Experiments of clustering for central European area specially in extreme weather situations

•István Ihász

•Hungarian Meteorological Service

1. ECMWF clustering

2. Clustering for central European area

- **Forecasters's requirements**

- **Method**
- **Experiments**
- **Products**
- **Experiences**

3. Future plans

1. ECMWF clustering

Userguide to ECMWF products:

http://www.ecmwf.int/products/forecasts/guide/EPS_clustering.html

00&12 UTC products

Web, fax and GRIB products:

MARS

http://www.ecmwf.int/services/dissemination/3.1/

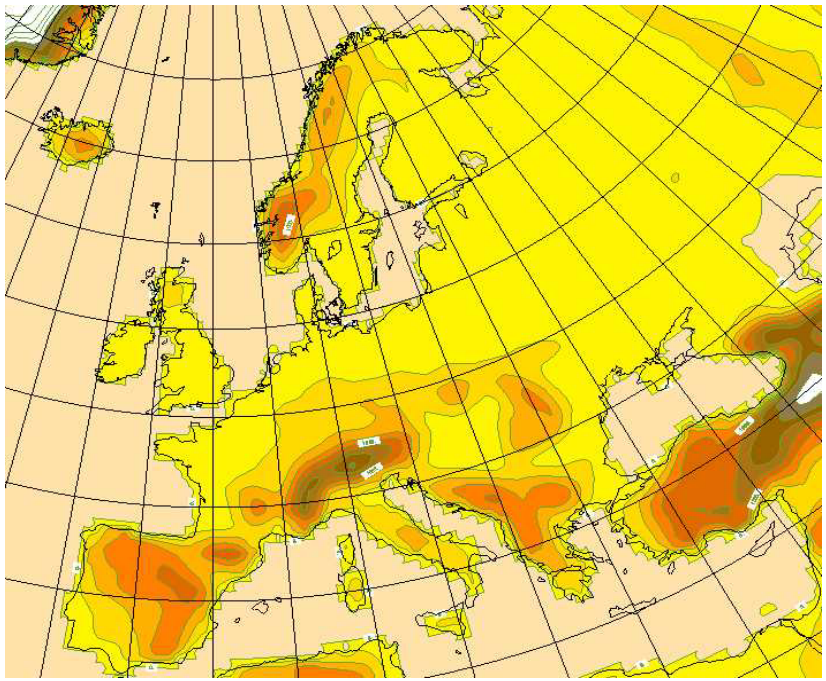
Clusters, or groups, of similar forecasts are computed within the ensemble of 51 (i.e. the 50 perturbed forecasts plus the control forecast);
For five different areas of clustering - domains

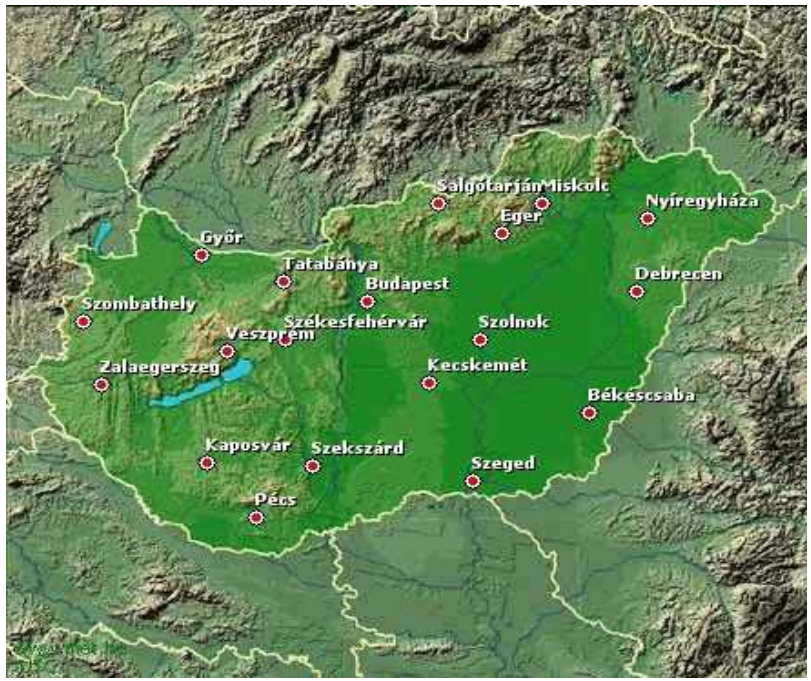
- General European Area	(75.00N	20.00W	30.00N	45.00E)
- North West Europe	(70.00N	27.50W	40.00N	10.00E)
- North East Europe	(72.50N	0.00W	50.00N	45.00E)
- South West Europe	(57.50N	15.00W	32.50N	17.50E)
- South East Europe	(57.50N	2.50E	32.50N	42.50E)

Up to 6 clusters are produced, depending on the overall spread of the ensemble. The measure of similarity between individual forecasts is based on the geopotential at 500hPa over the particular domain area for the period from day 5 to day 7, so that the clusters are fully consistent within that range. For each cluster, the mean and standard deviation of its elements are computed every 12 hours from day 3 to day 7 for 500 hPa geopotential, 500 hPa temperature, 850 hPa temperature, and 1000 hPa geopotential

2. Clustering for central European area

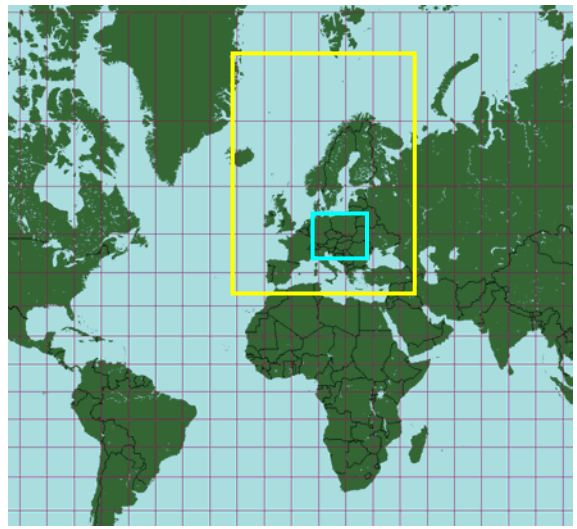
- **Forecasters's requirements**
- **Method**
- **Products**
- **Experiences**





Forecasters's requirements:

- **Clustering for central European area**
- **Use wide range of products**
- **Create forecast probabilities for each clusters**
- **Display cluster means and spagetthies**
- **Etc**



Central European Area (55.00N 10.00E 40.00N 30.00E)

Method - clustering:

Basic tool is available in installation package of metview:

Metview Macro:

- **Examples from EPS tools**
  - **EPS tools**
    - **Clustering.hiera**

```
#
# hierarchical clustering
# Frederic Atger
```

Process of clustering

Clustering with metview macro /F. Atger/

Generate cluster mean and std fields for many met. variables /EMOS/

Generate graphical products for intraweb /MAGICS/

Create netcdf file from GRIB file for visualization system

Archive GRIB files for verification

Products:

- T2 (cluster mean+std)
- T850 (cluster mean+std)
- GEO500 (cluster mean+std)
- MSLP (cluster mean+std)
- Precipitation (cluster mean+std & probabilities:
1, 5, 10, 20mm)
- Wind speed(10m) (cluster mean +std & probabilities:
<2m/s, >5m/s, >10m/s, >15m/s)
- Cloudiness (cluster mean + std & probabilities:
<2octa, >7octa)

