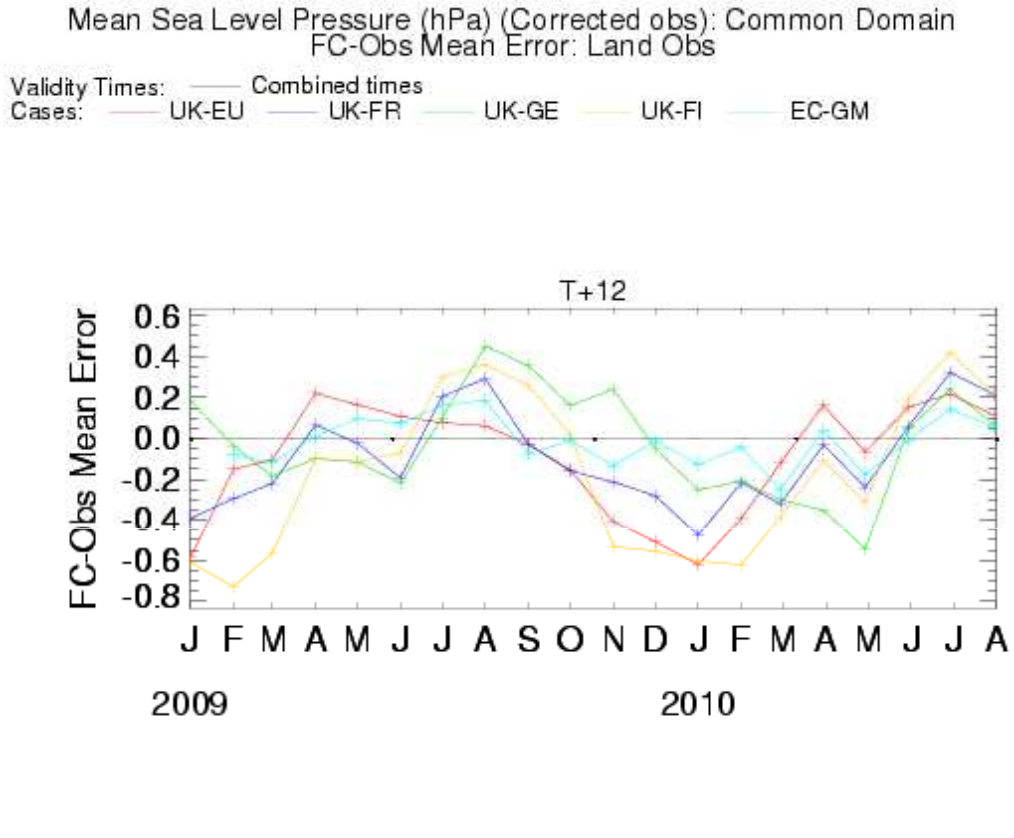
15km

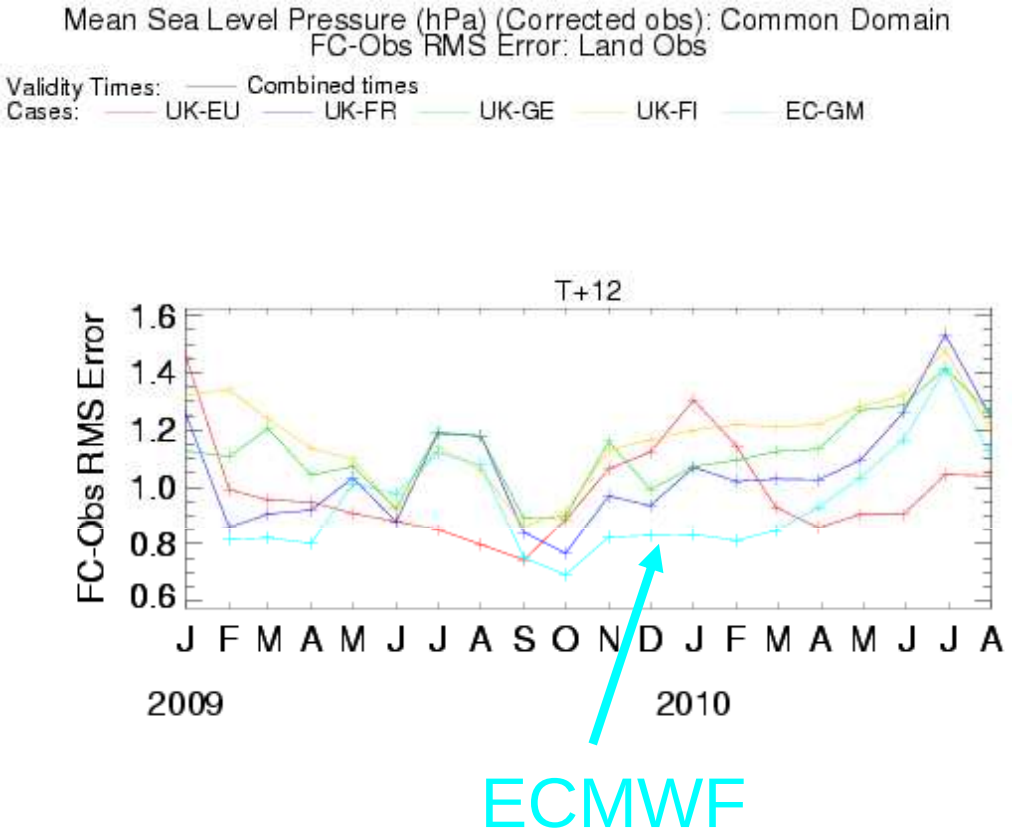
12km

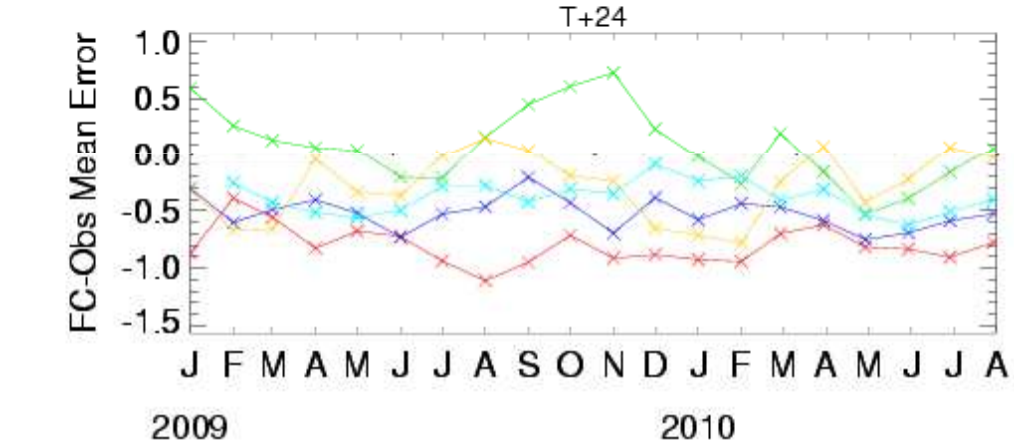
7km

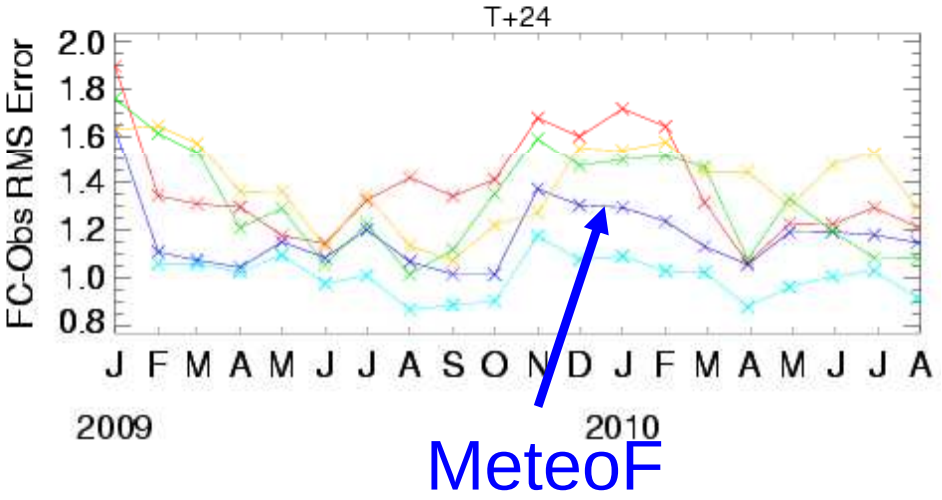
10km

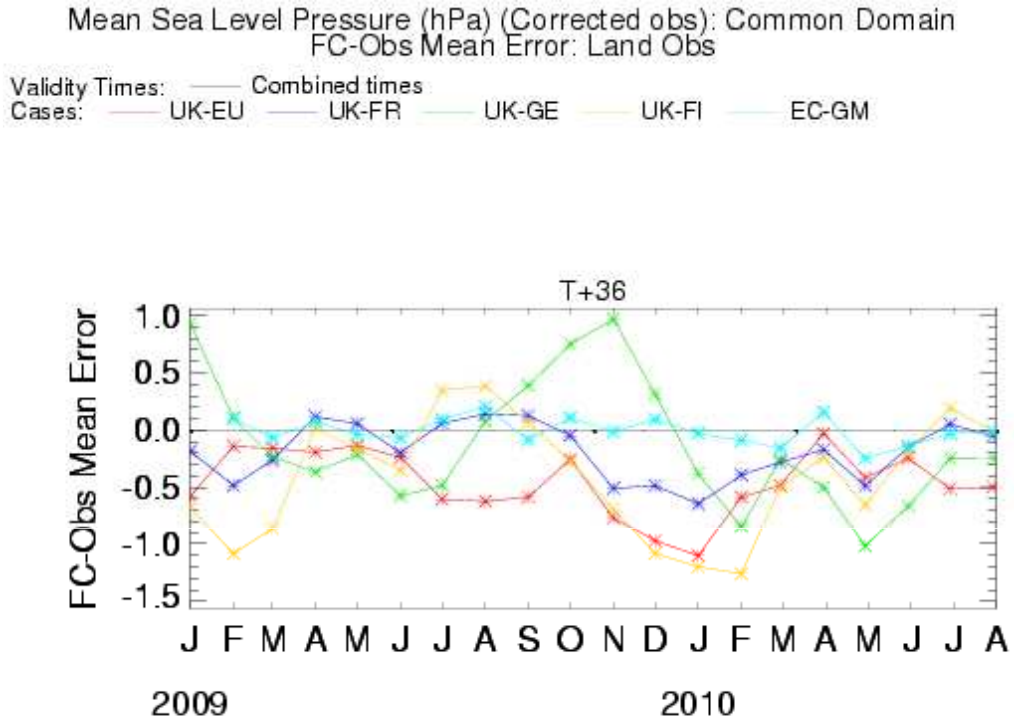
Hirlam UM COSMO ALADIN

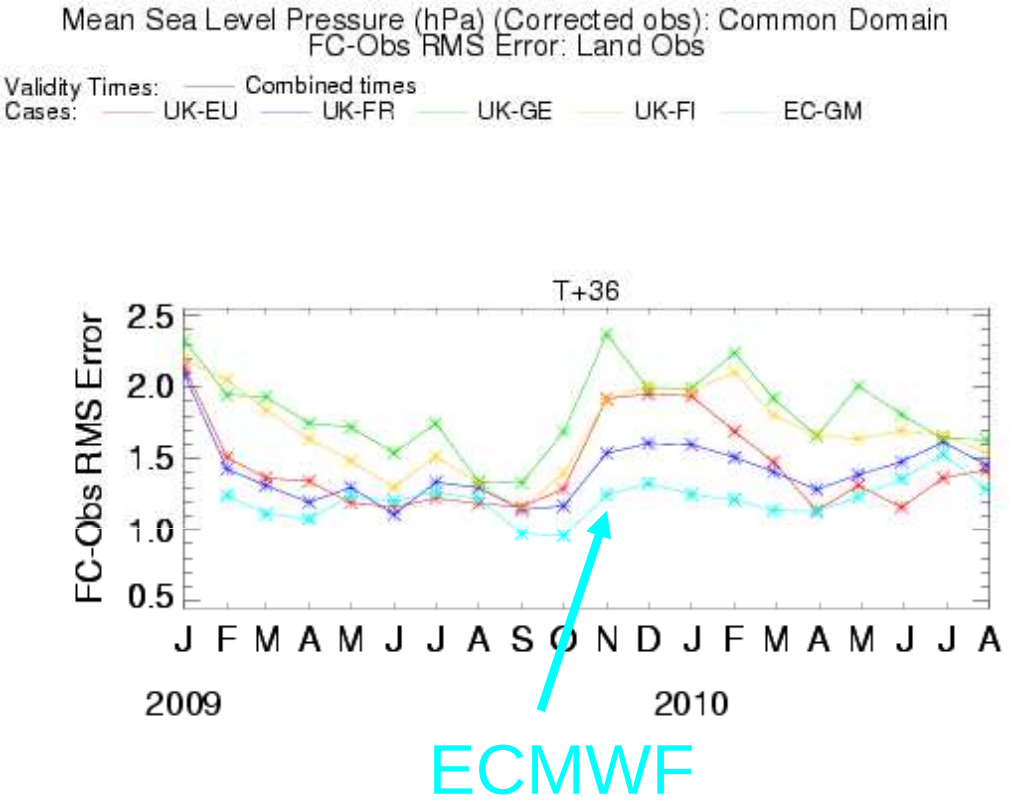

Mean Sea Level Pressure (hPa) (Corrected obs): Common Domain
FC-Obs Mean Error: Land Obs
Validity Times: Combined times
Cases: UK-EU UK-FR UK-GE UK-FI EC-GM
T+12
FC-Obs Mean Error
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
-0.8
J F M A M J J A S O N D J F M A M J J A
2009
2010

