PREVIEW observation targeting experiment

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ECMWF

Acknowledgements: Andy Lawrence, Claude Gibert and Keir Bovis

ECMWF

Outline

- PREVIEW Data Targeting System (DTS)
- Process of Targeting: main steps
- Prototype of DTS system:
  main functionalities
- Summary & Future Developments

DTS Project

DTS is a project of EURORISK PREVIEW programme

Aim of the project:

develop a pre-operational system to provide data targeting information and request additional observations to improve short-range (2-3 days) forecasts of potentially high-impact or high uncertainty weather events in Europe.

DTS Project

The DTS was planned to build on the lessons learnt from Atlantic-THORPEX Regional Campaign (A-TReC) (October and November 2003), which attempted for the first time to control a complex set of observing platforms in a real-time. Despite of the success of this programme a significant manual effort was necessary to make it work.

DTS has the ambition of making data targeting a practical and viable concept in the operational environment.

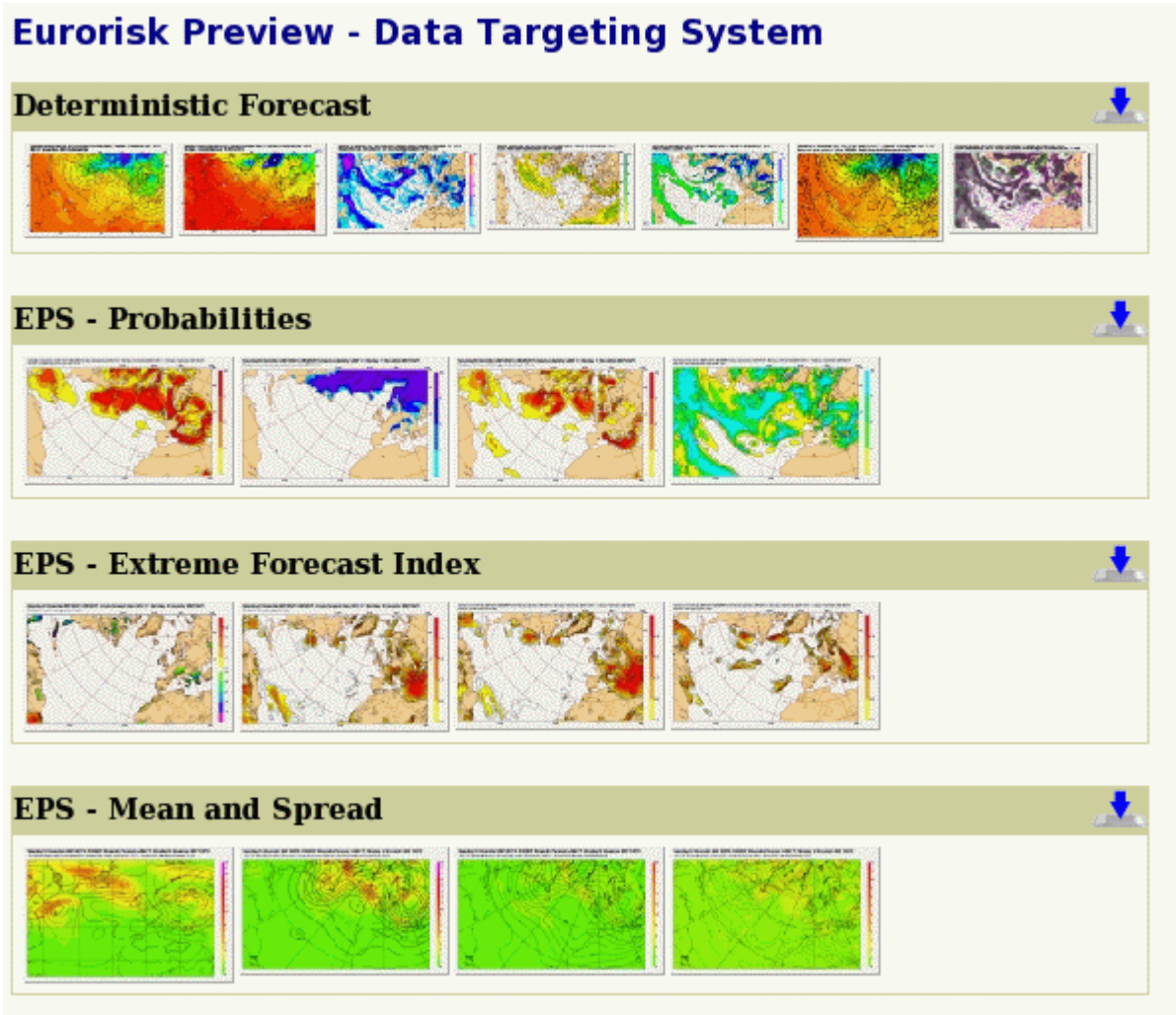
An 11-month trial will take place from February to December 2008: 13 EUCOS members have already confirmed their participation.

Targeting Process

Forecast display – A selection of forecast products is available to help the forecast identify suitable meteorological event that will benefit from extra observations.

The data targeting activity is focus on forecast in the T+60 to T+120 hours and high priority is given to situations where available ensemble predictions indicate a potential high-impact weather event, but with a large degree of associated uncertainty.

Forecast display – ECMWF products



Targeting Process

1. Event Selection

Identification of the meteorological feature for which forecasts are to be improved:

Its time : **Verification Time (VT)**

Location : **Verification Area (VA)**

Brief description of the meteorological situation highlighting the extremes (e.g. precipitation, wind gust)

Targeting Process

2. Case Proposal

Define a future targeted observation time - Target Time (TT) - typically chosen based on practical constraints (e.g issue instruction and prepare observation platforms for targeting)

Ideally as soon as possible but due to practical constraints at least a minimum of 24 h is required

Targeting Process

3.Sensitive Area Prediction (SAP)

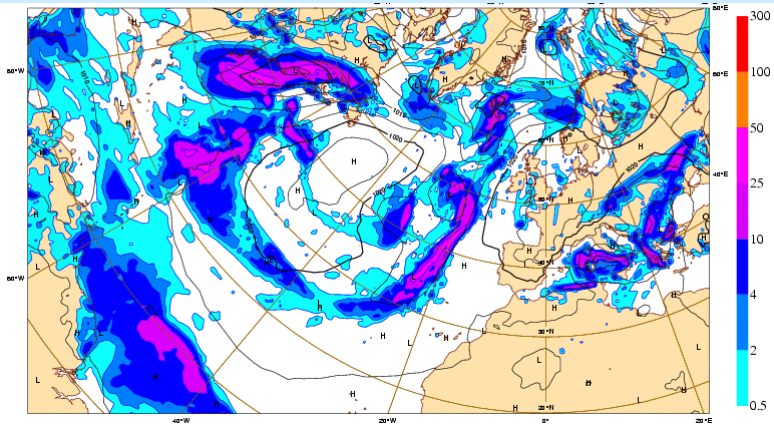
Sensitive areas are the regions where extra observations are expected to have the largest impact on the forecasts for the verification area.

Objective techniques:

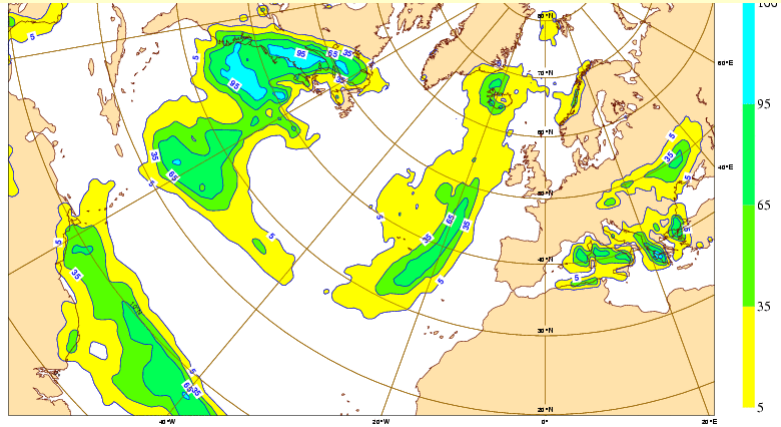
- Total Energy Singular vectors (TESV) - ECMWF
- Ensemble Transform Kalman Filter (ETKF) – UKMO
- Others may joint : Meteo-France, MEDEX