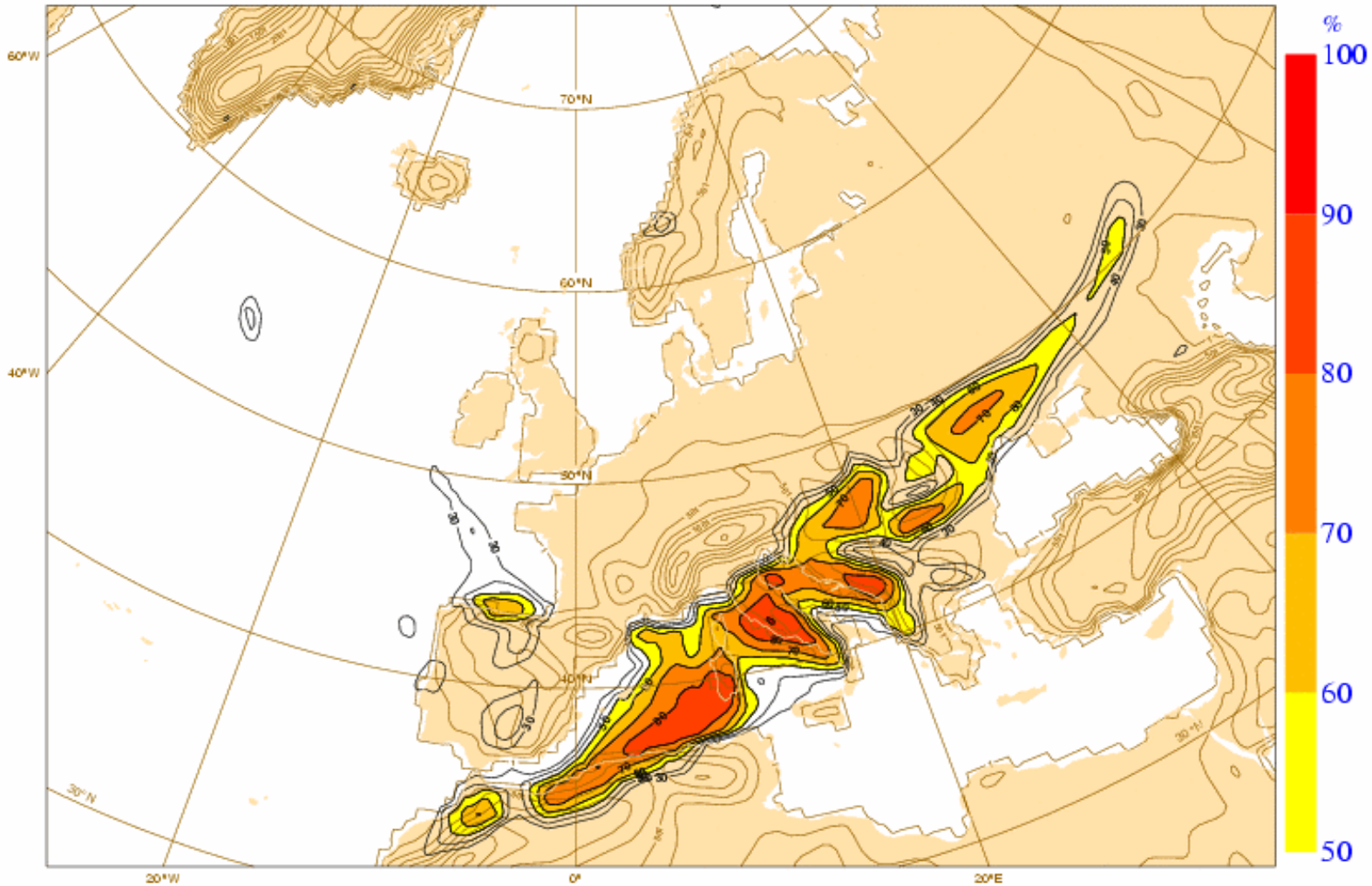
standard fields every 6 hours
precipitation: 12 & 24 hours
(06-18UTC, 18-06UTC, 06-06)