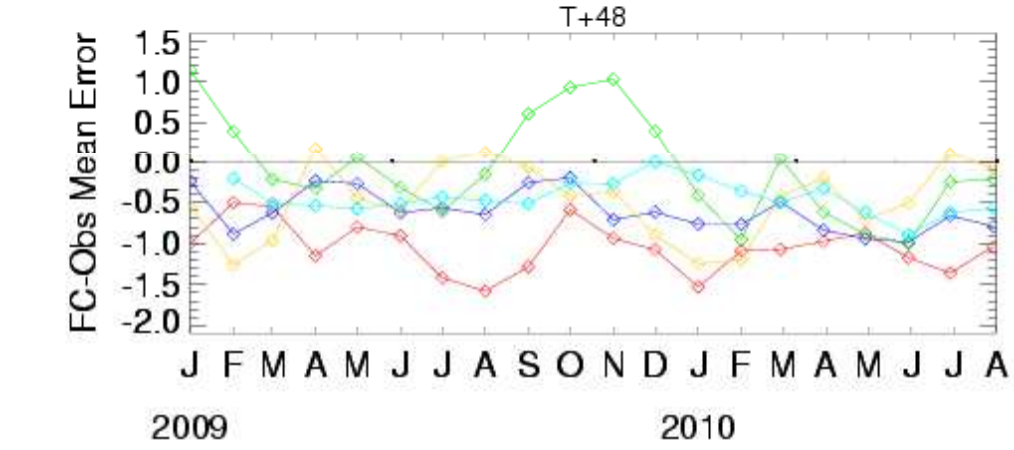

Mean Sea Level Pressure (hPa) (Corrected obs): Common Domain
FC-Obs RMS Error: Land Obs
Validity Times: Combined times
Cases: UK-EU UK-FR UK-GE UK-FI EC-GM
T+12
FC-Obs RMS Error
1.6
1.4
1.2
1.0
0.8
0.6
J F M A M J J A S O N D J F M A M J J A
2009
2010
ECMWF

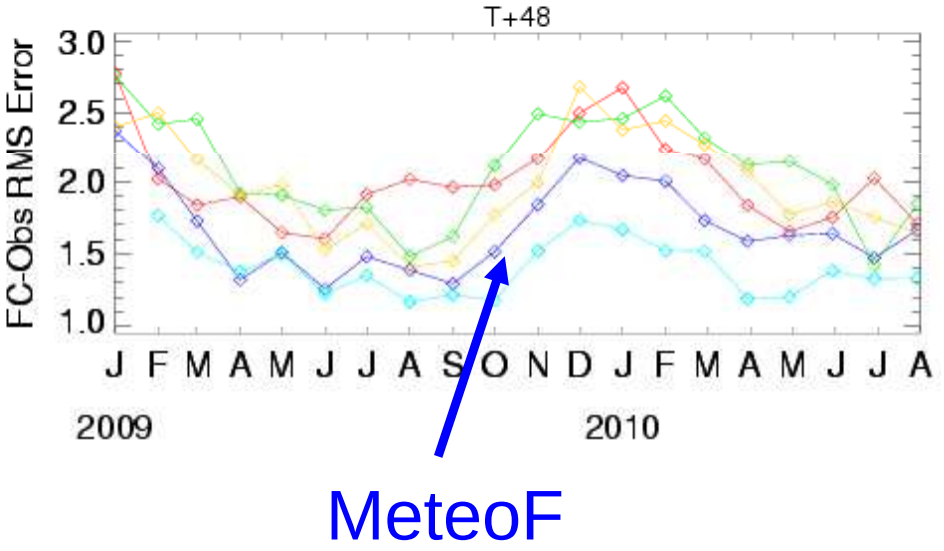

T+24
FC-Obs Mean Error
1.0
0.5
0.0
-0.5
-1.0
-1.5
J F M A M J J A S O N D J F M A M J J A
2009
2010


T+24
FC-Obs RMS Error
2.0
1.8
1.6
1.4
1.2
1.0
0.8
J F M A M J J A S O N D J F M A M J J A
2009
2010
MeteoF


Mean Sea Level Pressure (hPa) (Corrected obs): Common Domain
FC-Obs Mean Error: Land Obs
Validity Times: Combined times
Cases: UK-EU UK-FR UK-GE UK-FI EC-GM
T+36
FC-Obs Mean Error
1.0
0.5
0.0
-0.5
-1.0
-1.5
J F M A M J J A S O N D J F M A M J J A
2009
2010


Mean Sea Level Pressure (hPa) (Corrected obs): Common Domain
FC-Obs RMS Error: Land Obs
Validity Times: Combined times
Cases: UK-EU UK-FR UK-GE UK-FI EC-GM
T+36
FC-Obs RMS Error
2.5
2.0
1.5
1.0
0.5
J F M A M J J A S O N D J F M A M J J A
2009
2010
ECMWF

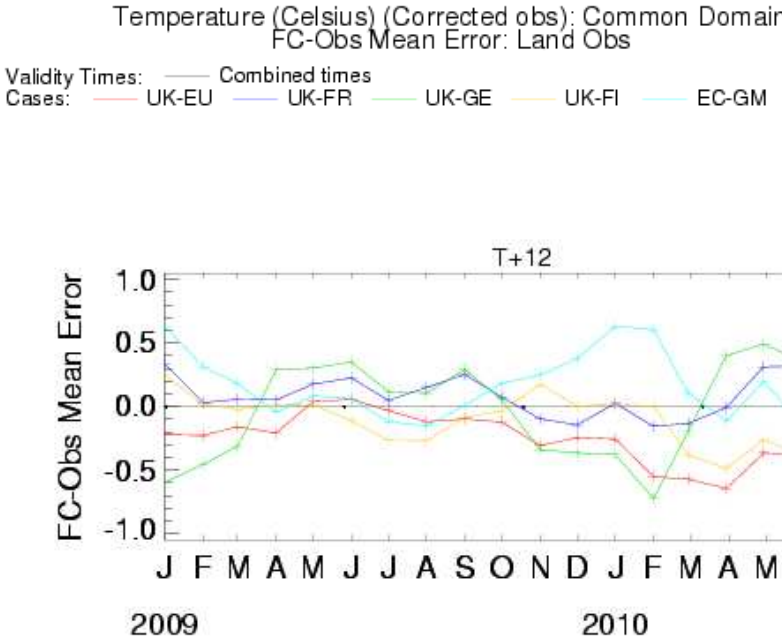

T+48
FC-Obs Mean Error
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
J F M A M J J A S O N D J F M A M J J A
2009
2010

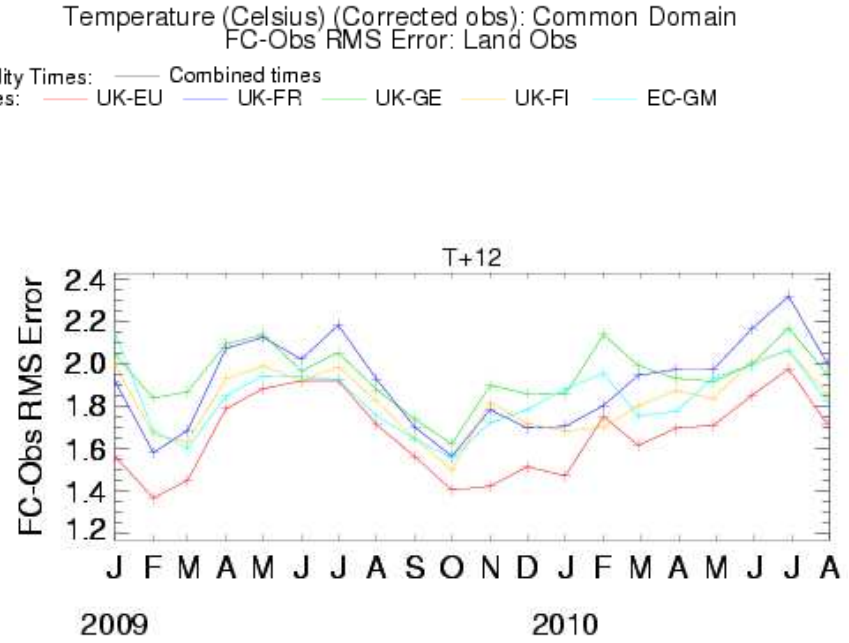

T+48
FC-Obs RMS Error
3.0
2.5
2.0
1.5
1.0
J F M A M J J A S O N D J F M A M J J A
2009
2010
MeteoF

Mean sea level pressure

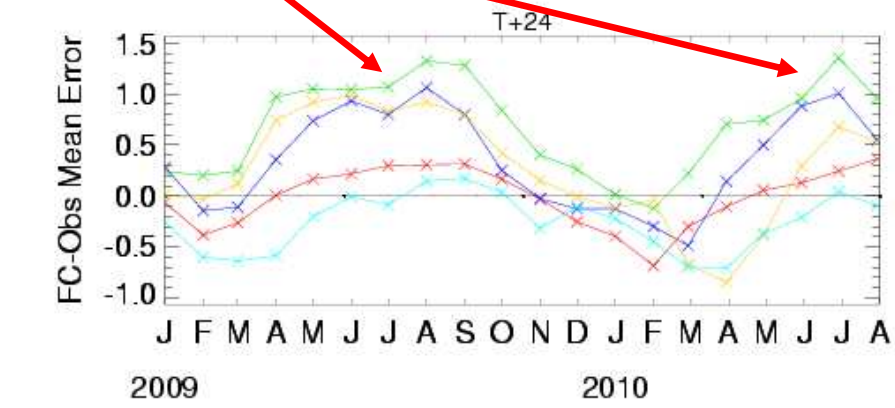
- Generally ECMWF high resolution smallest rms error
  - Lbc influence
- Meteo-France best overall of LAMs (comparison=own domain)
- Models have mostly negative bias (except COSMO some months) and generally worse T+24,+48 (night)