t+72 Friday 16 November 2007 00 UTC

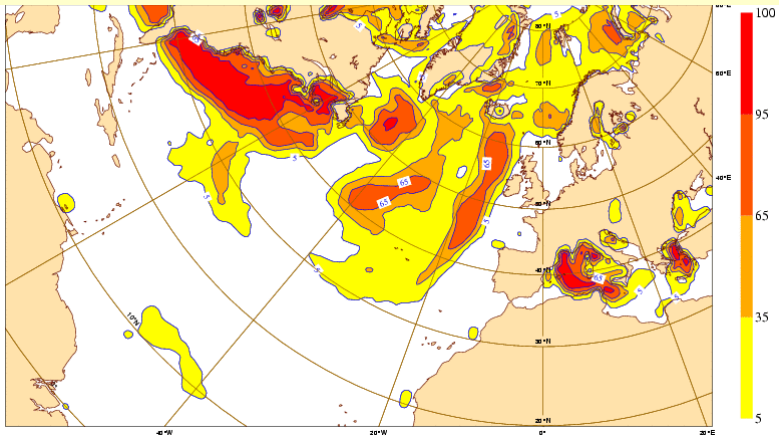
Deterministic MSLP and Precipitation



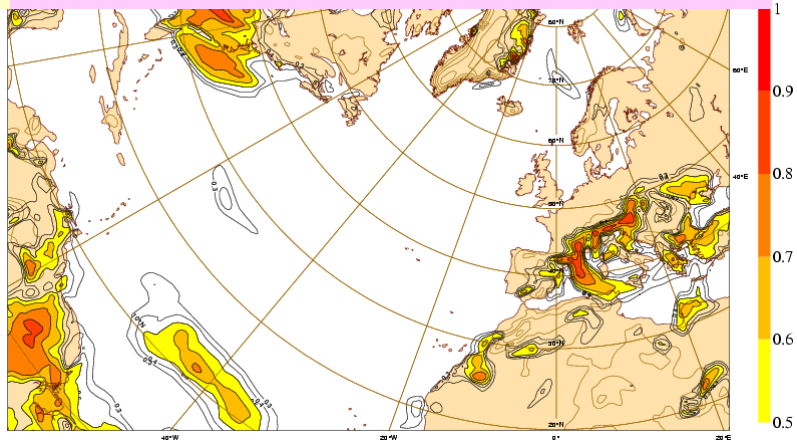
EPS – Probability of Precipitation ≥ 10mm