Case study 1

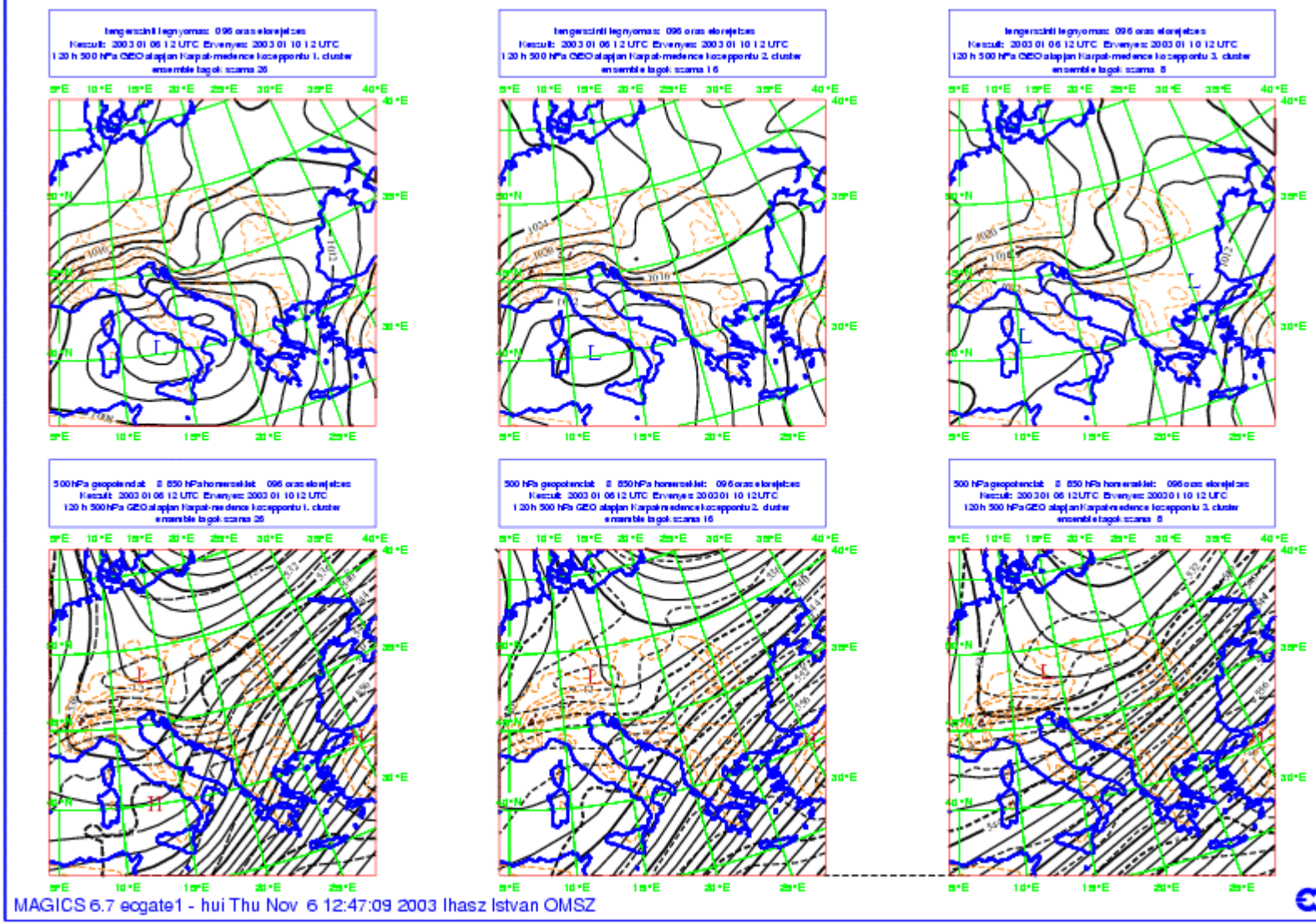
6 – 16 January 2003

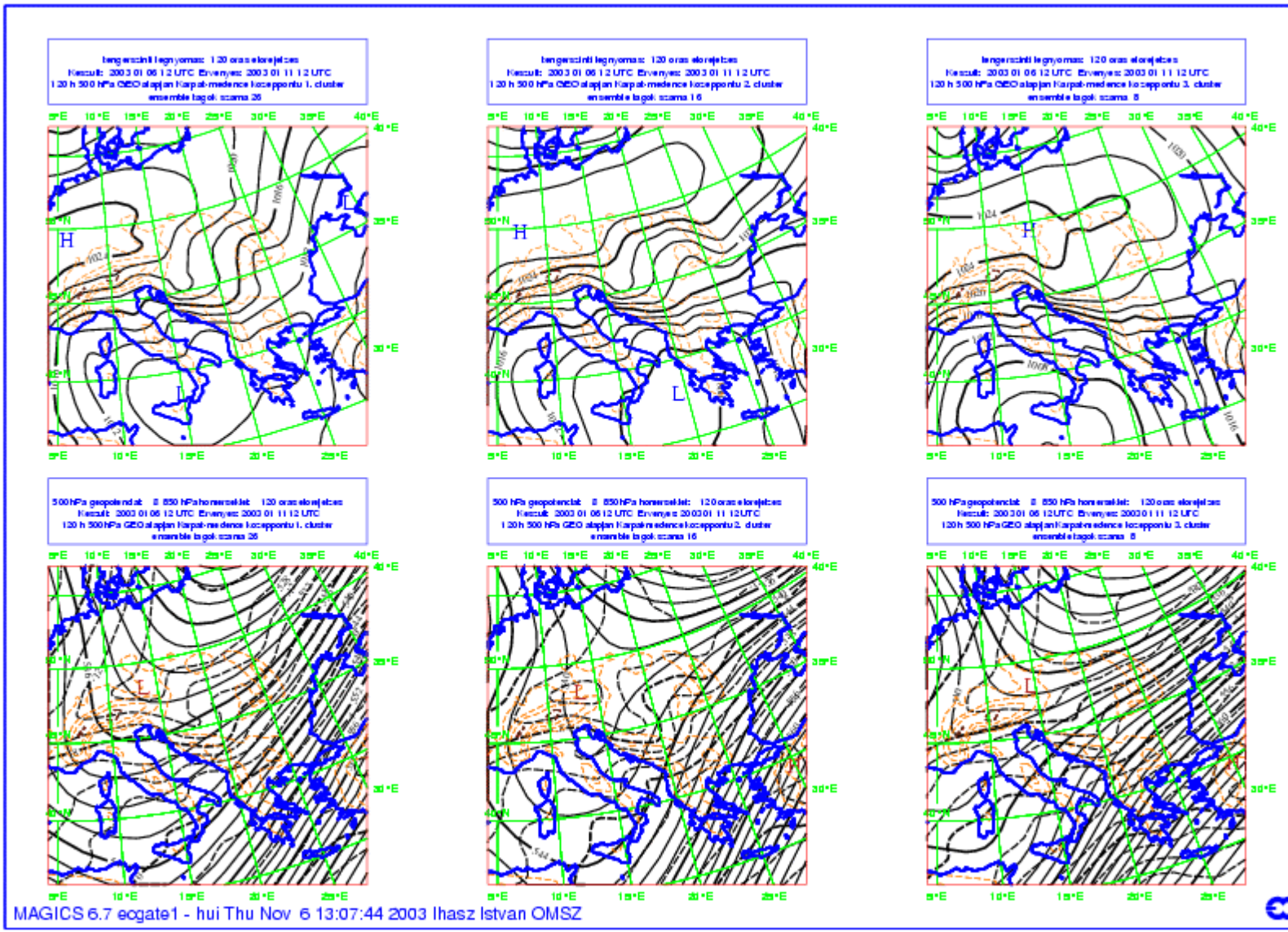
Several mediterrean cyclones

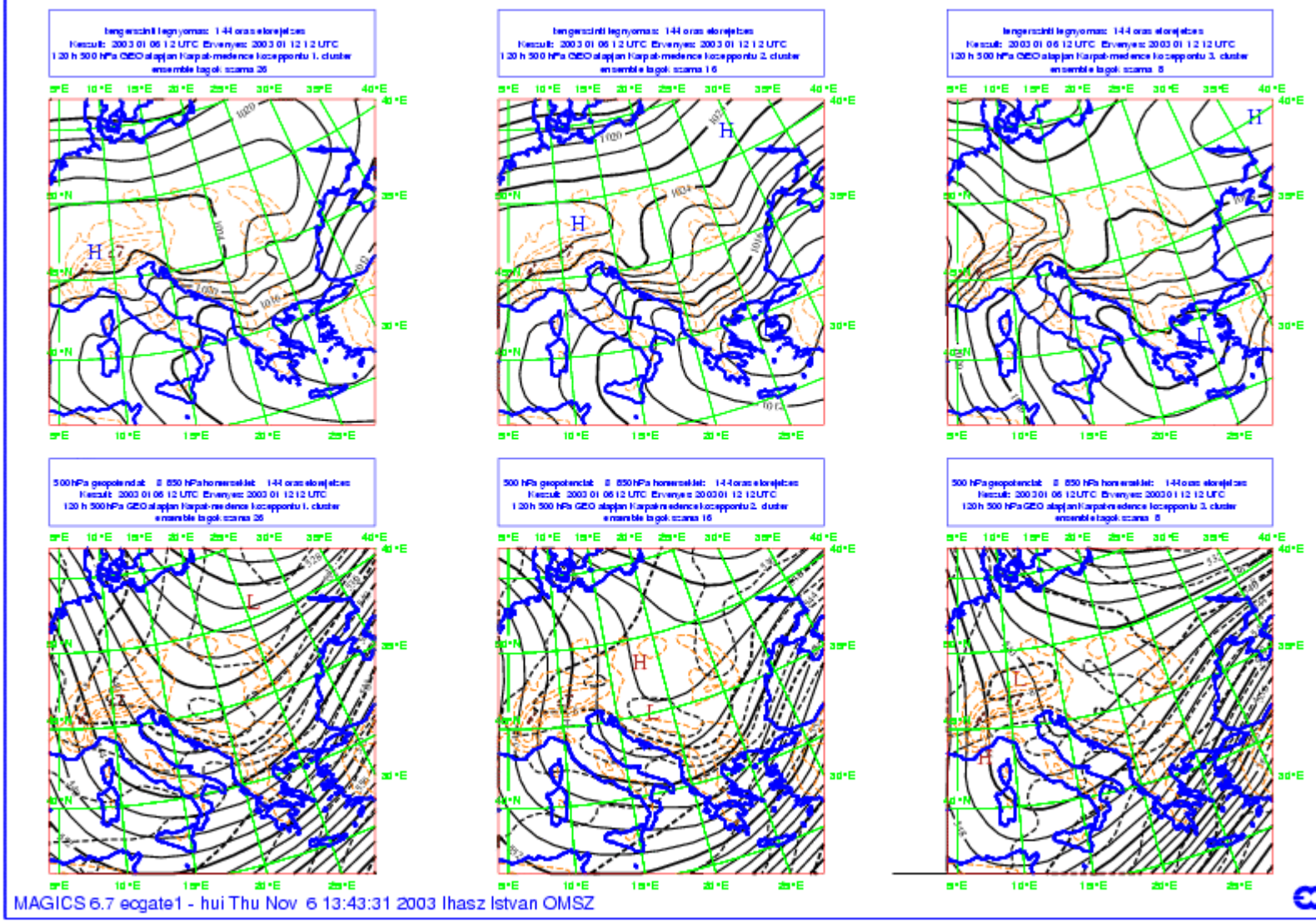
Precipitation accumulated over last 240h EPS Extreme Forecast Index 3
Base 6 January 2003 12UTC, VT: Thursday 16 January 2003 12UTC