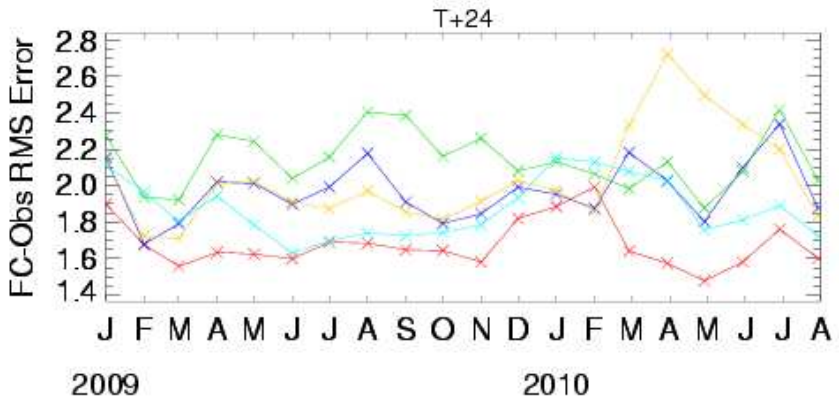
2m Temperature bias & rmse





Seasonal bias

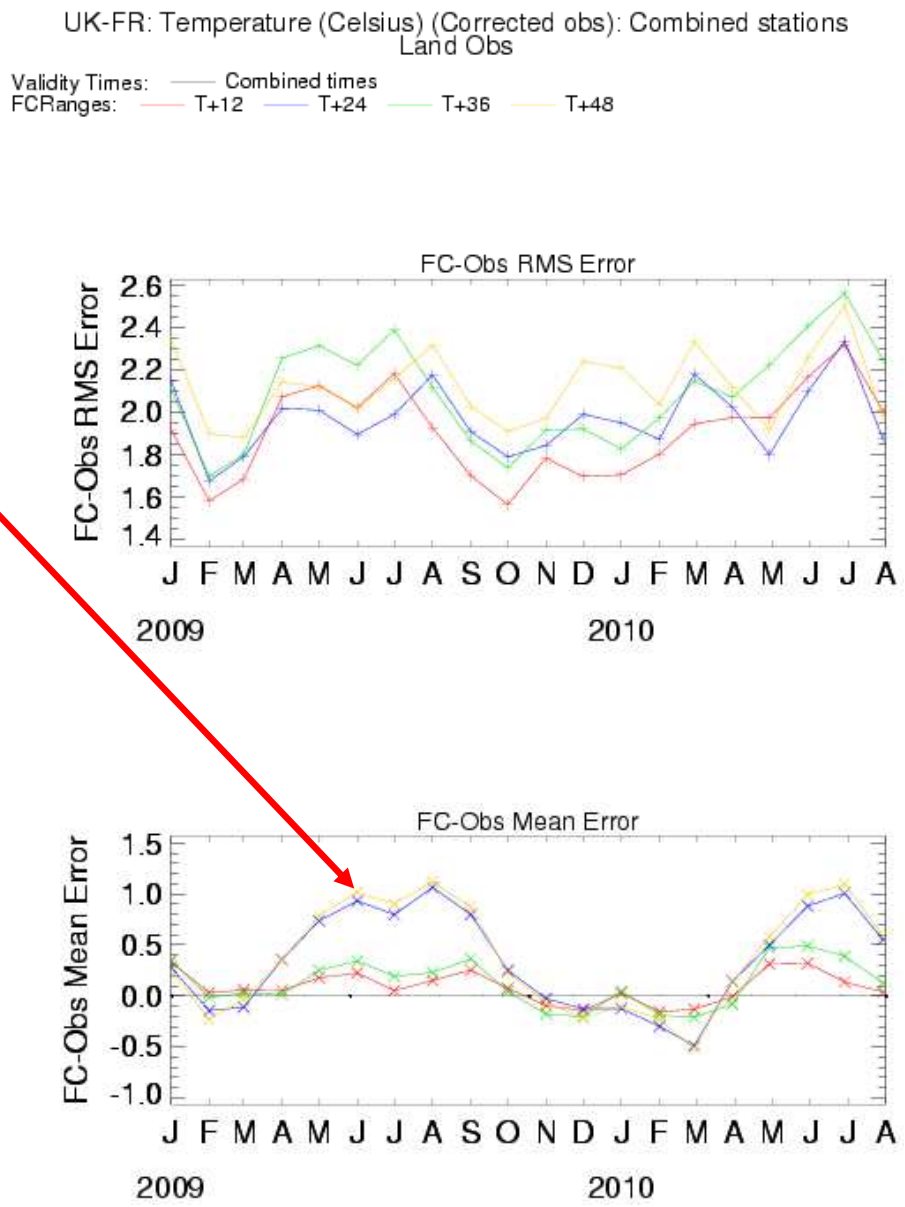




2m Temperature

MeteoF Aladin

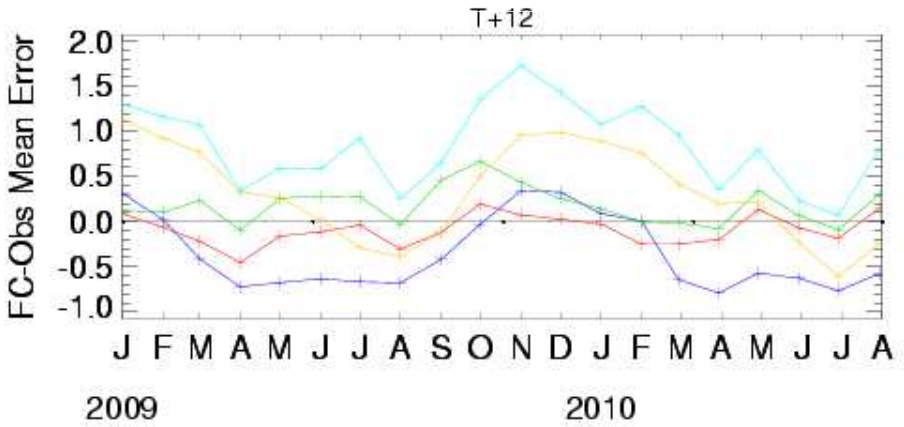
- Models generally too warm in summer at night
- 1.6K< RMSE < 2.6K