EPS – Probability of wind speed ≥ 10m/s



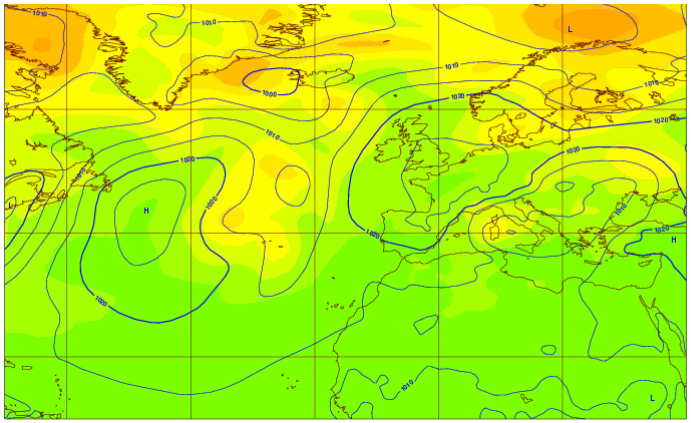
EPS – EFI 10m wind gust



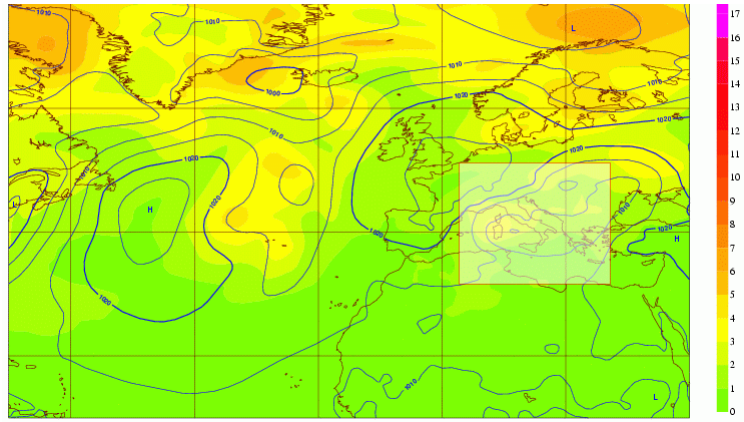
ECMWF

t+72 Friday 16 November 2007 00 UTC

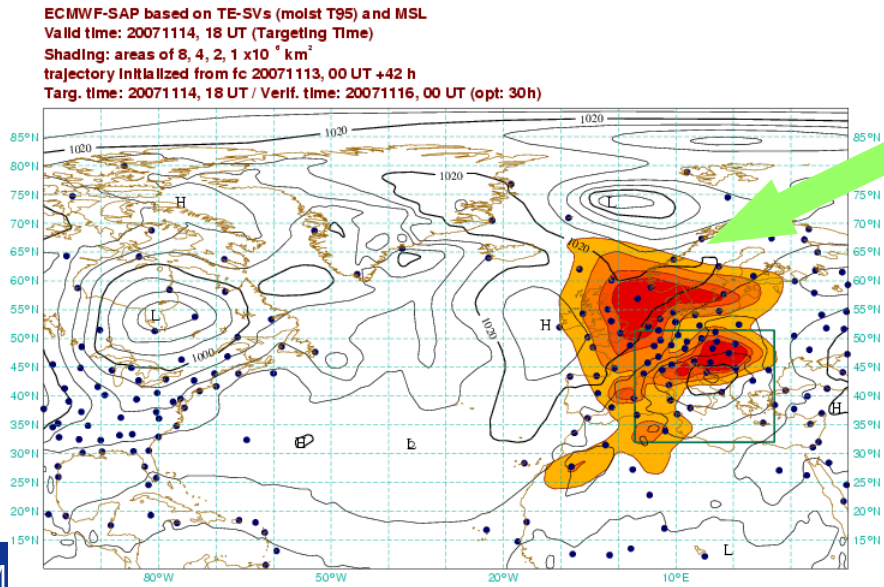
EPS – MSLP Ensemble Mean & spread



EPS – MSLP Ensemble Mean & spread

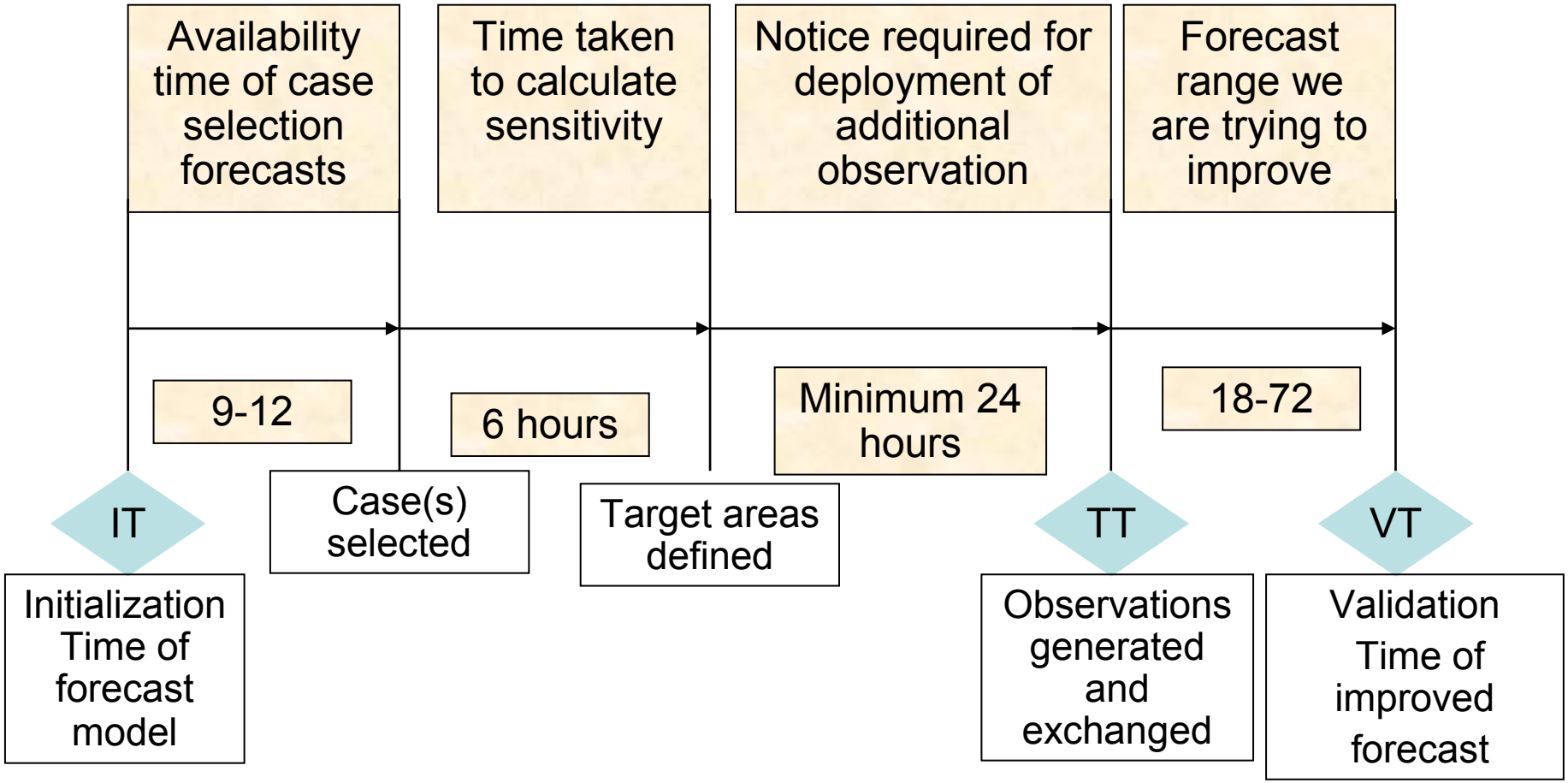


t+42 Thursday 14 November 2007 18 UTC



Increased sensitivity is indicated by darker shading

Forecast range used for case selection 60-120 hours



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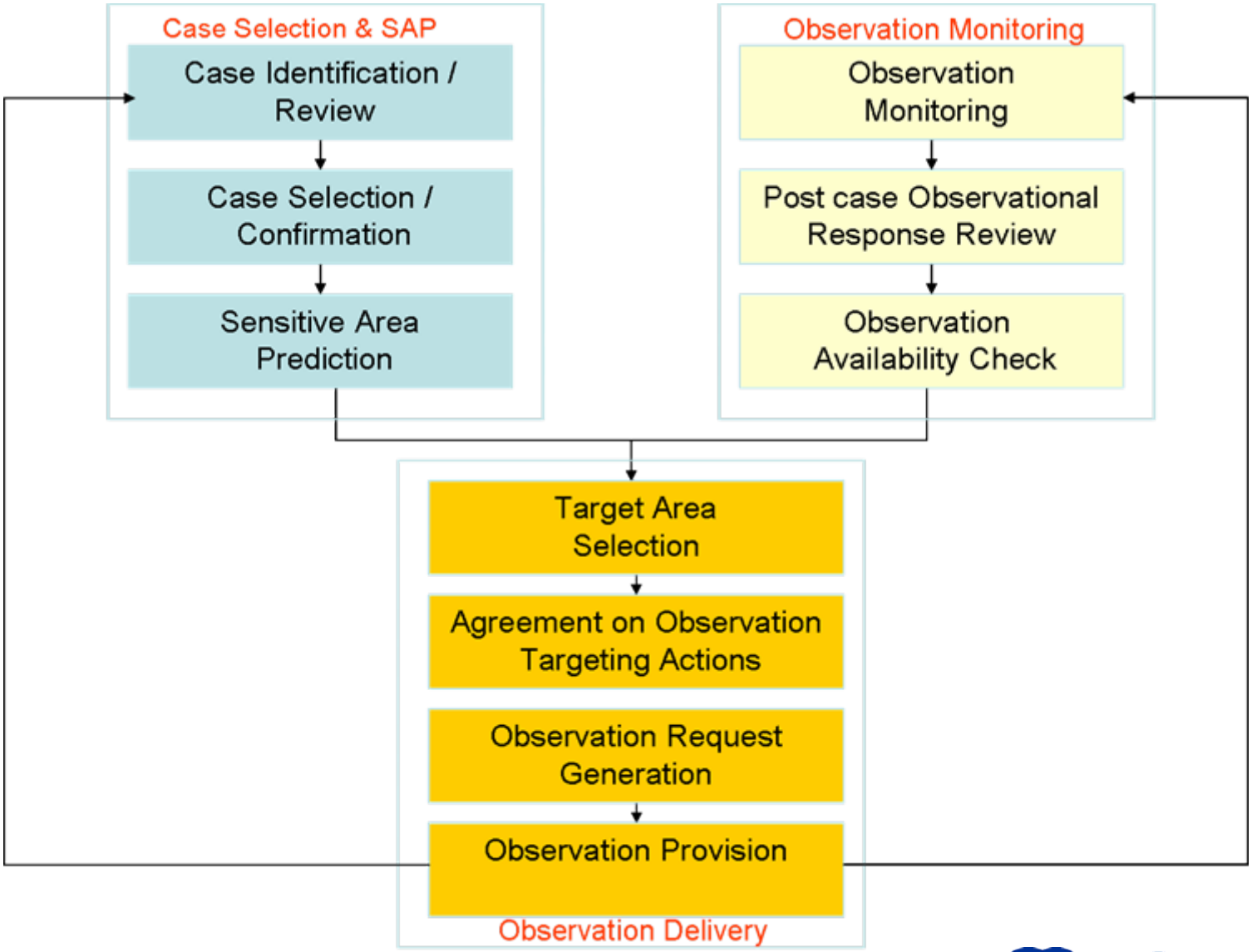
Targeting Process

4. Observation Targeting

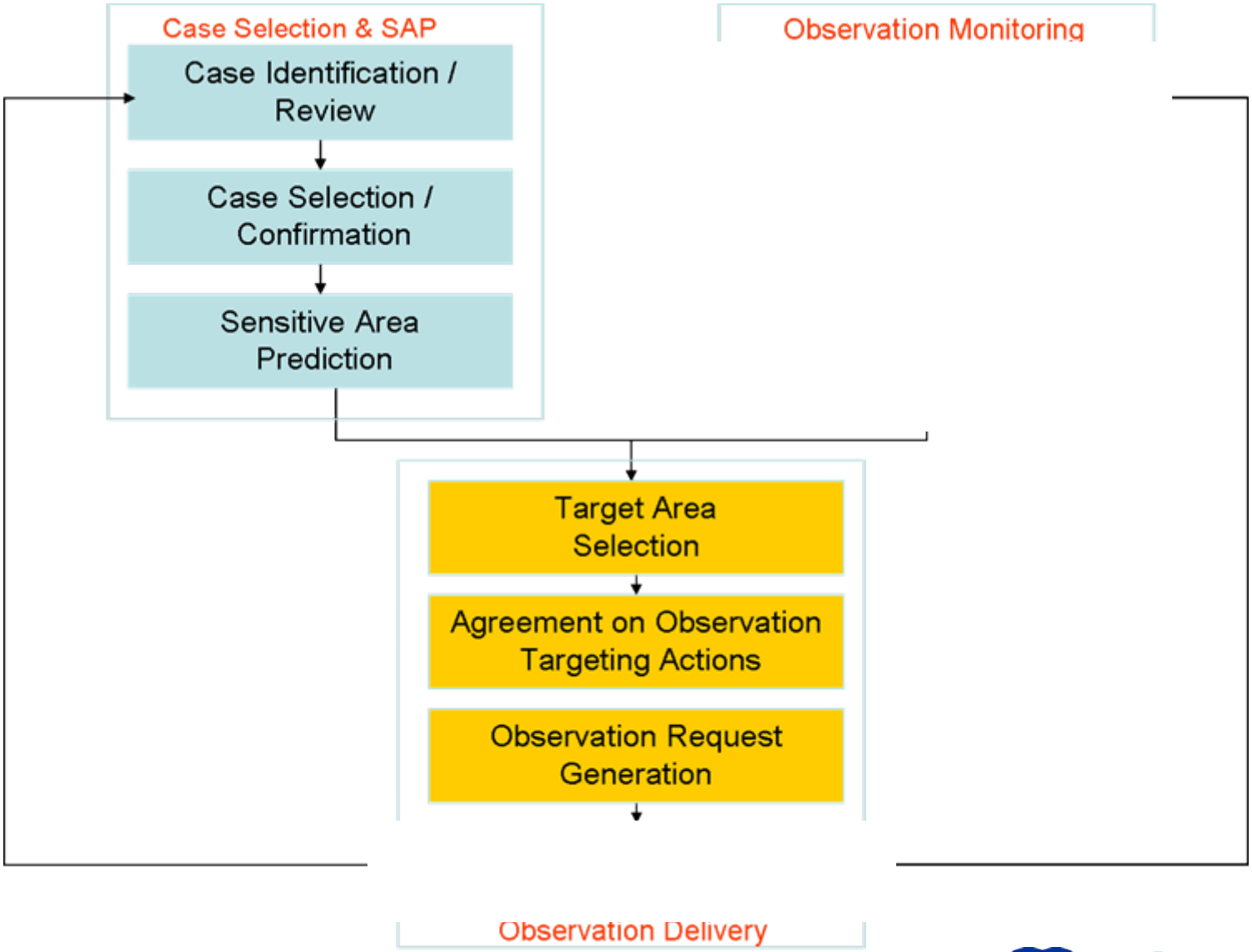
- Based on a comparison of SAP results the location(s) of observation target area(s) will be defined
- Availability of observations:
  - ASAP ship sounding ; AMDAR aircraft reports and additional radiosonde ascents
- After reviewing the availability of observation resources request to observation providers will be issued