M62 261


MAGICS 6.7 eogate1 - hui Thu Nov 6 12:47:09 2003 Ihasz Istvan OMSZ

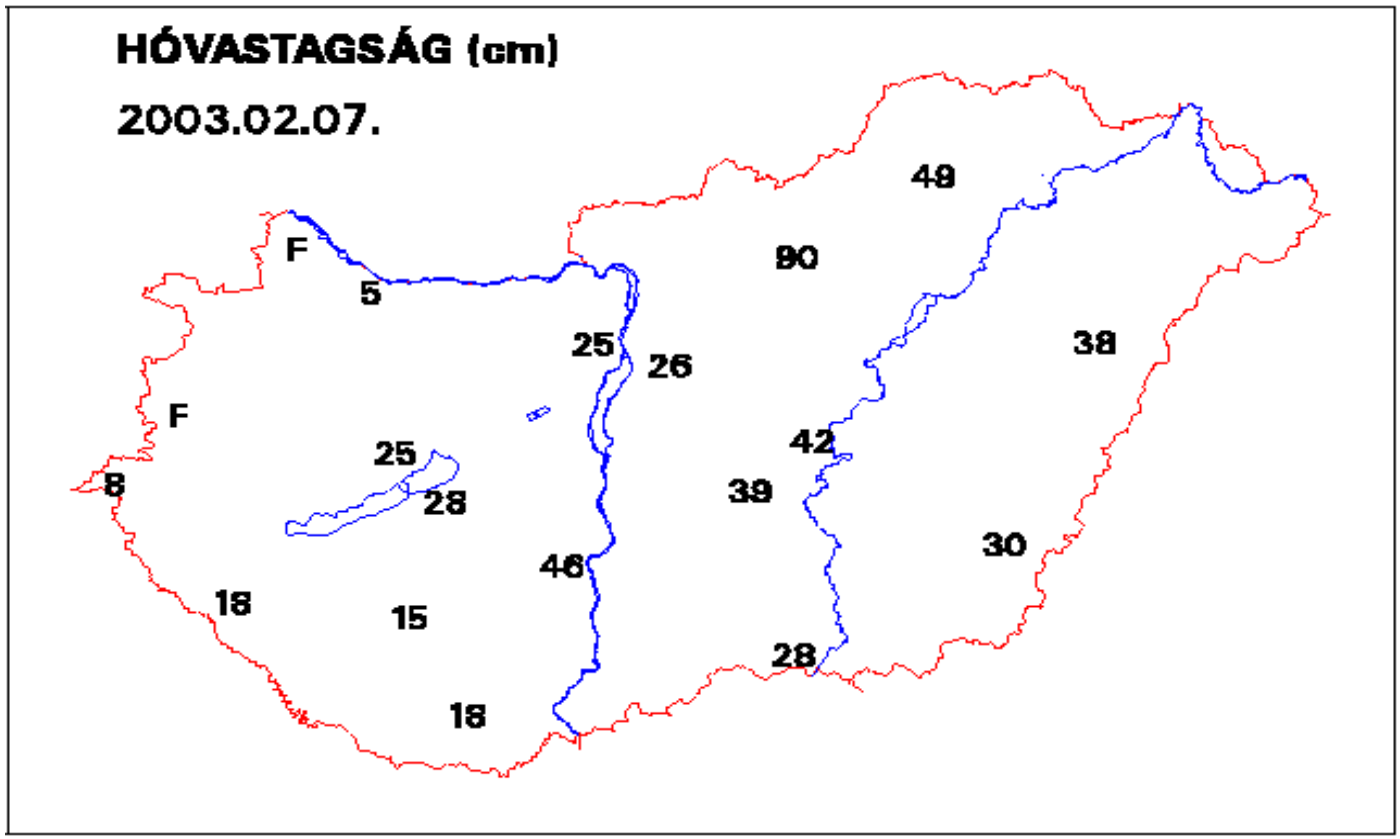

MAGICS 6.7 ecgate1 - hui Thu Nov 6 13:07:44 2003 Ihasz Istvan OMSZ


MAGICS 6.7 ecgate1 - hui Thu Nov 6 13:43:31 2003 Ihasz Istvan OMSZ

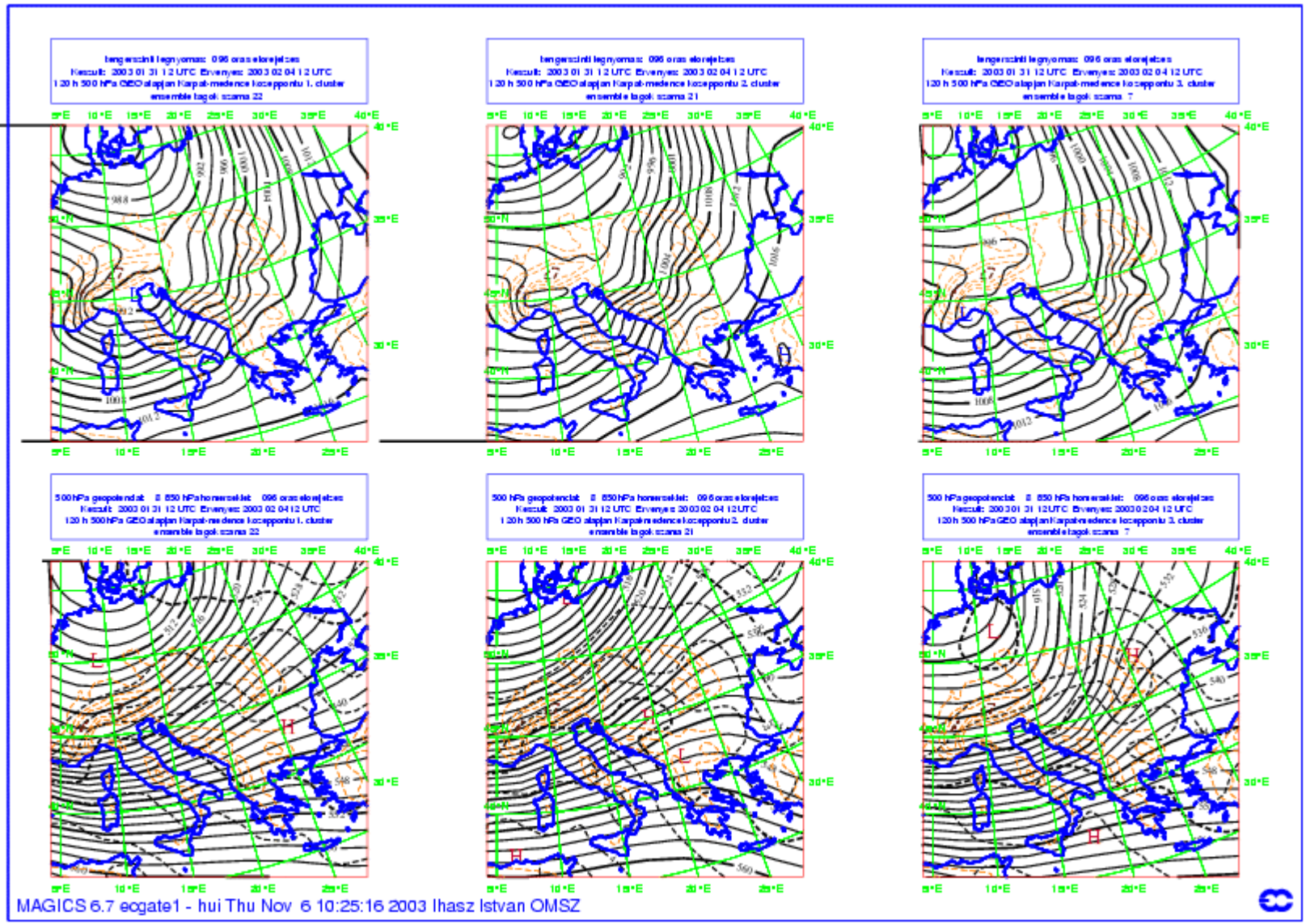
Case study 2

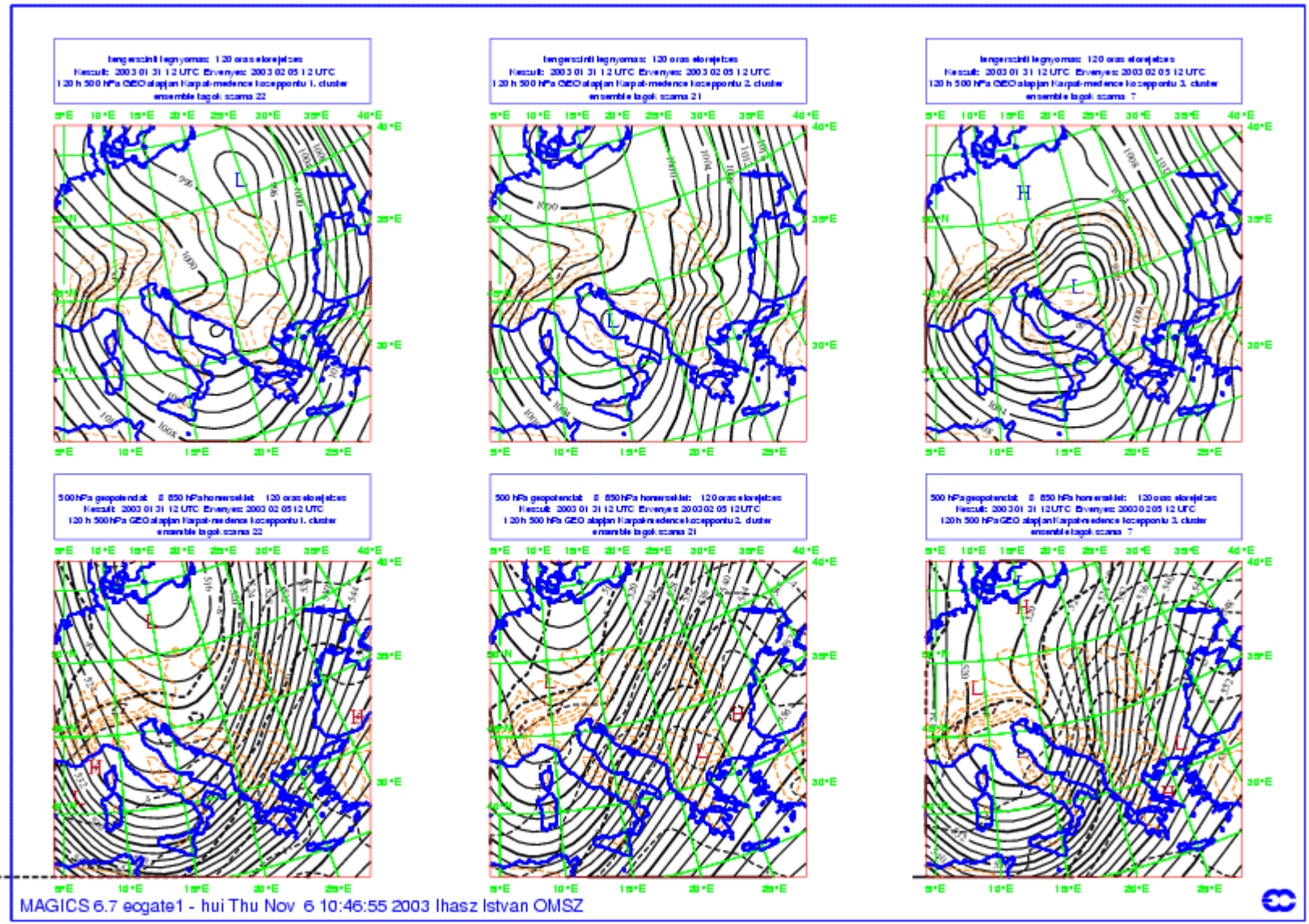
4-9 Februry 2003

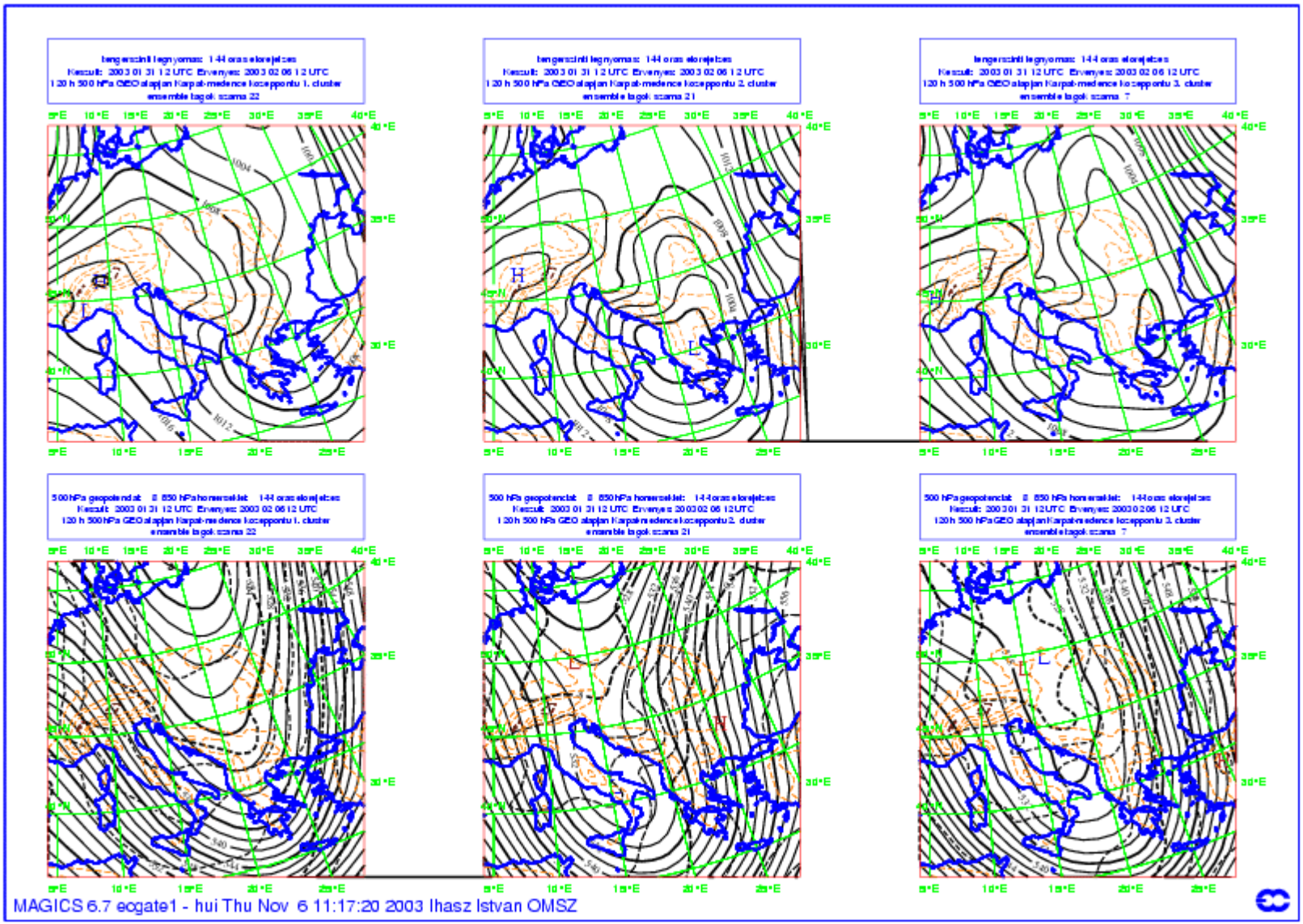
Intensive mediterrean cyclone



Snowdepth 7 February 2003


MAGICS 6.7 eogate1 - hui Thu Nov 6 10:25:16 2003 Ihasz Istvan OMSZ

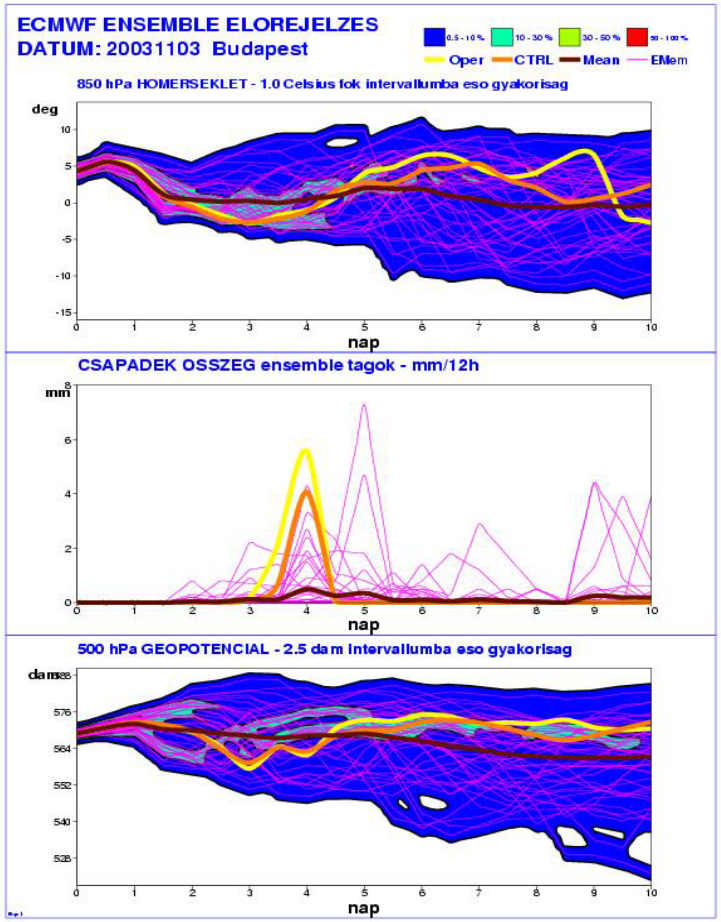

MAGICS 6.7 ecgate1 - hui Thu Nov 6 10:46:55 2003 Ihasz Istvan OMSZ

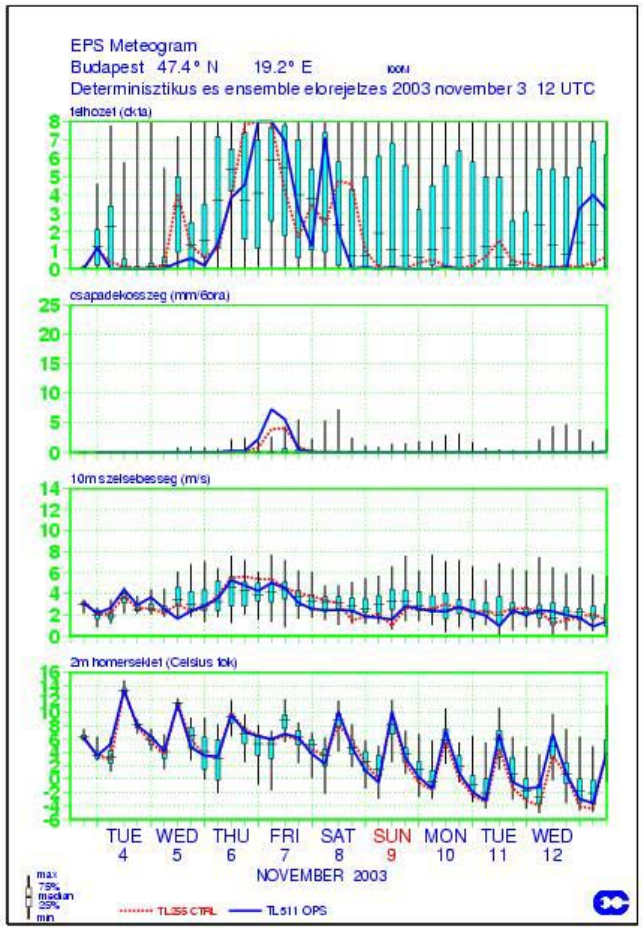

MAGICS 6.7 eogate1 - hui Thu Nov 6 11:17:20 2003 Ihasz Istvan OMSZ