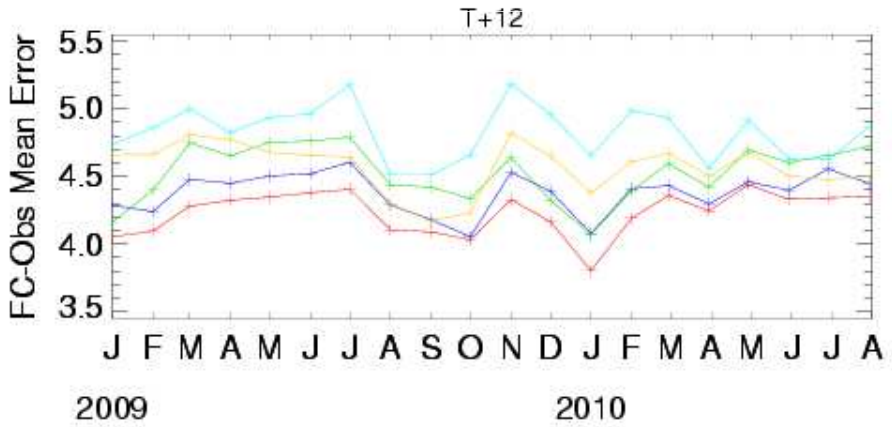


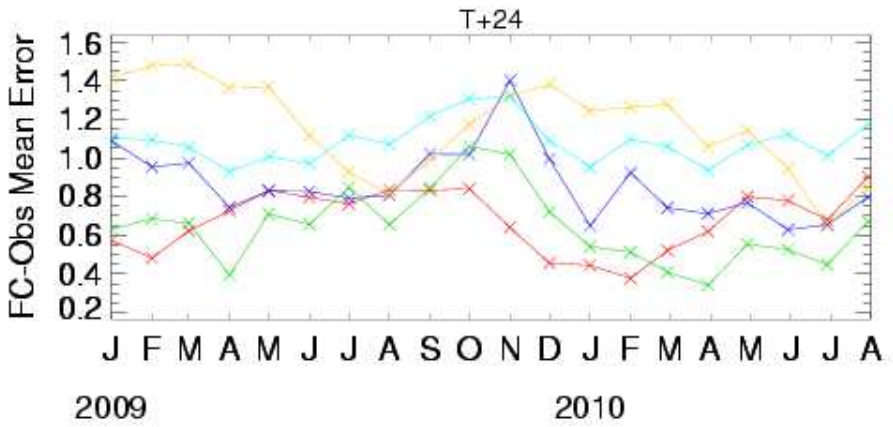
10m Winds – speed &rms vector error

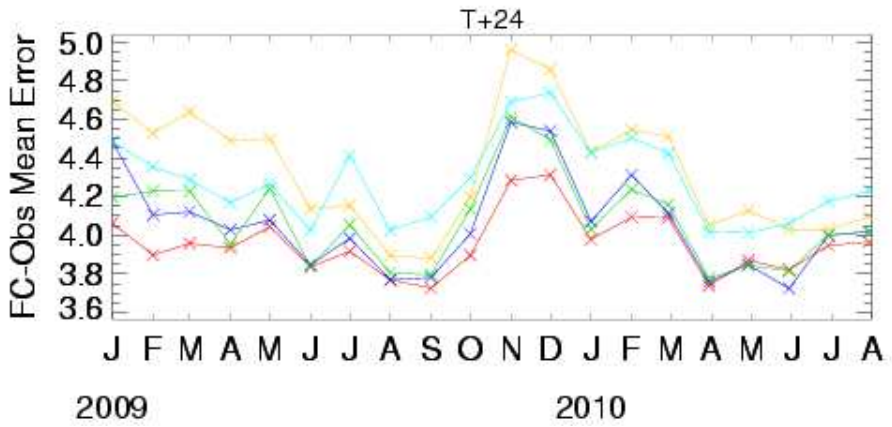
Speed error

Vector wind error





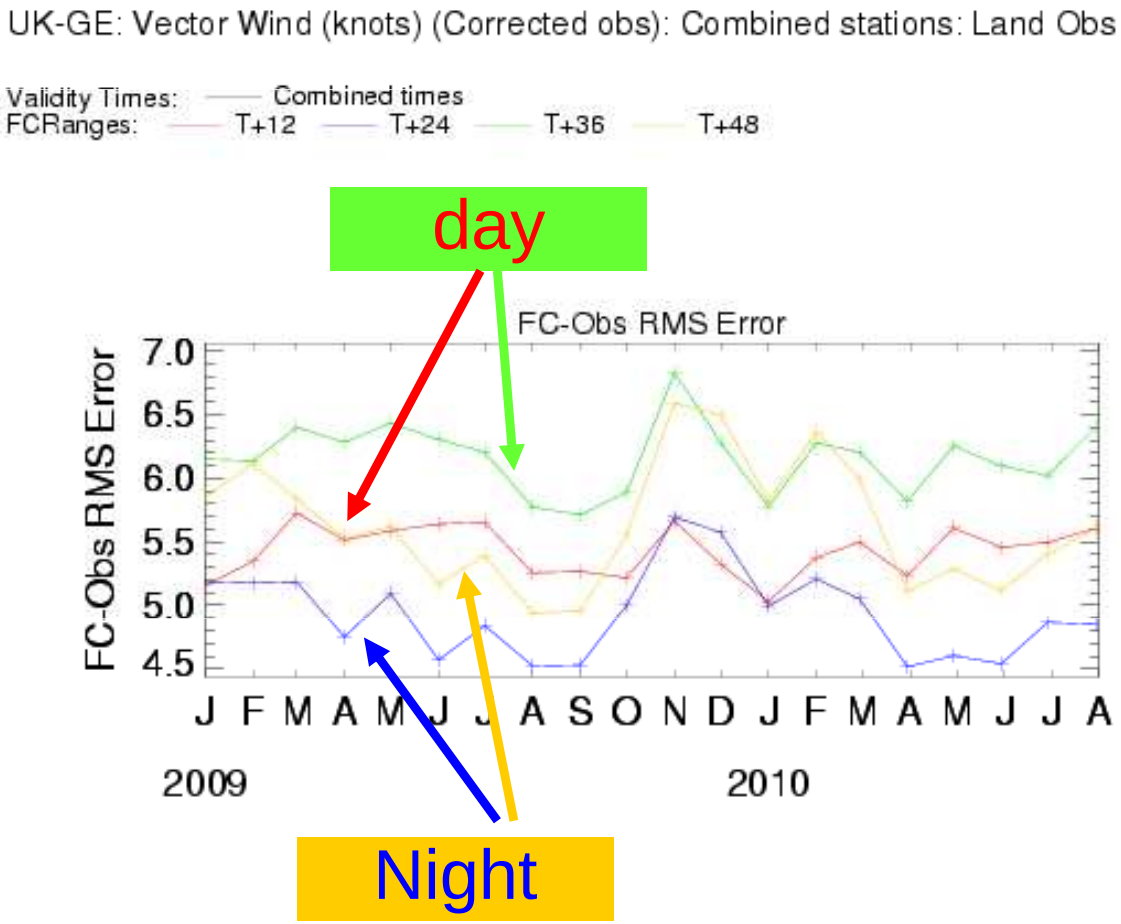




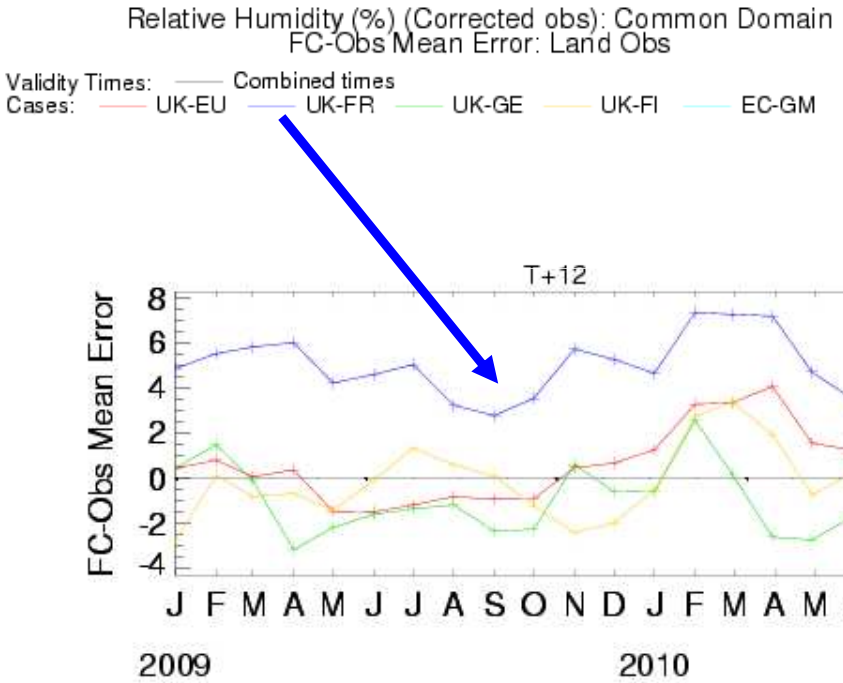
10m Winds – speed &rms vector error

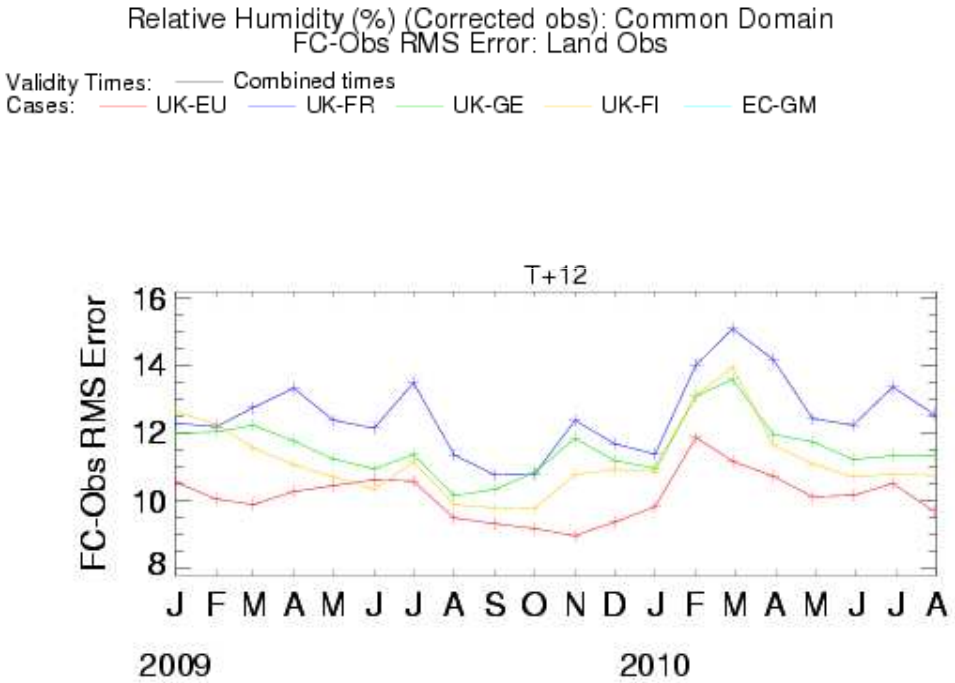
- All models too fast at night- typically ~0.5m/s
- Vector wind errors ~ 2-2.5 m/s
- Worse errors in day than night