Targeting Process – Full System



ECMWF

Targeting Process - Prototype



ECMWF

DTS Prototype System

Case Proposal

November, 2007

Today

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Select date

Proposed Cases

A1.2007111212
D2.2007111212

Observations

Show Observations

Administration

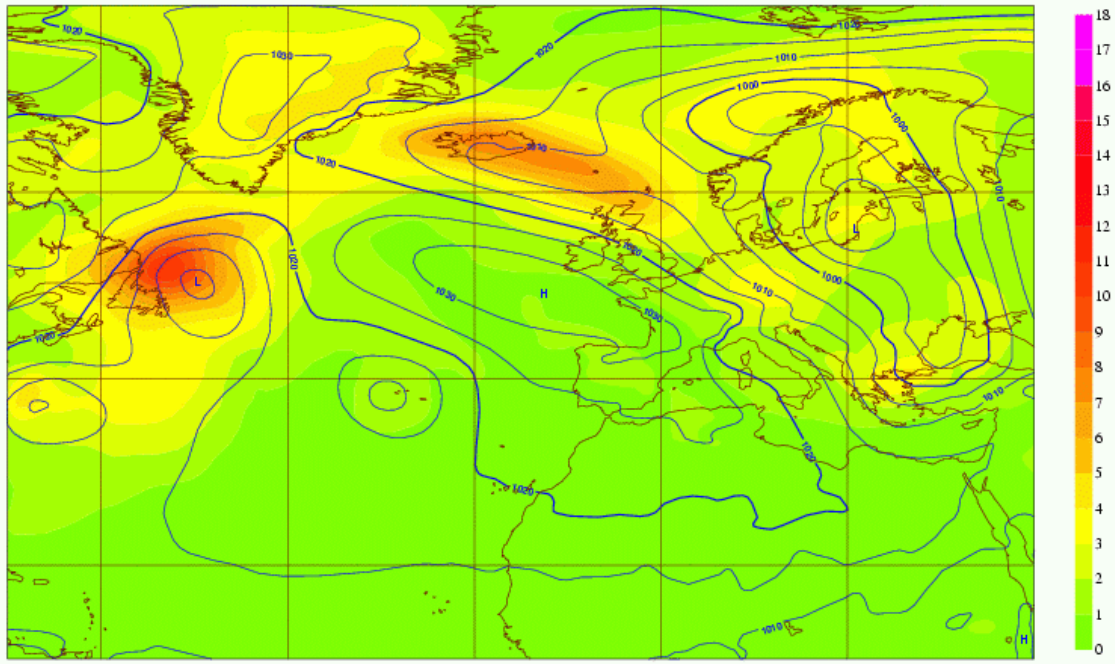
Case Evaluation

Case Proposal Deadline: 08/11/2007 at 10:00 UTC

Forecast Charts (EPS Mean/Spread):

2007111012 2007111100 2007111112 2007111200 2007111212 2007111300

Thursday 8 November 2007 00UTC ©ECMWF Ensemble Forecast t+060 VT: Saturday 10 November 2007 12UTC
Surface: Mean sea level pressure: Ensemble mean (contours, hPa) / Ensemble spread (shaded, hPa)



Proposed by: ()

Lat1: **Lon1:** **Verification Time:**

Lat2: **Lon2:** **Target Time:**

Case Description:

Status:

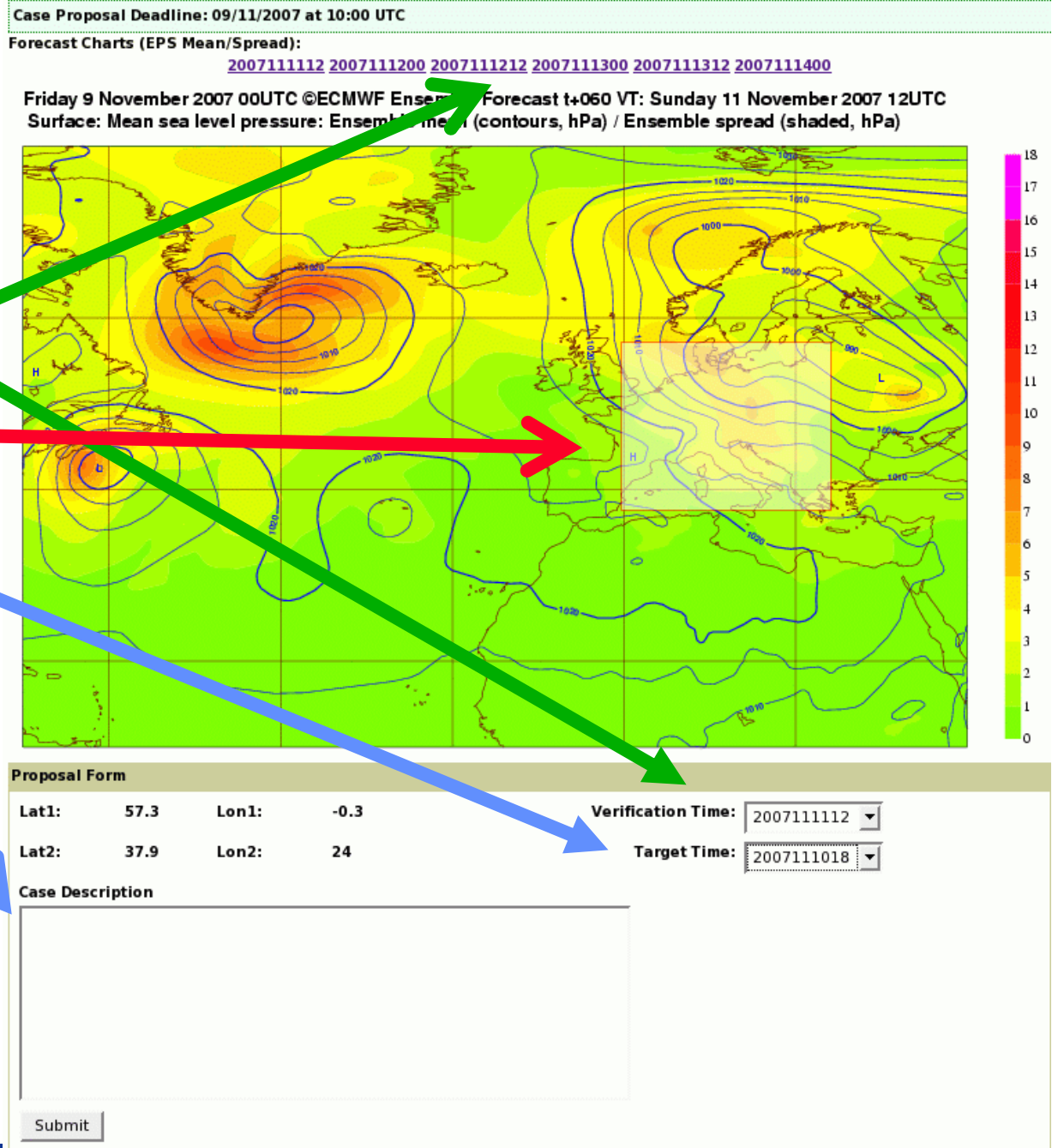
Justification By Lead User:

ECMWF

On-line form:

Propose a Case

1. Selecting the VT
2. Selecting the VA
3. Choose the TT
4. Add justification
5. To Submit



ECMWF

Case Proposal

November, 2007

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Select date

Proposed Cases

Observations

Show Observations

Administration

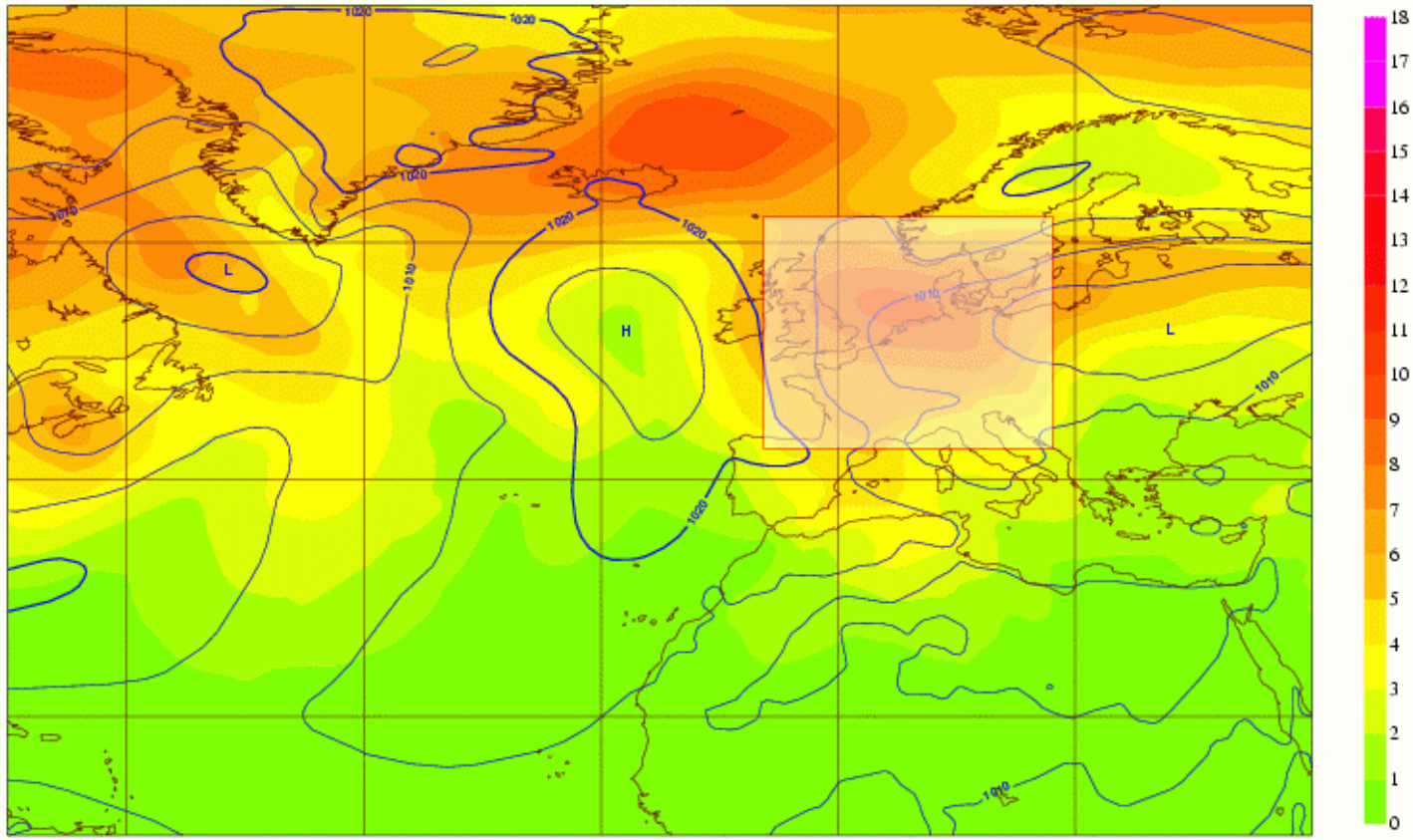
Case Evaluation

Case Proposal Deadline: 10/11/2007 at 10:00 UTC

Forecast Charts (EPS Mean/Spread):