Case study 3

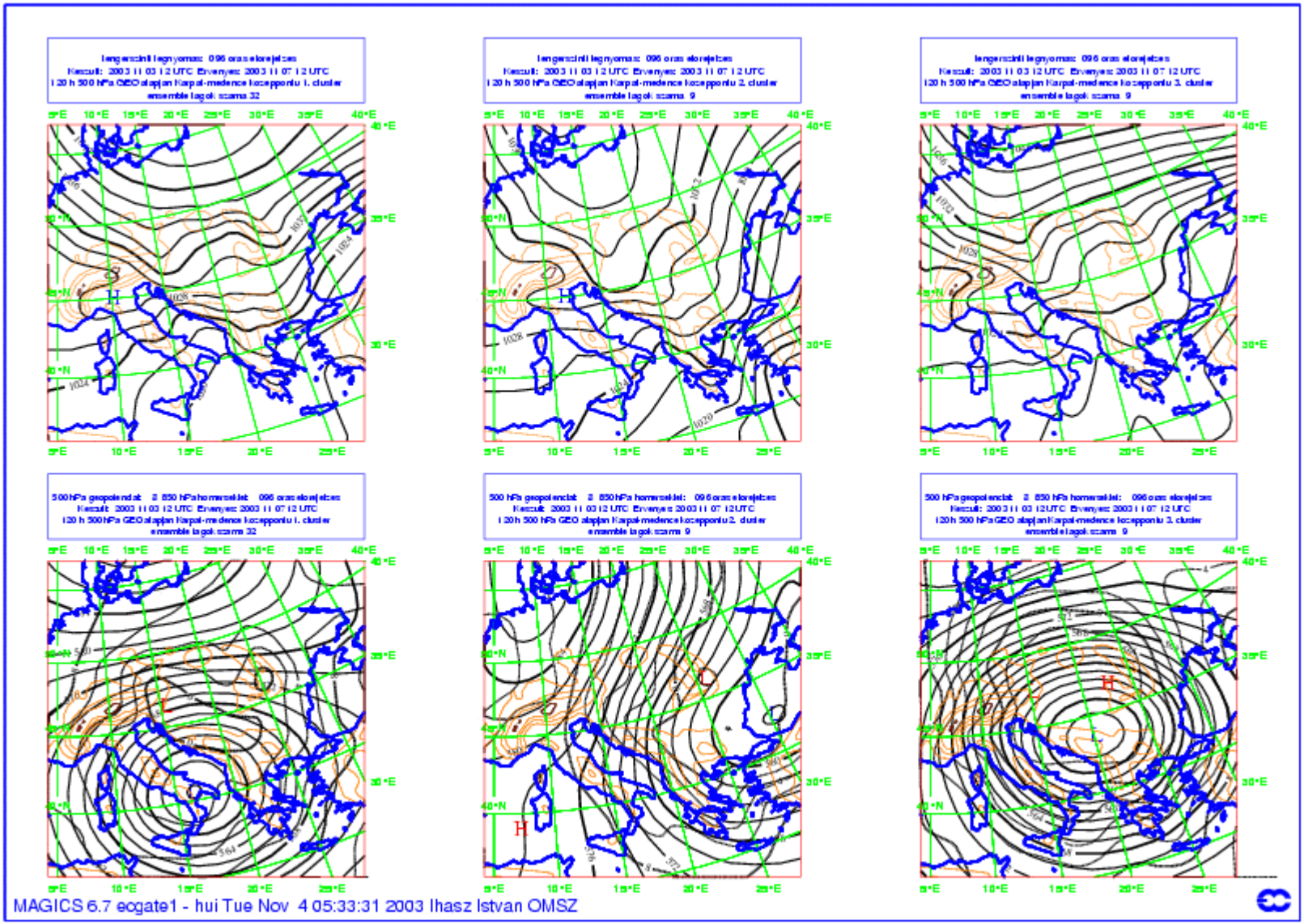
3– 8 November 2003

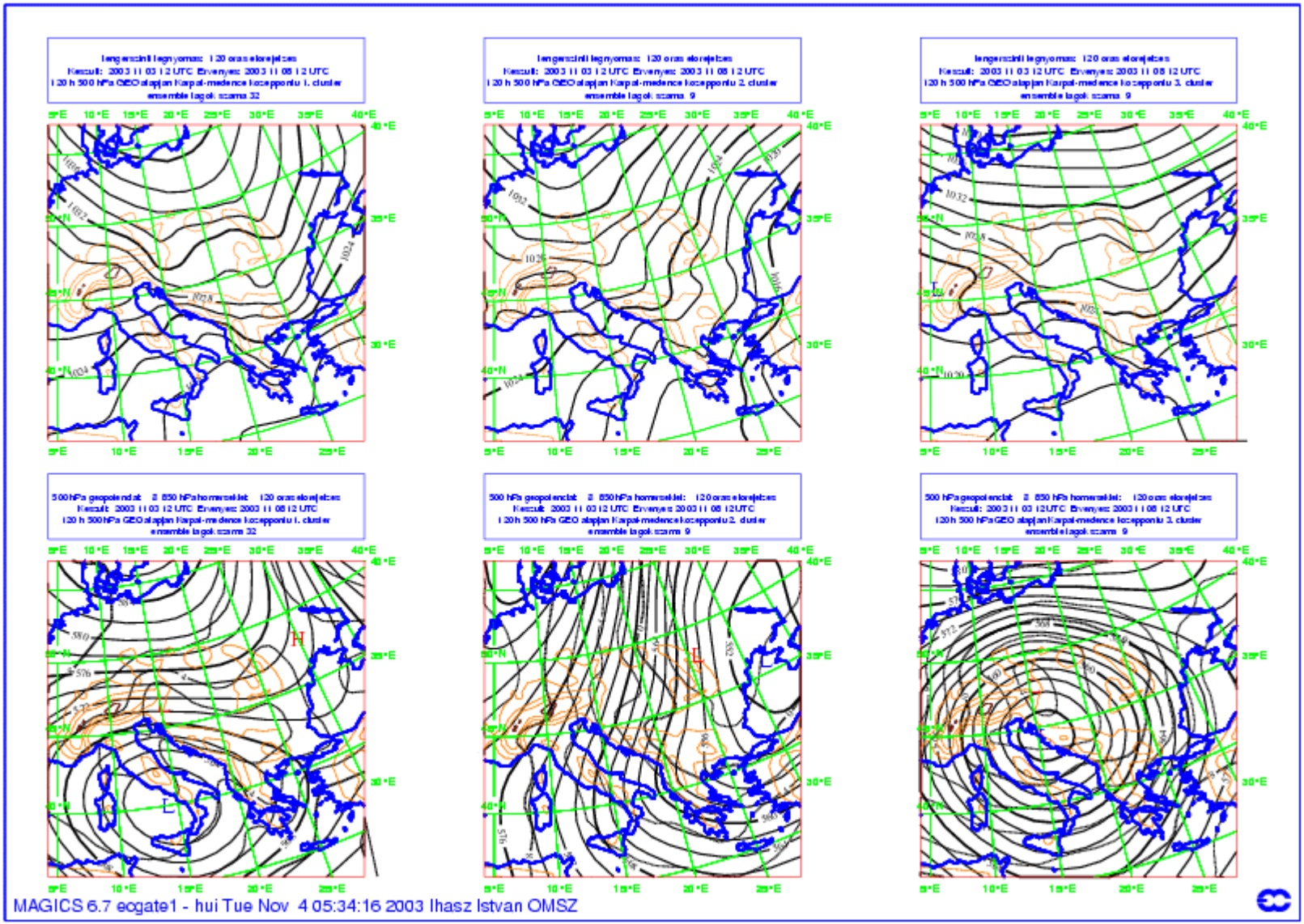
Retrograde cyclone

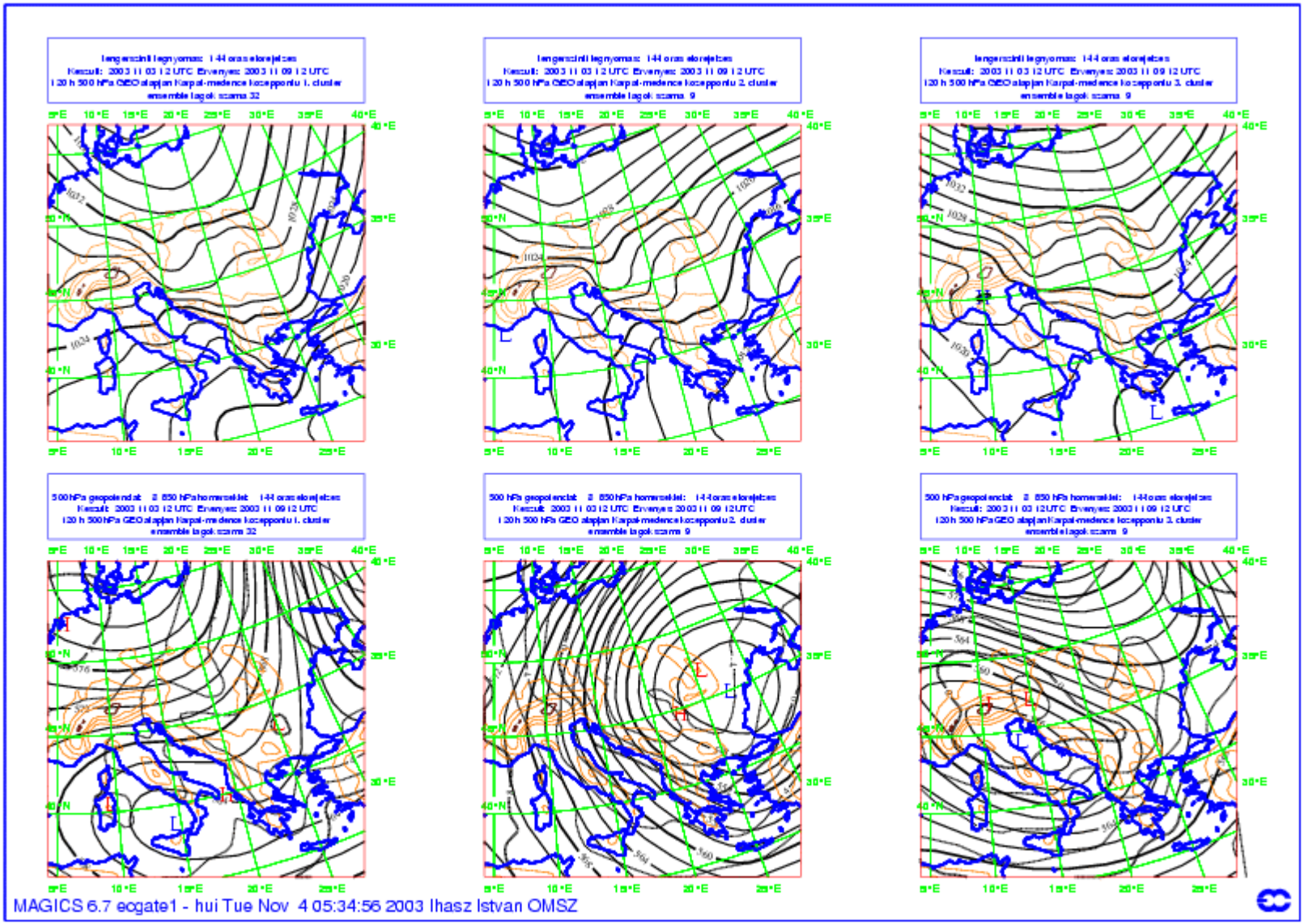


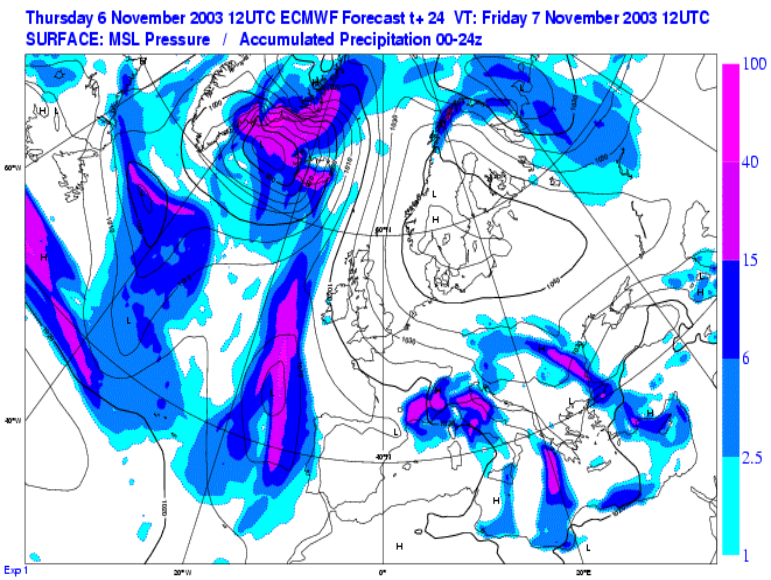


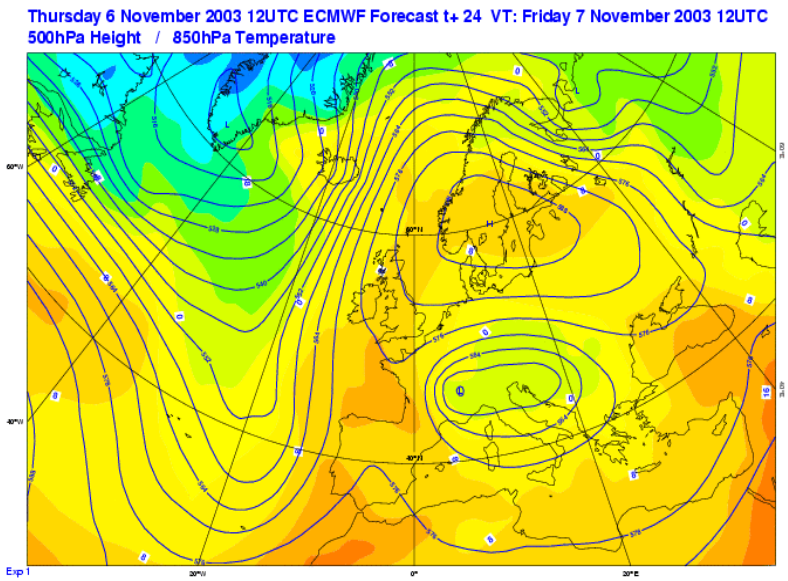
Base: 12 UTC 3 November 2003


MAGICS 6.7 ecgate1 - hui Tue Nov 4 05:33:31 2003 Ihasz Istvan OMSZ

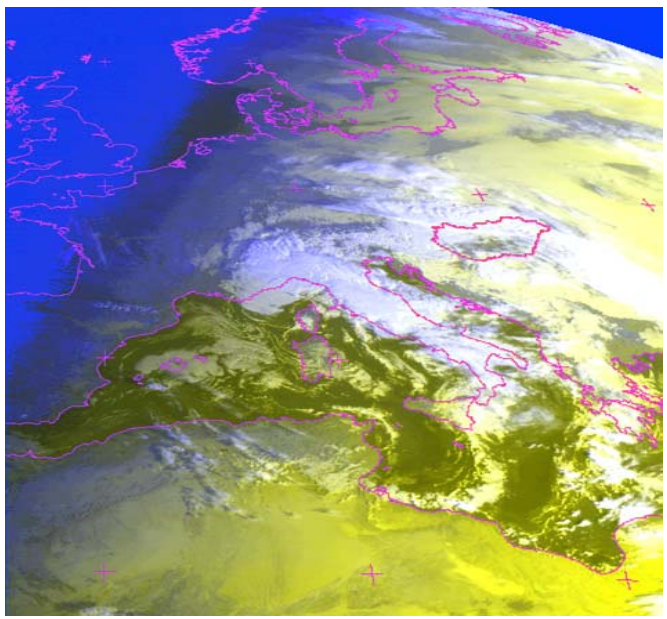

MAGICS 6.7 eogate1 - hui Tue Nov 4 05:34:16 2003 Ihasz Istvan OMSZ


MAGICS 6.7 eogate1 - hui Tue Nov 4 05:34:56 2003 Ihasz Istvan OMSZ





ECMWF forecast D+1 : base 12 UTC 6 November 2003



Satellite composite

Friday
7 November 2003
07:00 UTC

3. Future plans

- **Comprehensive objective verification**