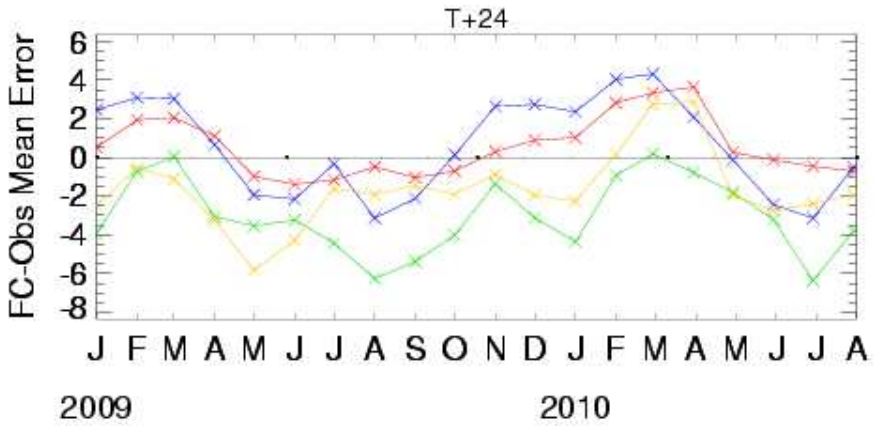
COSMO-EU

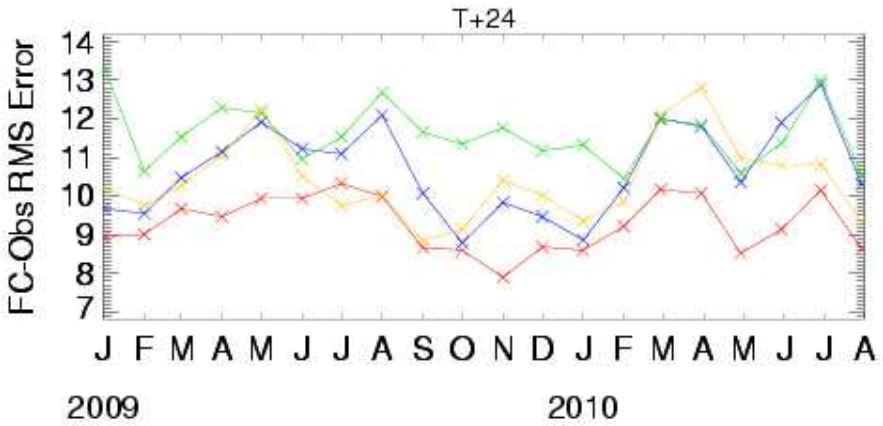


2m Relative Humidity

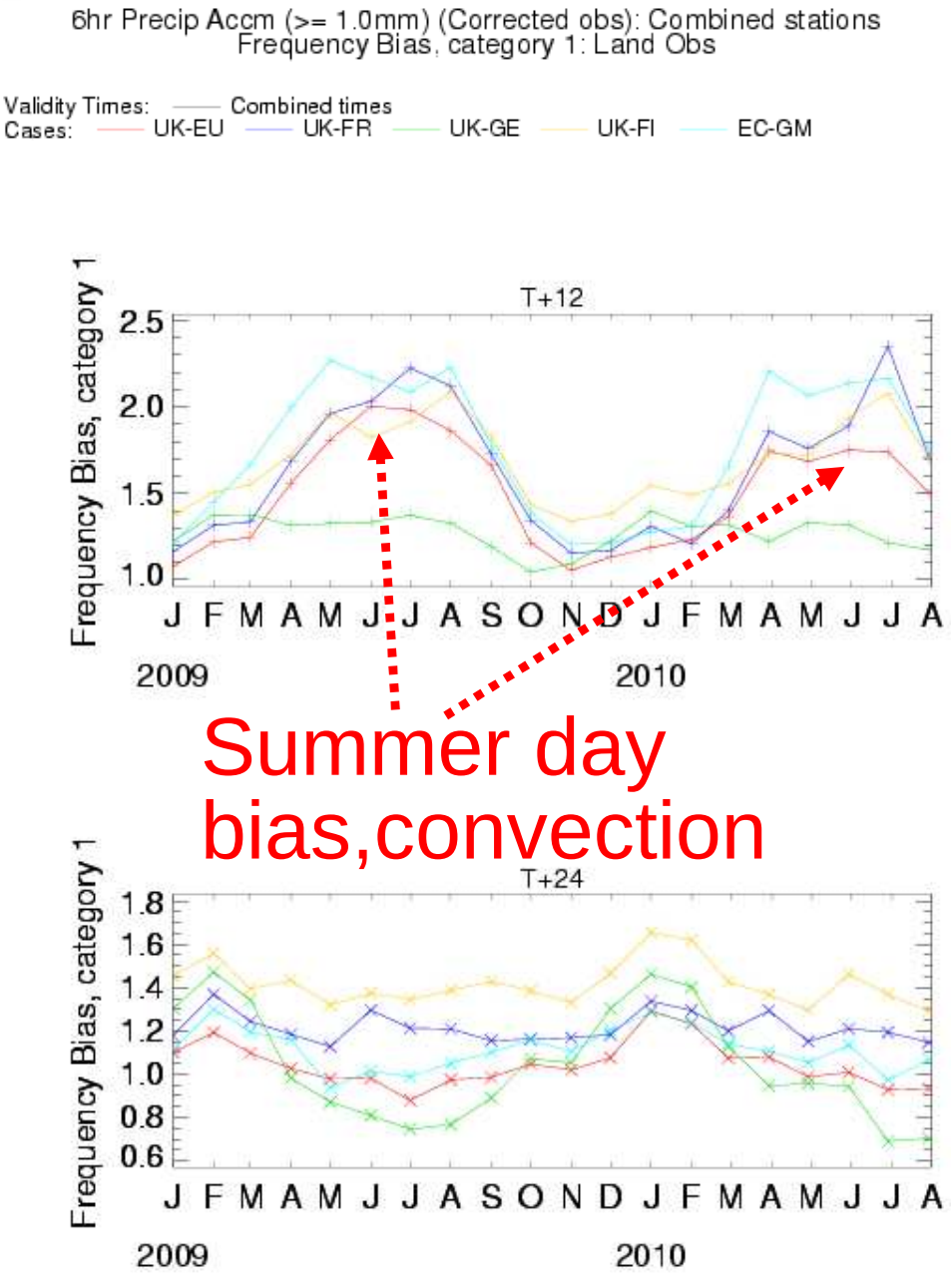


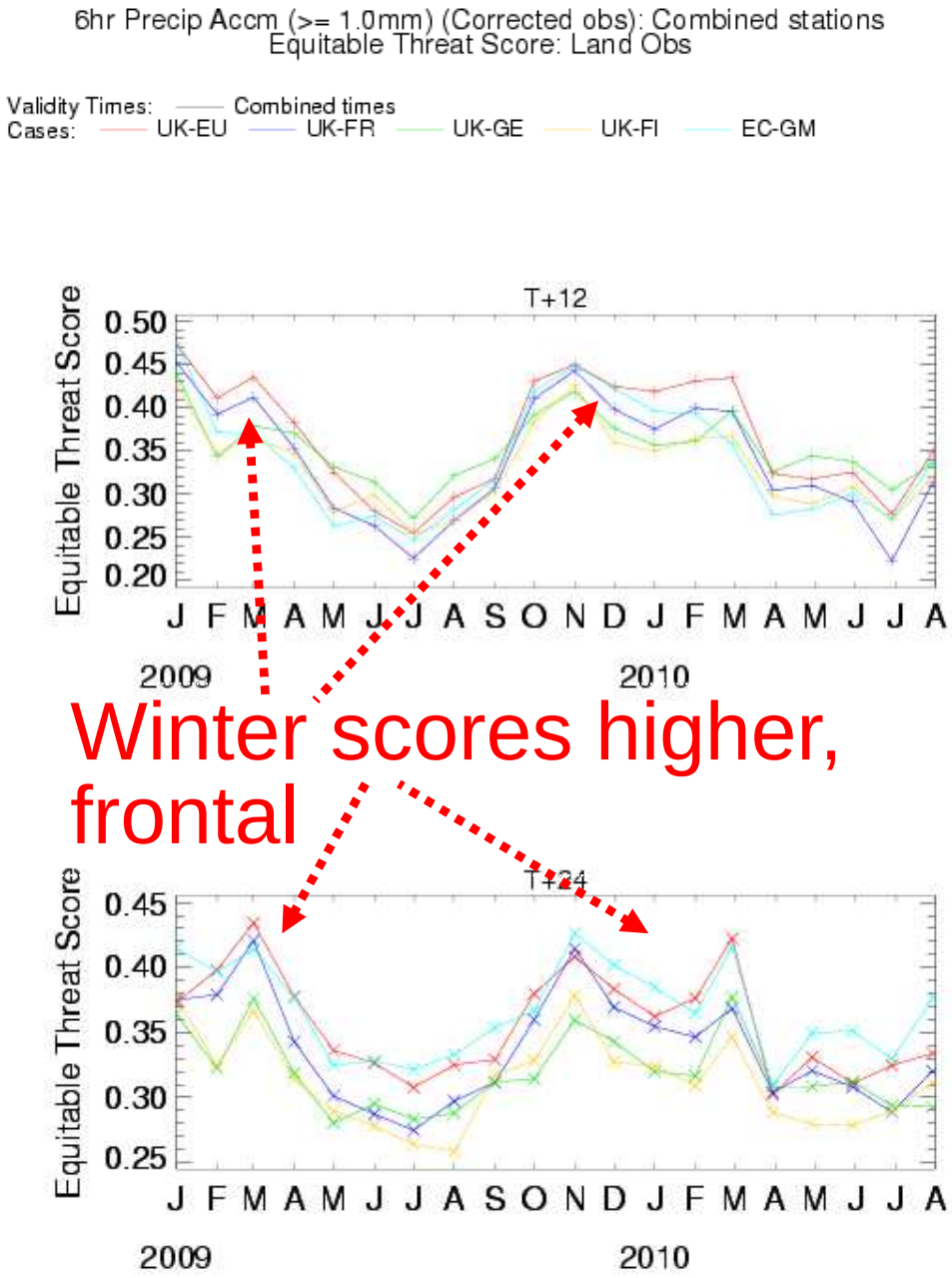






Precipitation bias & Equitable threat



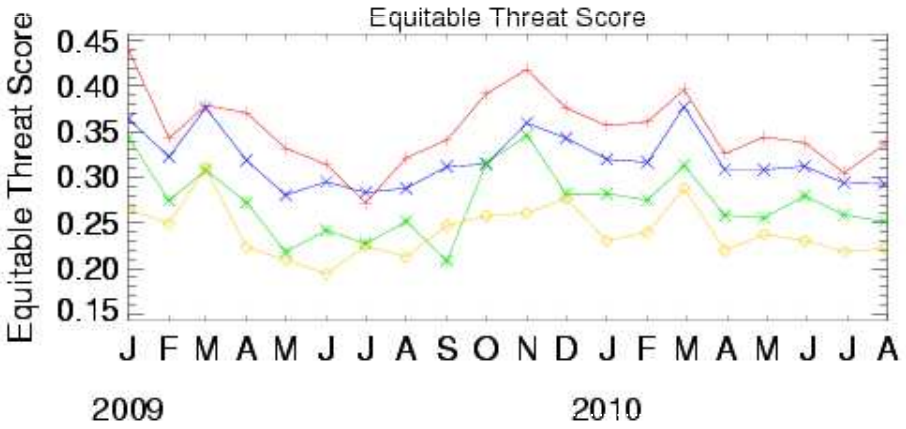


Precipitation – model differences

UK-GE: 6hr Precip Accm (>= 1.0mm): Combined stations: Combined times
Land Obs

FCRanges: T+12 T+24 T+36 T+48

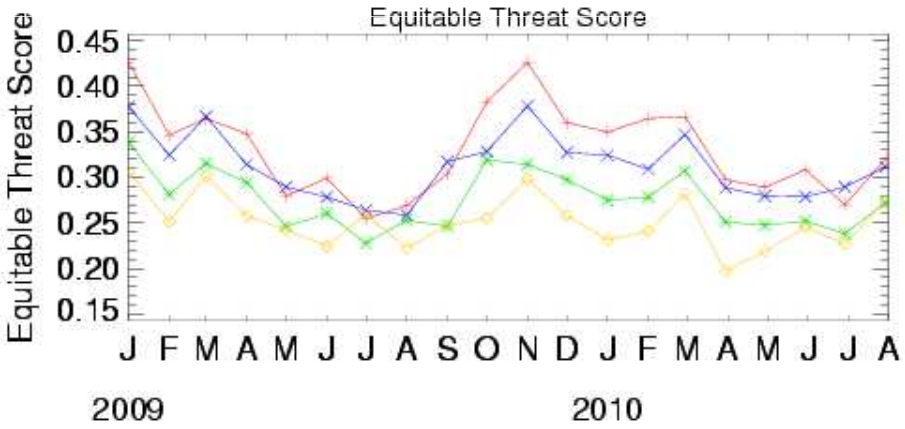
COSMO-EU



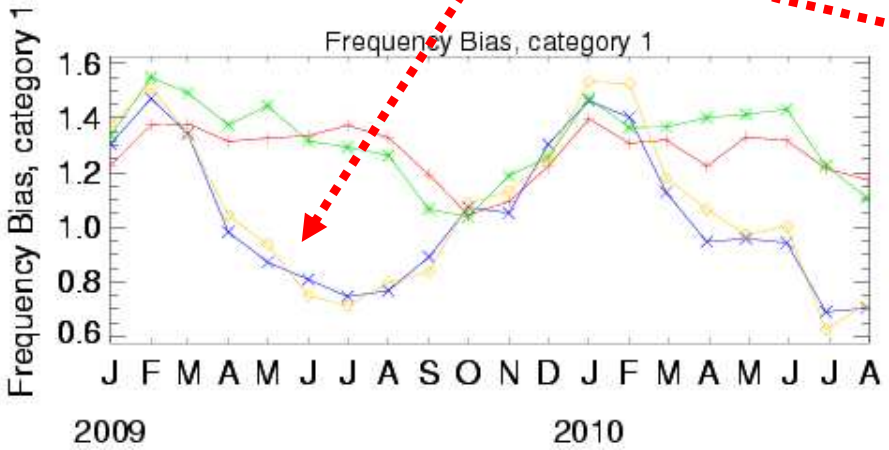
UK-FI: 6hr Precip Accm (>= 1.0mm): Combined stations: Combined times
Land Obs

FCRanges: T+12 T+24 T+36 T+48

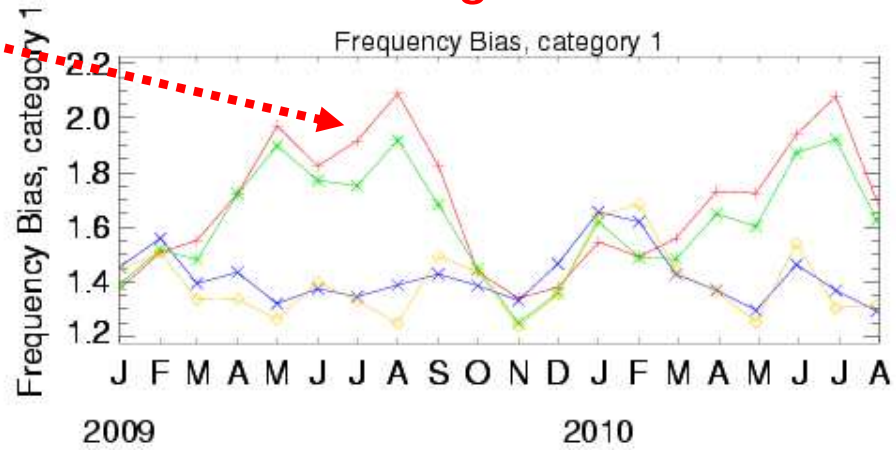
Hirlam_Ref



Convection influence



NB overforecasts
at all ranges



D1/D2 Intercomparison

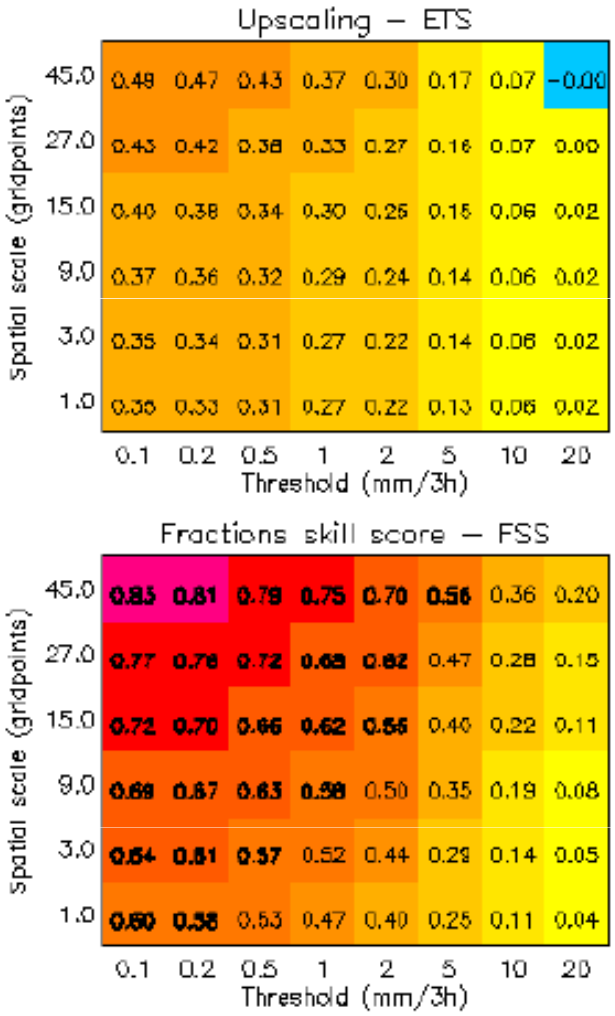
- Regular exchange of forecasts now established
- Results - QCed for each domain against suppliers' own verification
- Interesting differences evident
- Aladin- LACE Czech model added
- Publication of results via Eumetnet Portal from May 2010
  - Updated monthly

Other deliverables

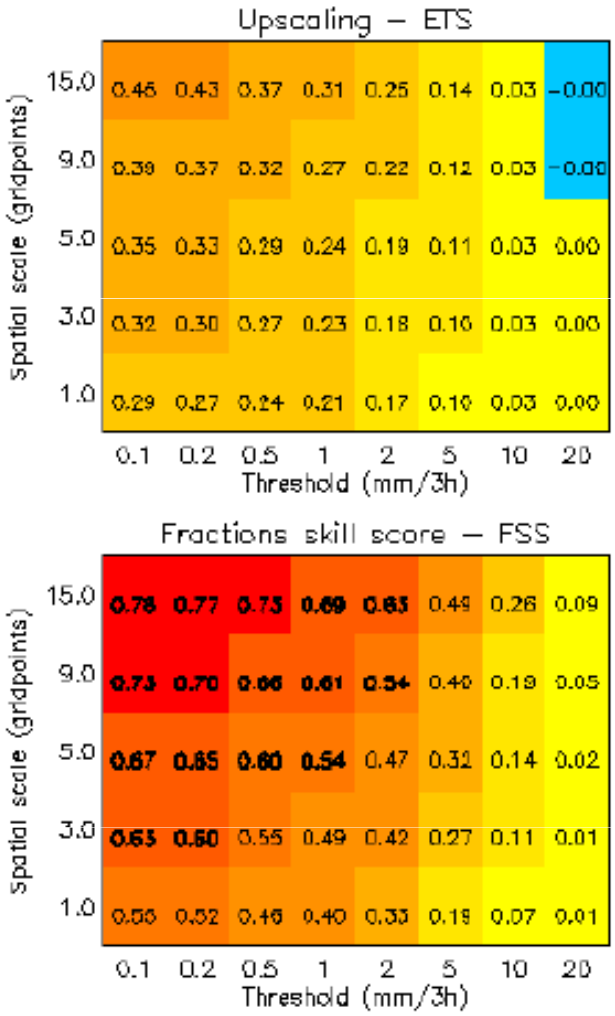
D3 Recommendation on new scale selective scores

- COSMO Project conclusions
  - Upscaling (Zepeda-Arce, 2000; Weygardt et al, 2004)
  - FSS- Fractional Skill score (Roberts & Lean, 2007)
  - Intensity-scale (Casati et al, 2004)
- Met Office
  - Operational verification – FSS
  - Intensity-scale
  - Upscaling
- Aladin – Modified FSS