2007111212 2007111300 2007111312 2007111400 2007111412 2007111500

Saturday 10 November 2007 00UTC ©ECMWF Ensemble Forecast t+096 VT: Wednesday 14 November 2007 00UTC
Surface: Mean sea level pressure: Ensemble mean (contours, hPa) / Ensemble spread (shaded, hPa)



Proposal Form

Lat1:	62.7	**Lon1:**	-6.3	**Verification Time:**	2007111400
Lat2:	43.2	**Lon2:**	18	**Target Time:**	2007111206

Case Description

Heavy precipitation and strong winds forecasted for Wednesday over central Europe. Large uncertainty in the MSLP field.

Case Proposal

November, 2007

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

Select date

Case Proposal

- Propose New Case
- Copy From This Case

Proposed Cases

U1.2007111400

Observations

- Show Observations

Administration

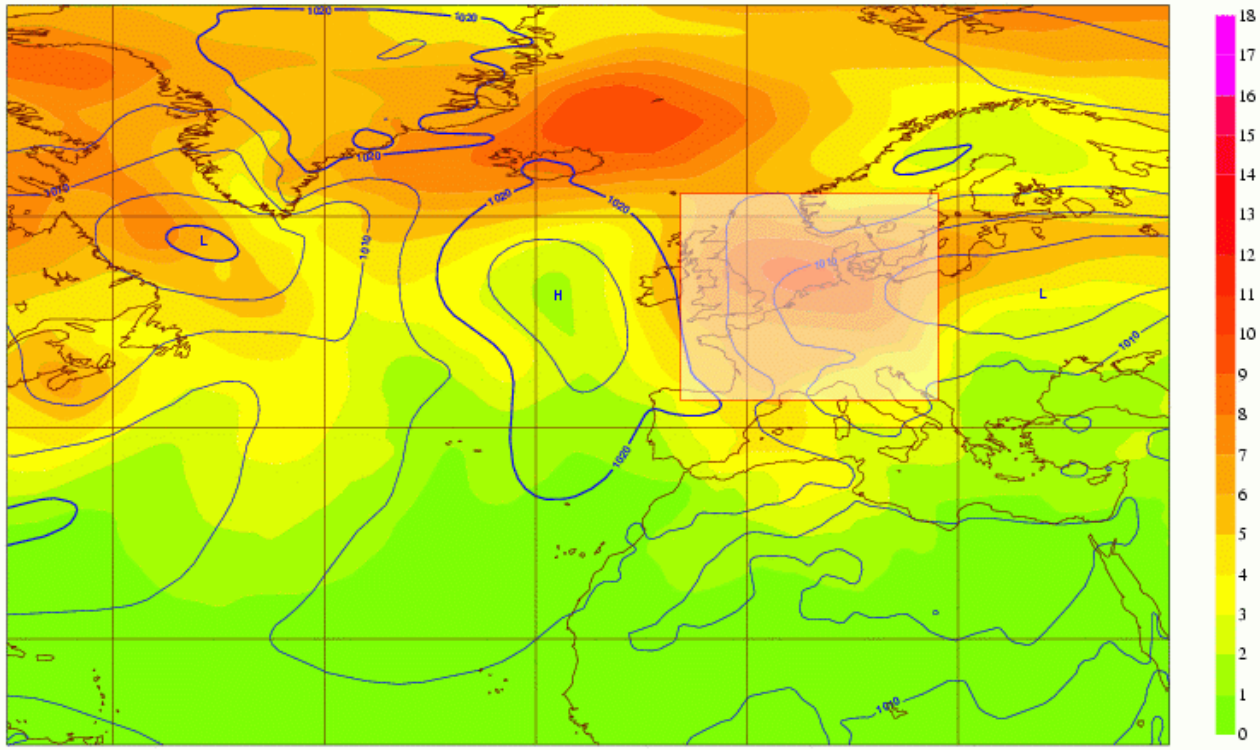
- Case Evaluation

Case Proposal Deadline: 10/11/2007 at 10:00 UTC

Forecast Charts (EPS Mean/Spread):

2007111212 2007111300 2007111312 2007111400 2007111412 2007111500

Saturday 10 November 2007 00UTC ©ECMWF Ensemble Forecast t+096 VT: Wednesday 14 November 2007 00UTC
Surface: Mean sea level pressure: Ensemble mean (contours, hPa) / Ensemble spread (shaded, hPa)



Proposed by: moh (10/11/2007 at 09:57 UTC)

Lat1: 62.7	Lon1: -6.3	Verification Time:	2007111400
Lat2: 43.2	Lon2: 18	Target Time:	2007111206

Case Description:

Heavy precipitation and strong winds forecasted for Wednesday over central Europe. Large uncertainty in the MSLP field.

U1.yyyymmddhh (VT) Status : Unknown

ECMWF

Case Proposal

- Other users can view and add comments to each proposal

Case Proposal

October, 2007

Today

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Select date

Proposed Cases

A1.2007100612
D2.2007100612
D3.2007100612
D4.2007100612
D5.2007100700
A6.2007100700

Observations

Show Observations

No Charts available! Charts are updated around 9:00 UTC every morning

Proposed by: dts_meto3 (04/10/2007 at 09:51 UTC)

Lat1: 52.3	Lon1: 0.2	Verification Time:	2007100700
Lat2: 32.8	Lon2: 24.5	Target Time:	2007100518

Case Description:

As U5, but with data time 12 hours earlier.
Uncertainty in 500hPa height and to lesser extent in mslp, but mostly in rainfall over Italy as upper trough extending southeast across Austria temporarily picking up cut off drifting east over northern Mediterranean, then disrupting and leaving cut off over southern Italy. Risk of heavy rain over southern Italy. More than 50 mm in 12hrs in deterministic model, 35+mm in 6 hours in GFS.

Status: Accepted

Justification By Lead User:

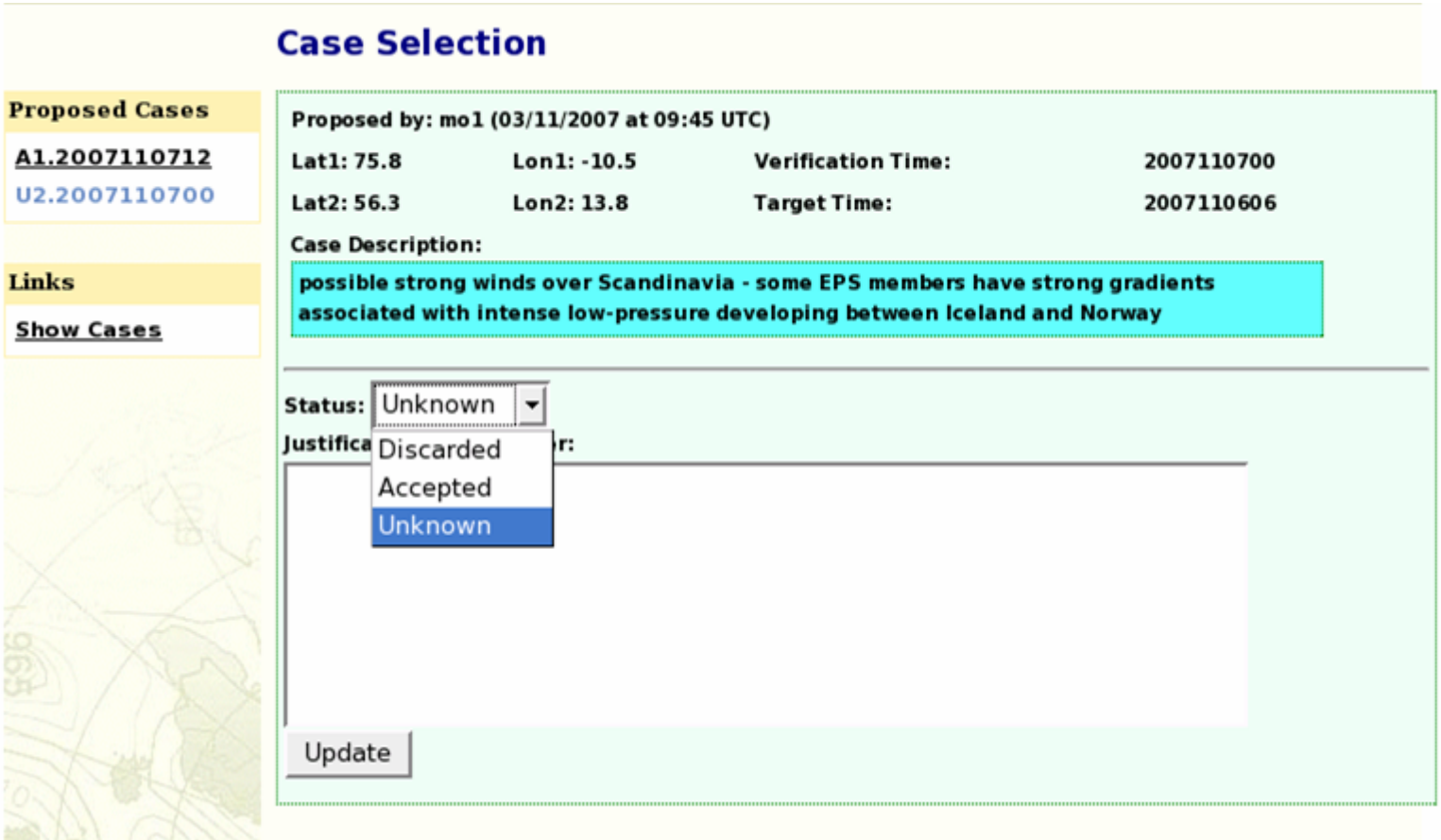
At least worth running SACs. Impact and degree of uncertainty marginal for full trial, but would still probably run to see here SACs are relative to available obs.