- **Clustering period from day 5 to day 7**
  recently only day 5
- **Combined clustering: 00&12 UTC ???**

Sent: Monday, July 28, 2003 3:20 PM TO: Met contact points cc: TAC representatives For information

Subject: Unusually high Sea Surface Temperature over the Mediterranean

Dear Colleague,

It has occurred to ECMWF analysts monitoring the forecast products that the Sea Surface Temperatures (SST) are unusually high in the Mediterranean sea (and also in the Baltic and North seas). This can be seen from example on the two maps (SST and SST anomaly from climate) available on ECMWF website at:

http://www.ecmwf.int/products/forecasts/d/charts/analysis/sst/

Further investigation aimed at quantifying how unusual these temperatures were by looking back at SST in the ECMWF Re-Analyses (ERA40) project that has just been completed (http://www.ecmwf.int/research/era/). It has revealed that the monthly mean of Mediterranean average SST in June 2003 is much higher than what has ever been observed before, and in some respect even outside the range of variability observed for this month in the previous 45 years (first attached picture).May was already on the edge of the distribution being also breaking the 45-years record. Evaluation of the value for July (until the 27th) are similar to June.

Although the SST analysis used in operations is slightly different from the one used in ERA40, an overlap of the two for the last 2/3 years shows that the two dataset are comparable and the difference observed this year can not be due to a different analysis technique or usage of data (second attachement).

I am drawing your attention to this because if such SST anomalies are persisted well into the autumn (as is usually the case see 3rd attached figure), it might not be without an impact in terms of the weather - including severe convective events - when the autumn brings colder upper air masses over the continental areas.

For more details, please contact Federico Grazzini (Met'Ops - f.grazzini@ecmwf.int, +44 118 949 9421) or Sakari Uppala (ERA40 - s.uppala@ecmwf.int, +44 118 949 9366)

Yours sincerely
Dominique Marbouty

Siófok
2003.11.07 06:56 UTC
OMSZ