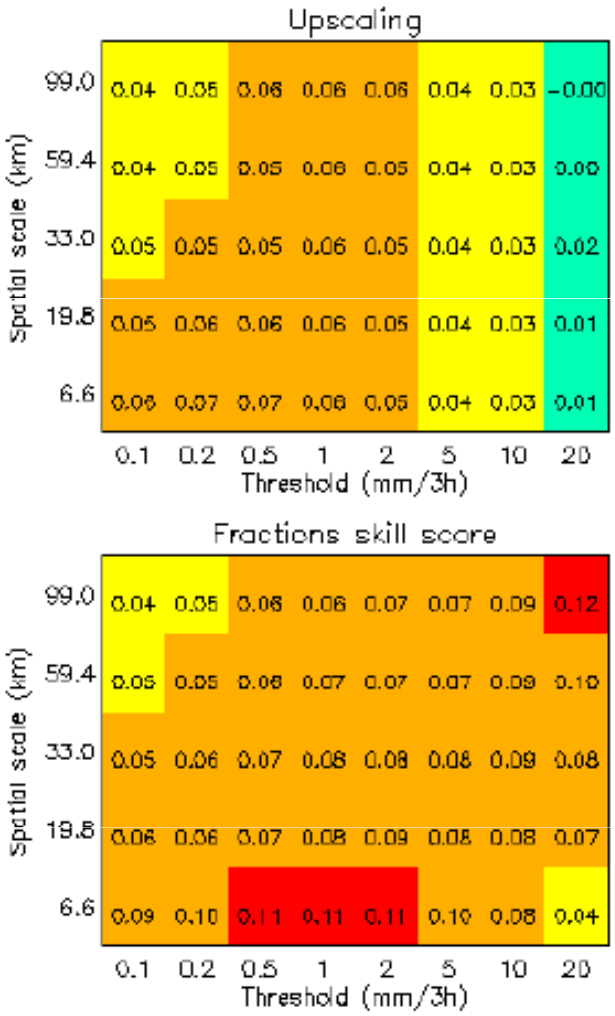
COSMO-2 (2.2km)



COSMO-7 (6.6km)



COSMO-2 (2.2km) – COSMO-7 (6.6km)



Map D- Phase Jun-Nov 2007,3h ppn

Courtesy Pierre Eckert

Comparison 6h accumulations 1.5 (UKV), UK4 and 12km (NAE) ~350 cases

Matthew Trueman

Key

	Statistical significance		
	<90%	≥90% <95%	≥95%
Higher-res model has more VTs with better score			
Lower-res model has more VTs with better score			

****Hover over table entries to see additional information****

Last updated: 10/03/10

Fractions Skill Score

UKV Vs. UK4:

FCR\Thr	0.5mm	1mm	4mm	8mm	16mm
[1]	54%	57%	54%	46%	31%
[2]	58%	58%	51%	40%	28%
[3]	56%	51%	46%	43%	26%
[4]	56%	56%	46%	40%	26%
[5]	58%	56%	51%	36%	25%

UKV Vs. NAE:

FCR\Thr	0.5mm	1mm	4mm	8mm	16mm
[1]	64%	62%	62%	53%	36%
[2]	66%	60%	58%	51%	33%
[3]	61%	62%	60%	53%	33%
[4]	63%	61%	61%	53%	33%
[5]	62%	61%	62%	51%	31%

UK4 Vs. NAE:

FCR\Thr	0.5mm	1mm	4mm	8mm	16mm
[1]	60%	60%	55%	43%	32%
[2]	60%	58%	52%	46%	36%
[3]	56%	58%	53%	48%	29%
[4]	54%	57%	58%	50%	29%
[5]	56%	57%	57%	46%	30%

Upscaling - ETS

UKV Vs. UK4:

FCR\Thr	0.5mm	1mm	4mm	8mm	16mm
[1]	53%	53%	50%	48%	33%
[2]	51%	55%	52%	42%	24%
[3]	54%	49%	48%	41%	34%
[4]	54%	52%	39%	36%	22%
[5]	52%	48%	42%	34%	26%

UKV Vs. NAE:

FCR\Thr	0.5mm	1mm	4mm	8mm	16mm
[1]	52%	53%	48%	42%	39%
[2]	49%	51%	45%	37%	32%
[3]	51%	50%	48%	40%	34%
[4]	48%	51%	41%	36%	31%
[5]	52%	46%	43%	30%	31%

UK4 Vs. NAE:

FCR\Thr	0.5mm	1mm	4mm	8mm	16mm
[1]	54%	48%	42%	33%	35%
[2]	49%	52%	44%	36%	36%
[3]	44%	48%	44%	41%	28%
[4]	47%	47%	48%	36%	25%
[5]	48%	44%	43%	33%	25%

Other deliverables

- D4 Catalogue of non-GTS data – draft
  - All contributions welcome !
  - Details of data and where located
- D5 Severe weather verification
  - Various Extreme Dependency scores
  - Intend to test with precipitation forecasts
  - Warnings review at Met Office (with David Stephenson & Ian Jolliffe)

SRNWP-V Follow-on Programme

ND1 Continue & expand comparison ; ND2 Additional products

- Continue & expand comparison
  - Longer more robust results
  - higher resolution of future operational models
  - Overlap models in pairs
- Additional products verified
  - Cloud amount/base
  - Visibility
  - Wind gust
  - Others as suggested by Consortia

ND3: Spatial & scale selective verification of precipitation

- Verify against
  - Gridded analyses- ECMWF, Meteo-France, Met Office
  - High resolution radar (5 min,1-2 km)
  - OPERA radar composite
- Methods
  - Intensity scale (Casati)
  - Structure,amplitude,location (SAL) (Wernli et al)
  - Fractional skill (Roberts & Lean)
  - Contiguous rain areas (Ebert & McBride)

ND4 Inclusion of severe/high impact weather verification

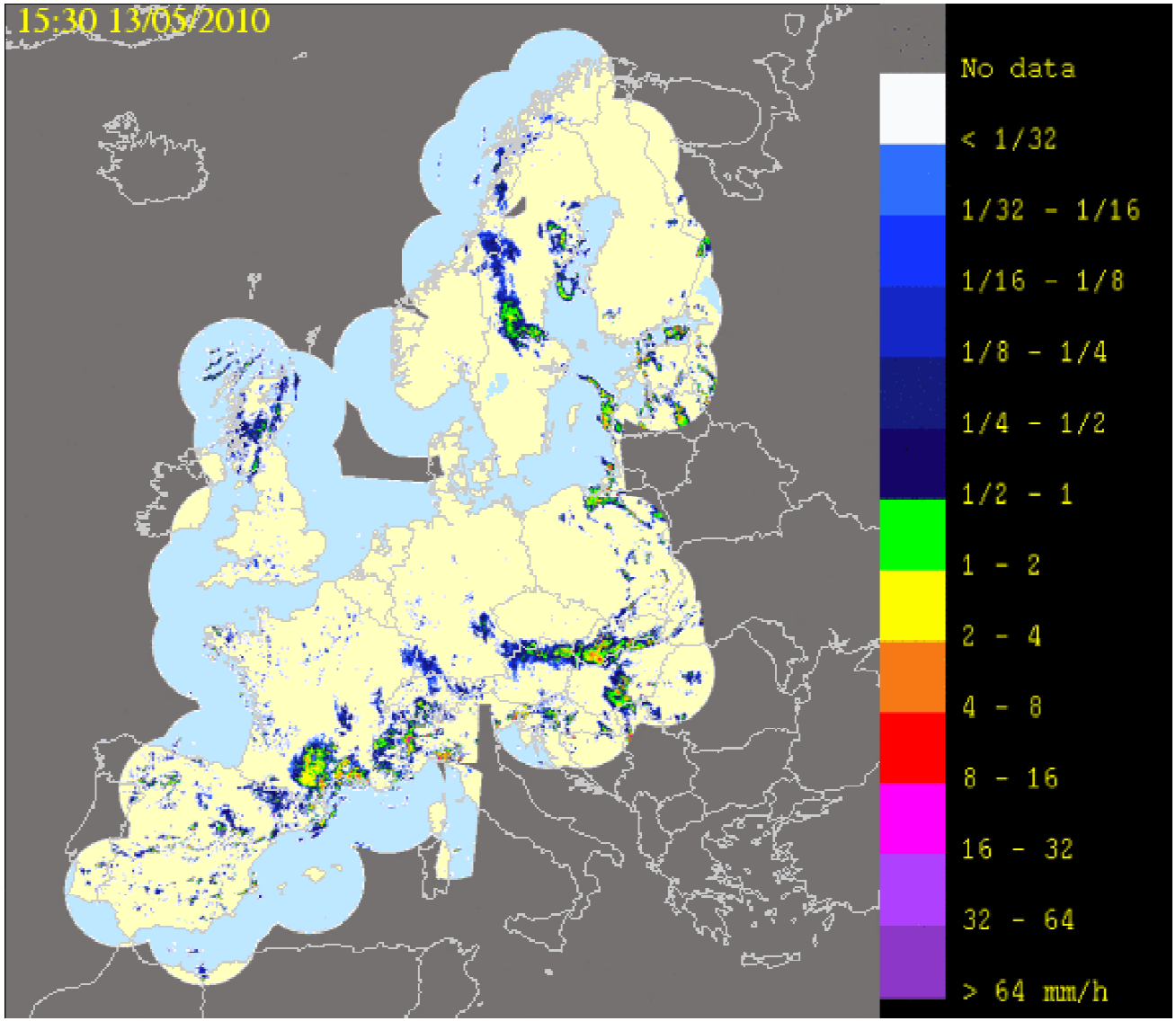
- ND4 Methods as identified in SRNWP-V 1
  - Extreme dependency scores
  - Warnings verification
- Deliverable ND5:
  - Full documentation of the methods used in the intercomparison.
  - Newer spatial methods code to be portable.

SRNWP-V Discussion

Discussion topics

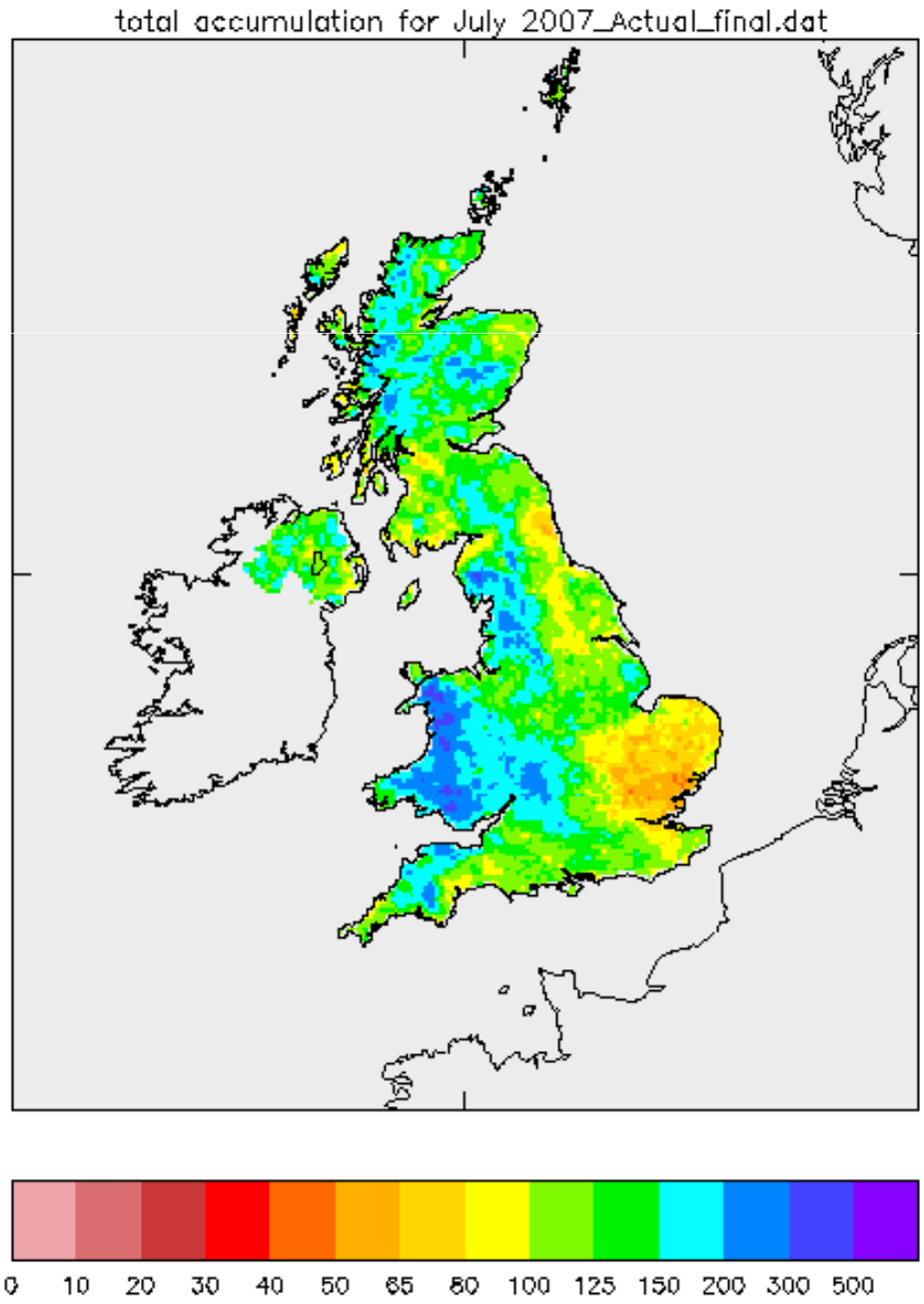
- Are results as expected ?
- Any remaining quality control issues
- Further verification scores ?
  - Skill v ECMWF ?
- Dissemination & publication of results
- Follow-on project - comments