Comments for Case 233

From: mo1
Time: 04/10/2007 at 09:58 UTC
Comment
I agree that it is better to have the earlier TT. David

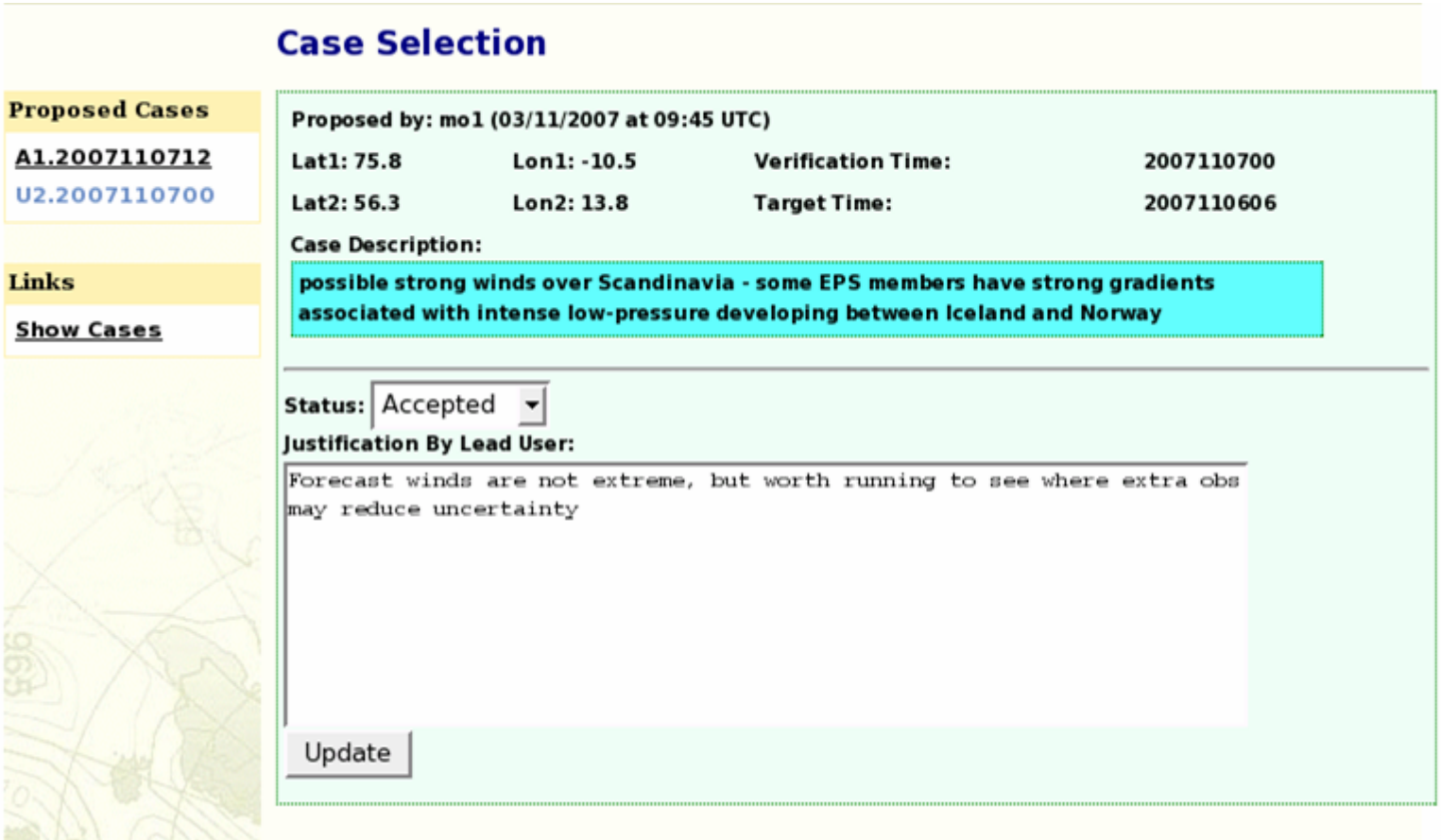
DTS - Case Selection

- **Lead user accepts or rejects proposed cases**
- **Sensitive area prediction requests are automatically submitted for all accepted cases**



DTS - Case Selection

- **Lead user accepts or rejects proposed cases**
- **Sensitive area prediction requests are automatically submitted for all accepted cases**



DTS - observation selection

For each accepted case, sensitive area results are plotted overlaid with available observations for both techniques: TESV (ECMWF) and ETKF (UKMO)

Lead user selects region(s) to target

All available observations in each region are automatically selected

Lead user can modify observation list interactively

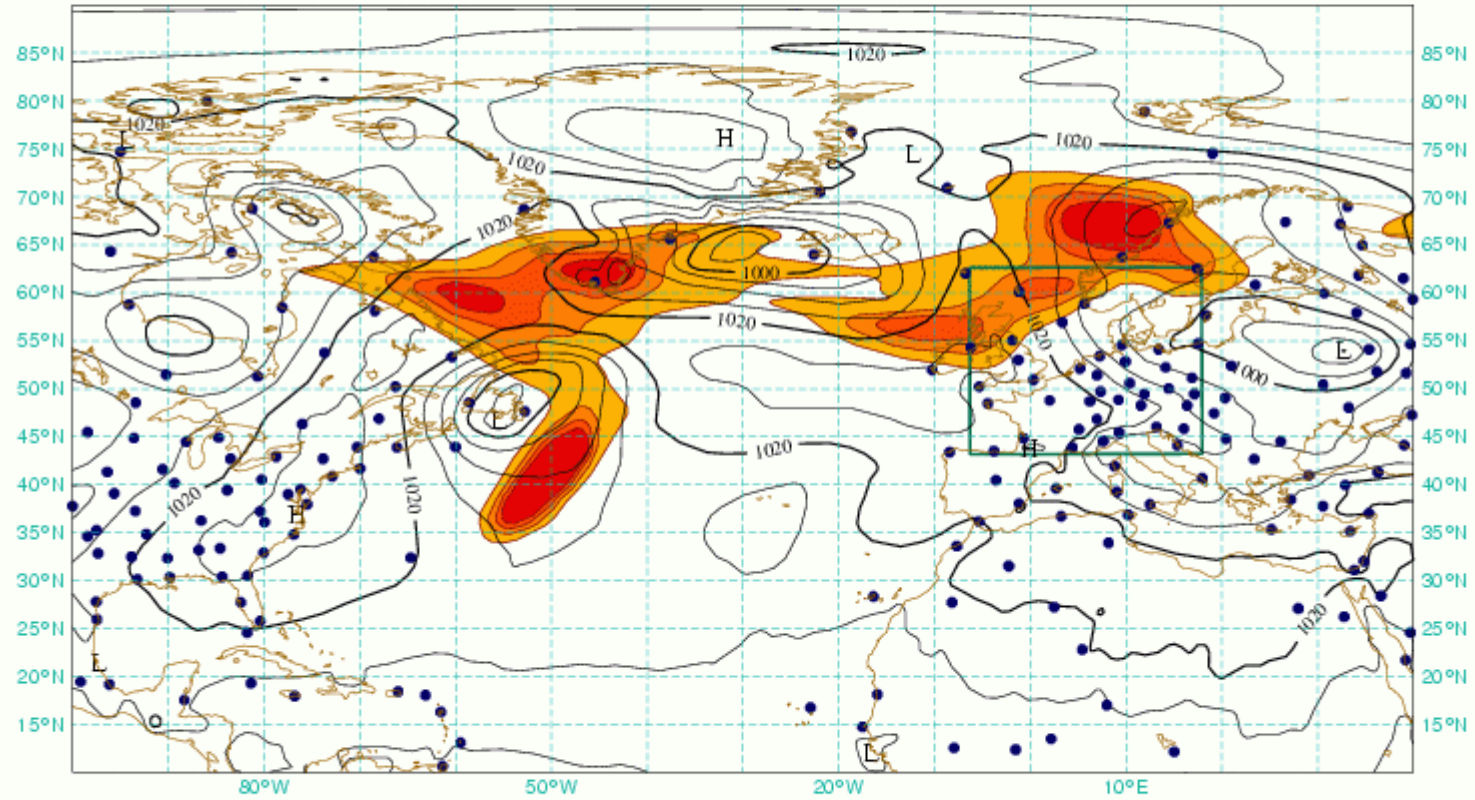
Extra Observation Proposal

Extra Observation Proposal Deadline: 10/11/2007 at 13:30 UTC

SAC Results :