OPERA Composite

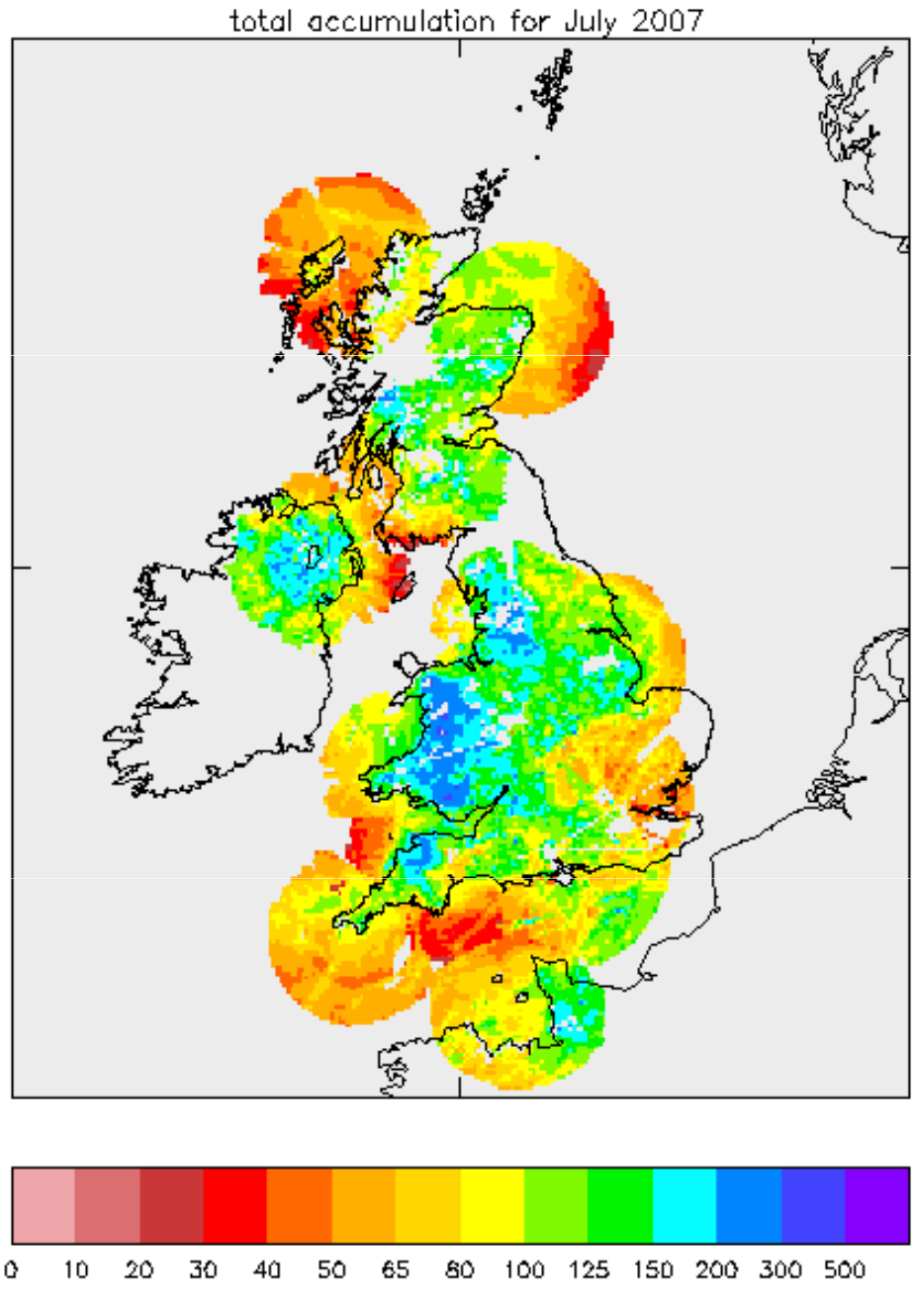


July 2007

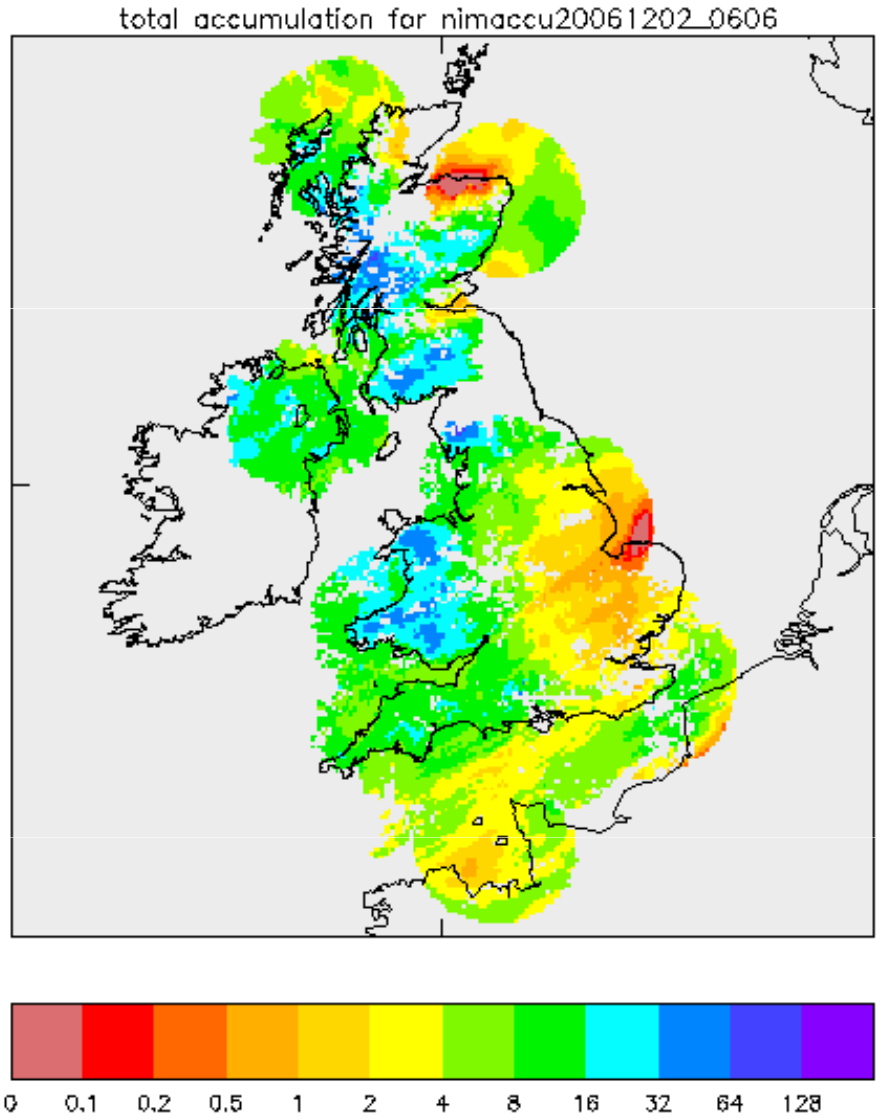
Gridded Gauges

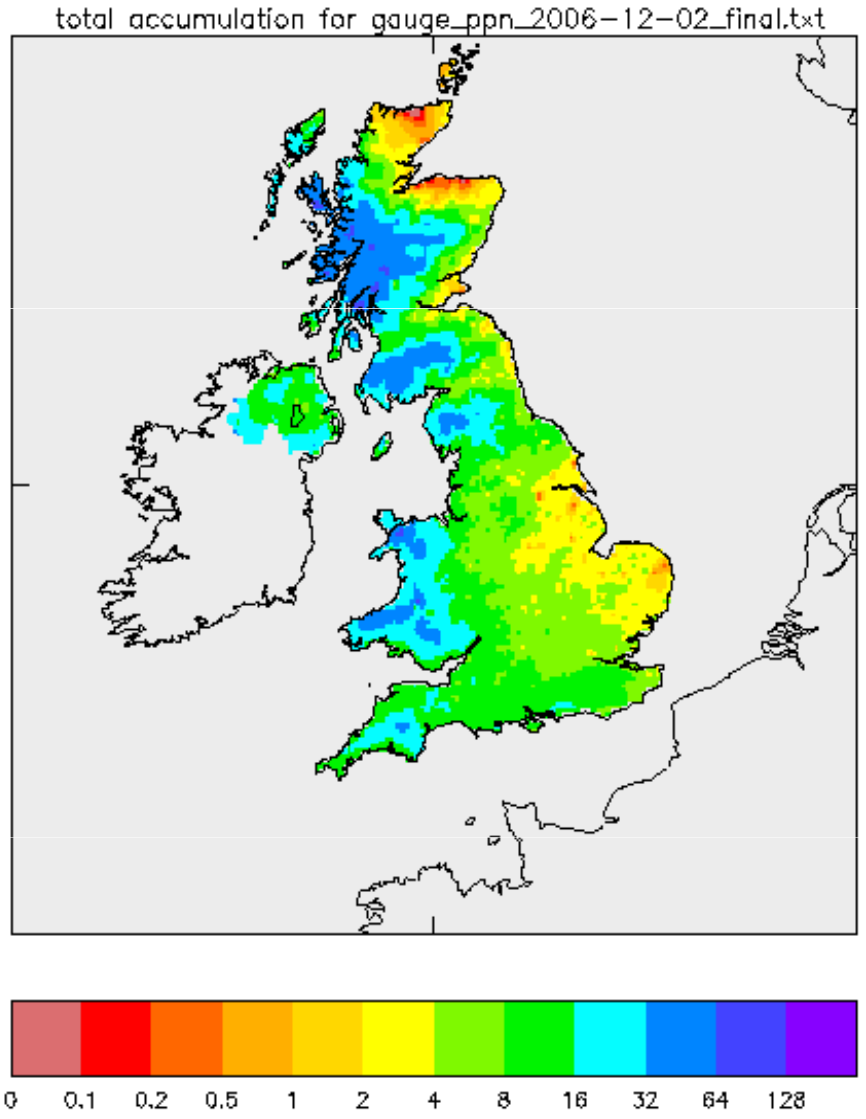


Radar



A single day – 02/12/2006





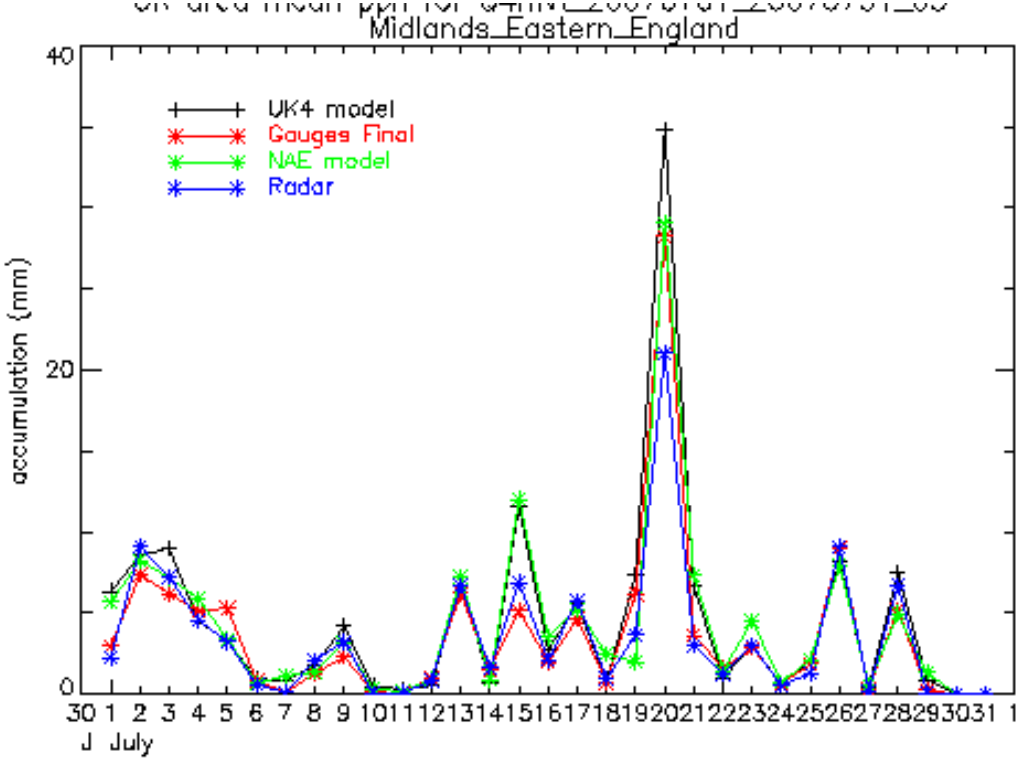
Uncertainties in observing precipitation

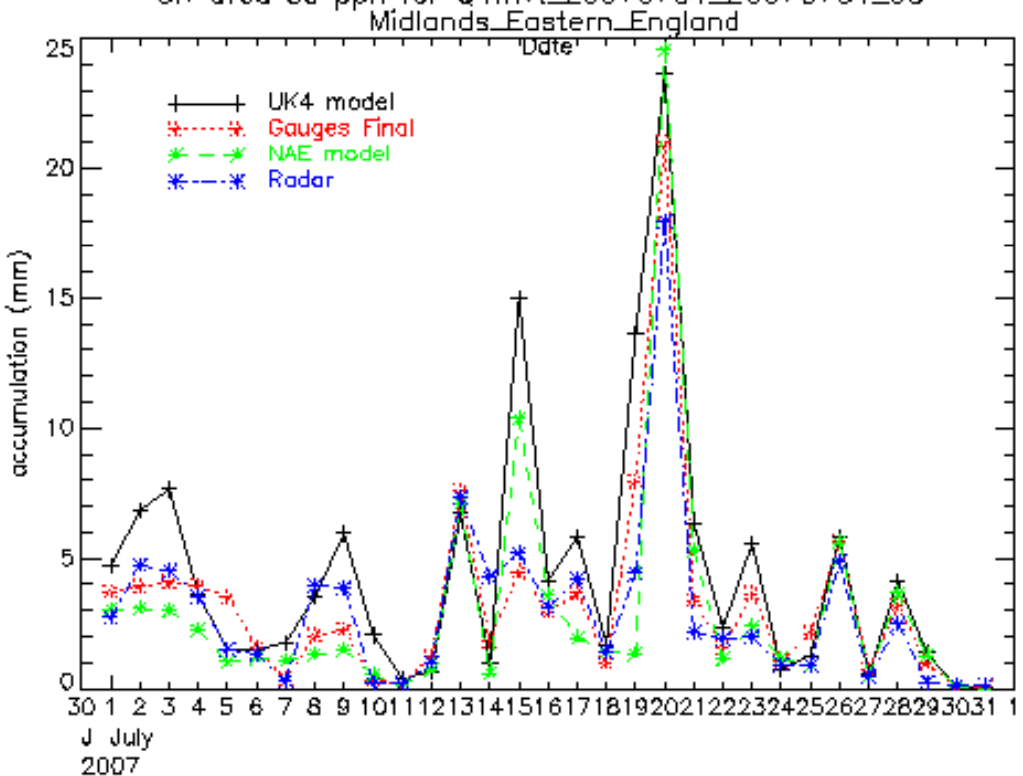
- Synoptic network sparse ~25- 50km
  - Nearest grid point model forecast
- Radar estimates ~-50%/+100% error
  - Averaged to 3x grid length = 15km

- Climatological precipitation stations
  - ~4400
  - 7 x7 km typical spacing
  - Gridded analysis -5x5km (Perry & Hollis,2005,Int J Climatol)
    - Monthly
    - daily

Met Office

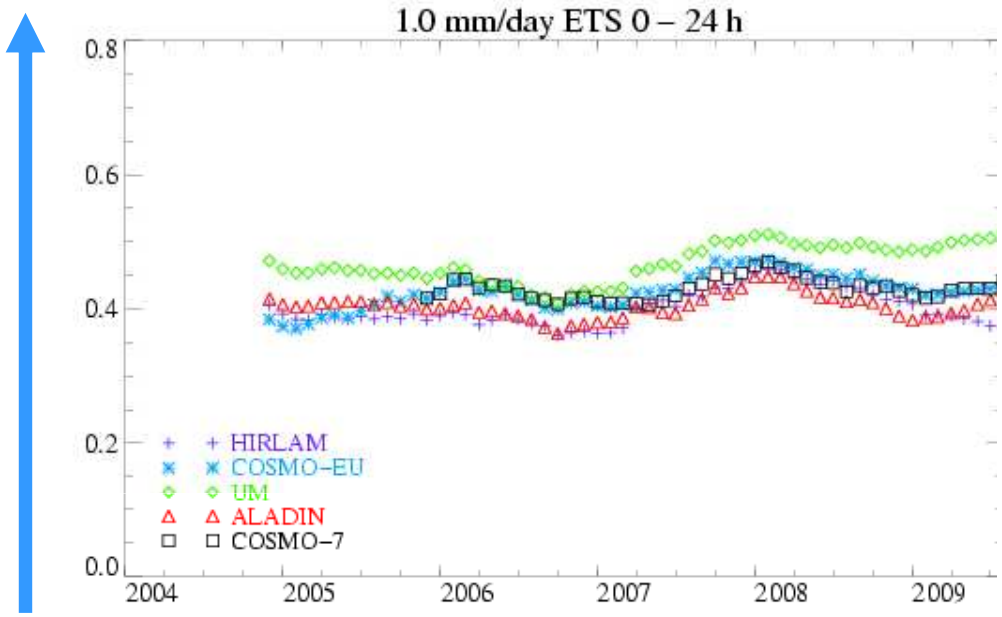
Daily rainfall July07

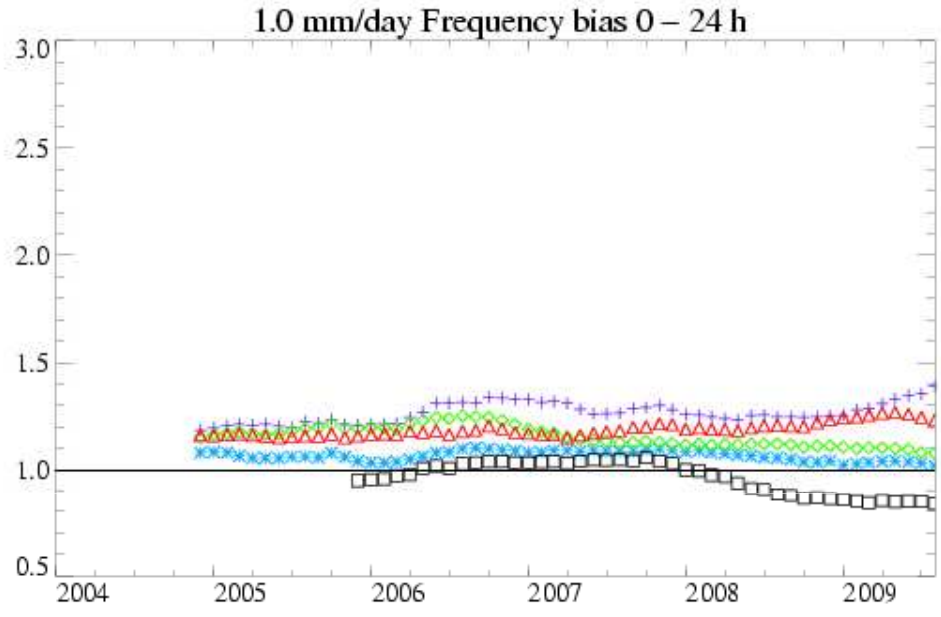




European Verification precipitation against British Isles composites

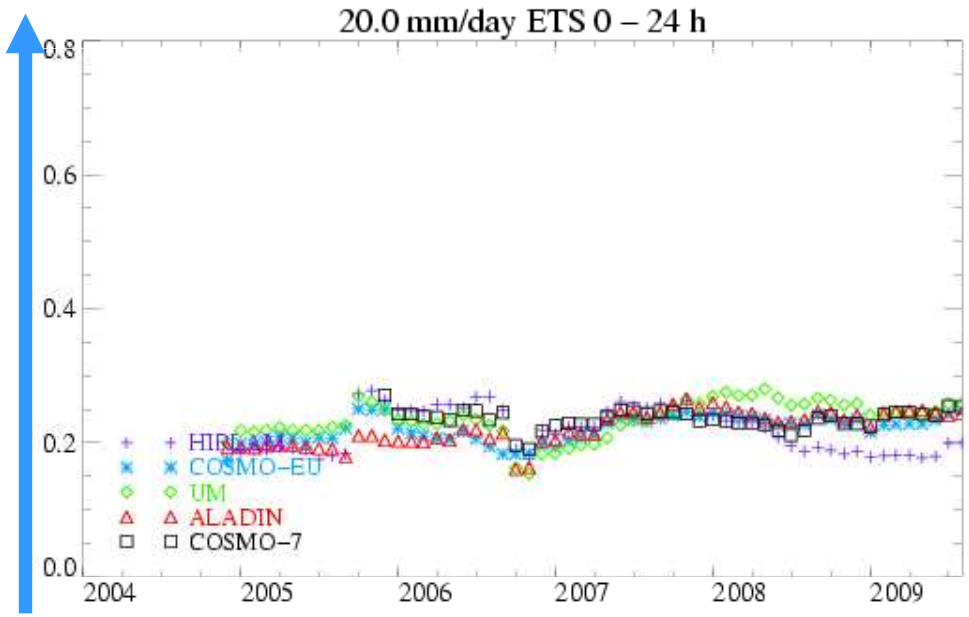
better

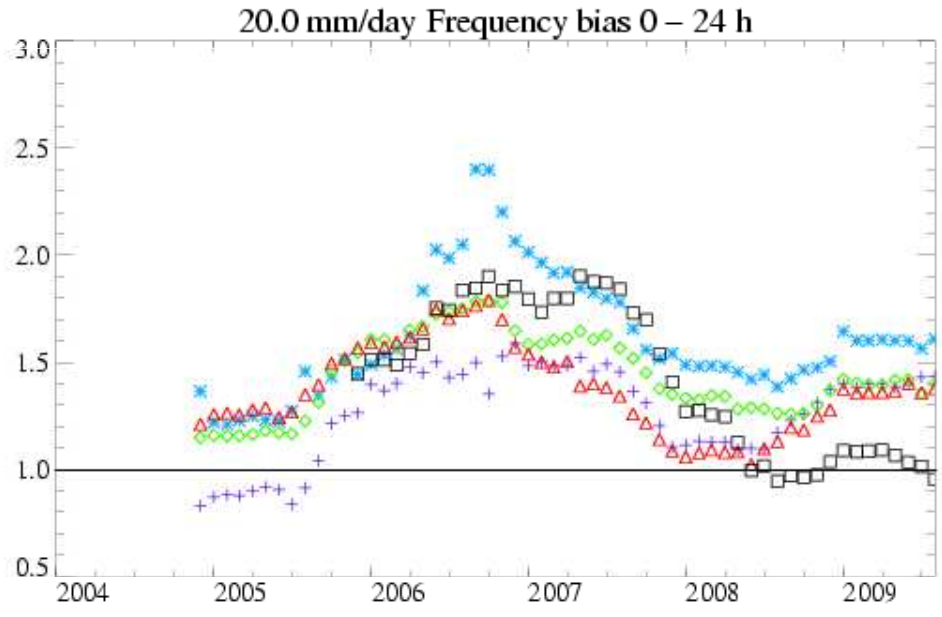




European Verification precipitation against British Isles composites

better





European Verification precipitation against British Isles radar composite