ecmwf msl z500 t850
ukmo msl z500 t850

ECMWF-SAP based on TE-SVs (moist T95) and MSL
Valid time: 20071112, 06 UT (Targeting Time)
Shading: areas of 8, 4, 2, 1 x10 ^{6} km^{2}
trajectory initialized from fc 20071110, 00 UT +54 h
Targ. time: 20071112, 06 UT / Verif. time: 20071114, 00 UT (opt: 42h)



Proposal Form

Lat1:	-	**Lon1:**	-	**Verification Time:**	**2007111400**
Lat2:	-	**Lon2:**	-	**Target Time:**	**2007111206**

Observation List:

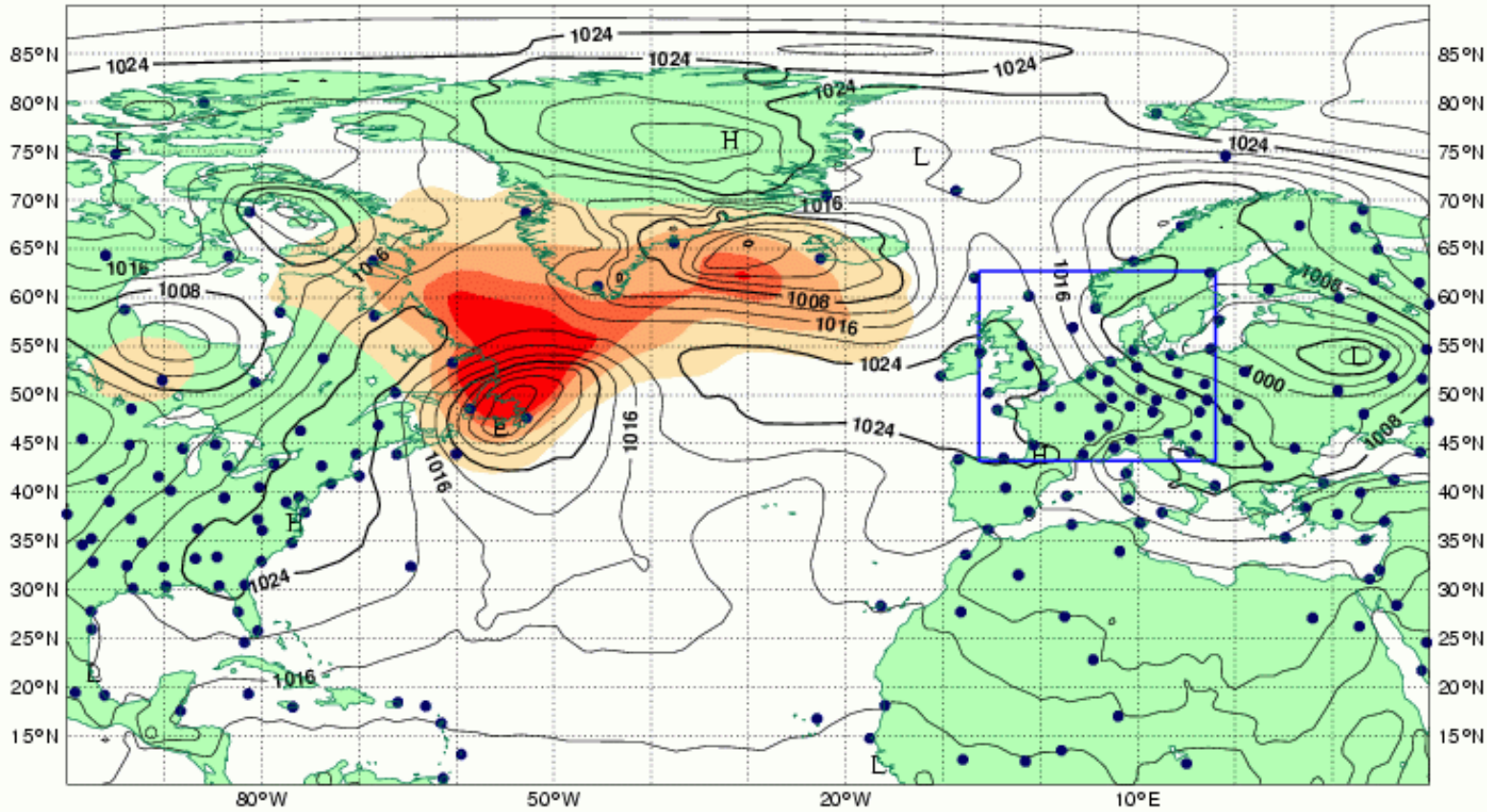
Extra Observation Proposal

Extra Observation Proposal Deadline: 10/11/2007 at 13:30 UTC

SAC Results :

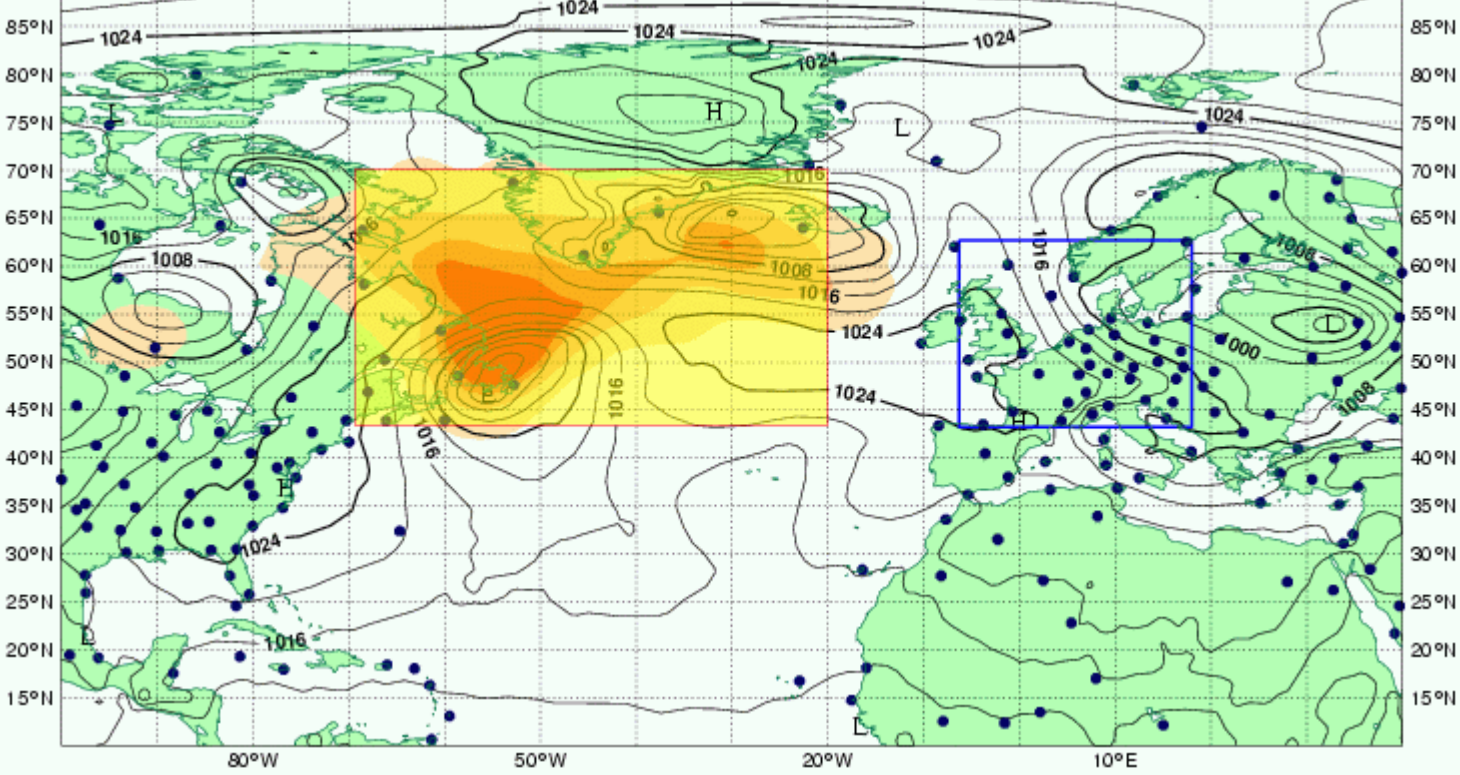
ecmwf msl z500 t850
ukmo msl z500 t850

UKMO-SAP based on ECMWF-initialised ETKF summary map and MSLP (black solid contour)
Valid time: 20071112, 6UT
Shading: areas of 8, 4, 2, 1 x 10 ^{6} km^{2}
Trajectory initialised from fc 20071110, 0 +54h (Lead time)
Targ. time: 20071112, 6UT / Verif. time : 20071114, 0UT (opt:42)



Proposal Form

Lat1:	-	**Lon1:**	-	**Verification Time:**	**2007111400**
Lat2:	-	**Lon2:**	-	**Target Time:**	**2007111206**

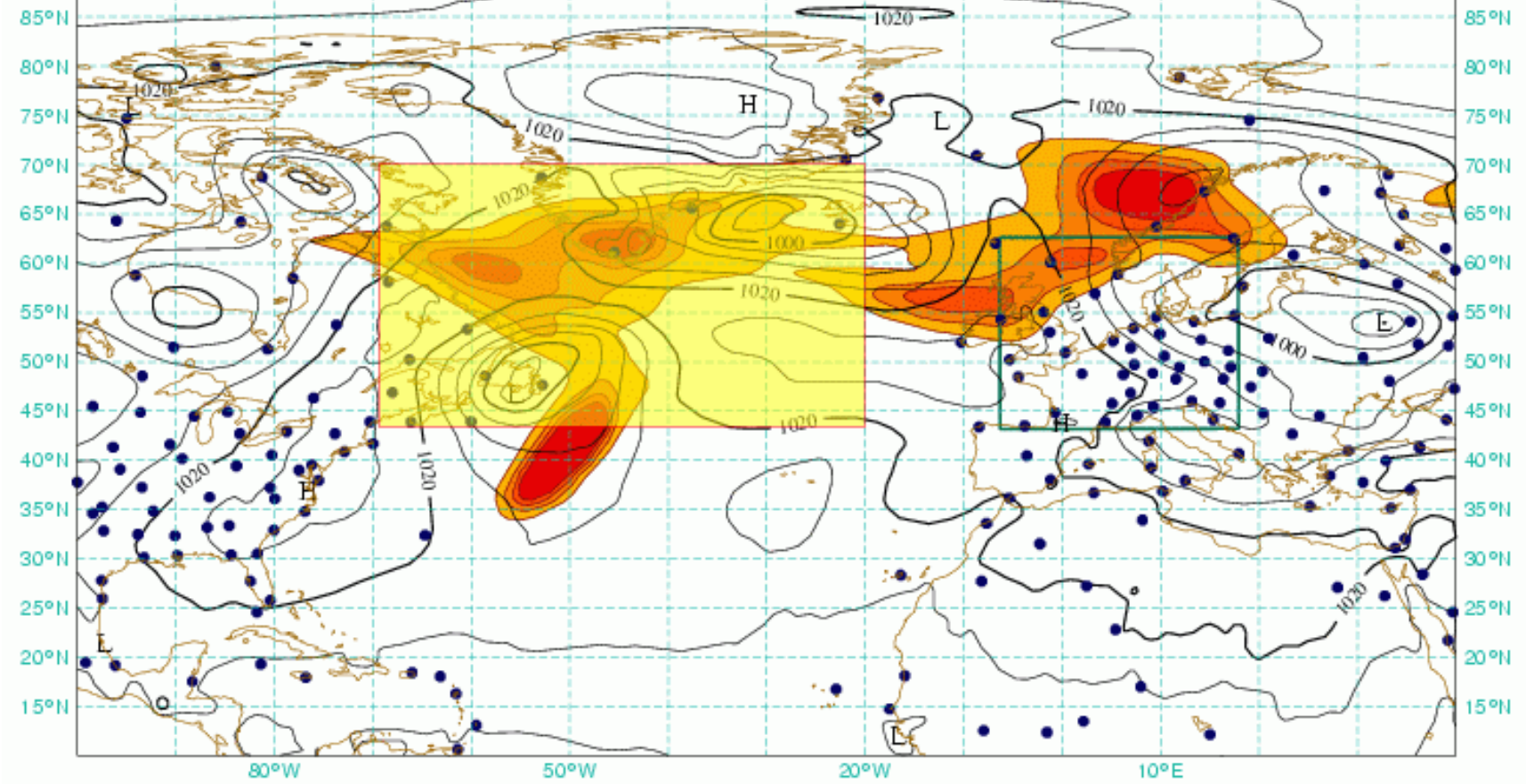


Proposed by: moh (10/11/2007 at 12:12 UTC)

Lat1: 70.2	**Lon1: -69.3**	**Verification Time:**	**2007111400**
Lat2: 43.6	**Lon2: -20.2**	**Target Time:**	**2007111206**

Observation List:

Observations on Selected Area
04360: 65.60 -37.63
04270: 61.15 -45.43
71909: 63.75 -68.55
04220: 68.70 -52.85
72712: 46.87 -68.00
71603: 43.87 -66.10
04018: 63.97 -22.60
71811: 50.22 -66.25
71906: 58.12 -68.42
71600: 43.92 -60.00
71801: 47.62 -52.75
71816: 53.30 -60.37
71815: 48.57 -58.57



Proposed by: moh (10/11/2007 at 12:12 UTC)

Lat1: 70.2	**Lon1: -69.3**	**Verification Time:**	**2007111400**
Lat2: 43.6	**Lon2: -20.2**	**Target Time:**	**2007111206**

Observation List:

Observations on Selected Area
04360: 65.60 -37.63
04270: 61.15 -45.43
71909: 63.75 -68.55
04220: 68.70 -52.85
72712: 46.87 -68.00
71603: 43.87 -66.10
04018: 63.97 -22.60
71811: 50.22 -66.25

Extra Observation Requests

DTS generates an email sending a consolidate list of observation requests

Subject: DTS (Trial Phase) Observation Report for 03/11/2007, 00 UTC

From: Cihan Sahin <mot@ecmwf.int>

Date: 03/11/07 14:05

To: mol@ecmwf.int, mot@ecmwf.int, moh@ecmwf.int,

```
Project: Data Targeting System (Trial Phase)

Dear Madam/Sir,

Please find attached the list of the extra observations based on the initialisation
date 03/11/2007, 00 UTC.

Extra Observations Proposal List


Target Time: 06/11/2007, 06 UTC
 Station ID: 04339, Position:  70.48 -21.95
 Station ID: 71801, Position:  47.62 -52.75
 Station ID: 04018, Position:  63.97 -22.60
 Station ID: 06011, Position:  62.02 -6.77
 Station ID: 04270, Position:  61.15 -45.43
 Station ID: 04320, Position:  76.77 -18.67
 Station ID: 01001, Position:  70.93 -8.67
 Station ID: 04360, Position:  65.60 -37.63

Target Time: 06/11/2007, 18 UTC
 Station ID: 04018, Position:  63.97 -22.60
 Station ID: 06260, Position:  52.10 5.18
 Station ID: 06011, Position:  62.02 -6.77
 Station ID: 10200, Position:  53.38 7.23
 Station ID: 07145, Position:  48.77 2.02
 Station ID: 07180, Position:  48.68 6.22
 Station ID: 01400, Position:  56.90 3.35
 Station ID: 03005, Position:  60.13 -1.18
 Station ID: 07110, Position:  48.45 -4.42
 Station ID: 10618, Position:  49.70 7.33
 Station ID: 10410, Position:  51.40 6.97
 Station ID: 03953, Position:  51.93 -10.25
 Station ID: 01415, Position:  58.87 5.67


Note:
This is an automatic message generated by DTS software. For enquiries or reporting
bugs, please contact to;
mol@ecmwf.int, mot@ecmwf.int, moh@ecmwf.int
---------------------------------
Best Regards
```

DTS Prototype : System timetable

Time (UTC)	**Activity**
9:00	**Deterministic and ensemble products displayed for case assessment**
9:00-10:00	**Users' case suggestions**
10:00-10:30	**Lead user finalise case decision and submit request for SAP**
10:40-12:00	**SAP run**
12:00	**SAP results and observations availability displayed**
12:00-13:00	**Lead user suggestions for observation areas**
13:00-14:00	**Comments from users**
14:00	**Lead user finalise the request of targeted data**
14:05	**An e-mail is sent with the list of observation requests**

Summary & Future Developments

- We succeeded to achieve one of the main goals of this project : build in a system that does not rely on significantly on manual effort.

- Easy to use, it has been successfully tested by the UKMO (lead user) during the last two months (17th September 2007) with just a few breakdowns.

- Observation monitoring component is being developed and should be integrated into the system begin of January 2008.

Summary & Future Developments

• Effectively request of observations needs to be implemented.

• The Forecast display will be extended to include UKMO forecast products.

• Other experiments requested to use the system:

- TPARC (THORPEX Pacific Asian Regional Campaign) which will take place during Summer 2008;

- MEDEX (Mediterranean Experiment) which will take place between September 2008 and January 2009.