



ALADIN Workshop and HIRLAM All Staff Meeting, Brussels, 7-10 April 2008

Latest LAMEPS activities at HMS

Edit HÁGEL, András HORÁNYI

Hungarian Meteorological Service

Division for Numerical Modelling and Climate Dynamics

Introduction

- Experiments with LAMEPS systems in order to provide **probabilistic guidance** to the forecasters complementing the categorical forecasts on short-range as well
- First step: **direct downscaling** of global ensemble forecasts (ARPEGE EPS, ECMWF EPS)
- Research directions: **sensitivity experiments** with global singular vectors (ARPEGE) + computation of **limited area SVs** with ALADIN



Introduction

- **Quasi-operational implementation of the downscaling of ARPEGE EPS (PEARP) with the ALADIN model in order to gain experience with the operational run and also to encourage forecasters to start using LAMEPS products**
- **However, further developments are needed and planned to optimize the system for Central Europe (direct downscaling is not enough, local perturbations are needed)**

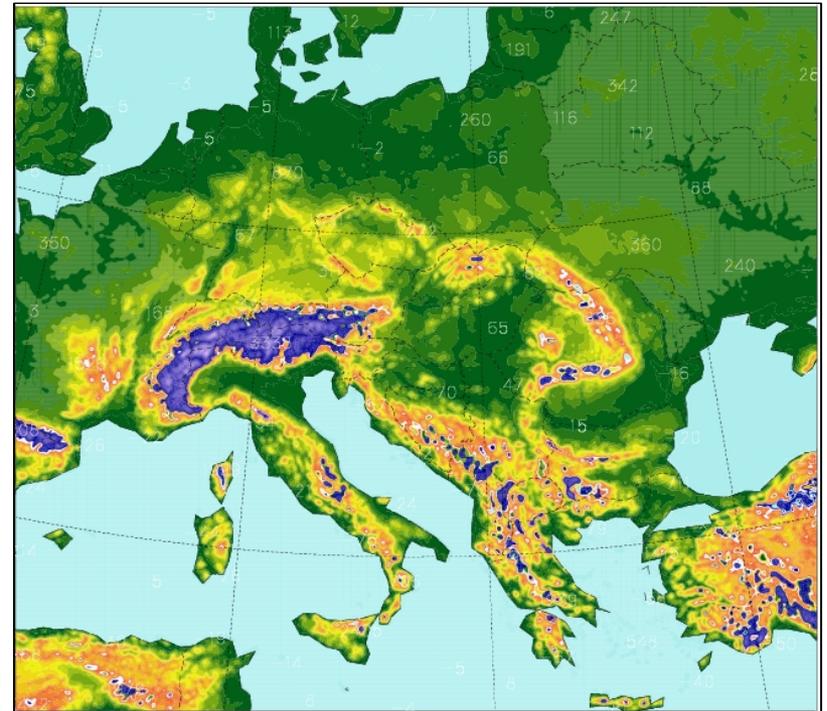
The ARPEGE/ALADIN LAMEPS system

- Since February, 2008 the ALADIN LAMEPS system is running **quasi-operationally** on a daily basis at HMS
- Initial and lateral boundary conditions are provided by the ARPEGE based **PEARP** system of Meteo-France ⇒ 10 perturbed members + 1 control run
- Integration of the 10 + 1 ensemble members every day at 18 UTC with the ALADIN model (cy28) up to 60 hours

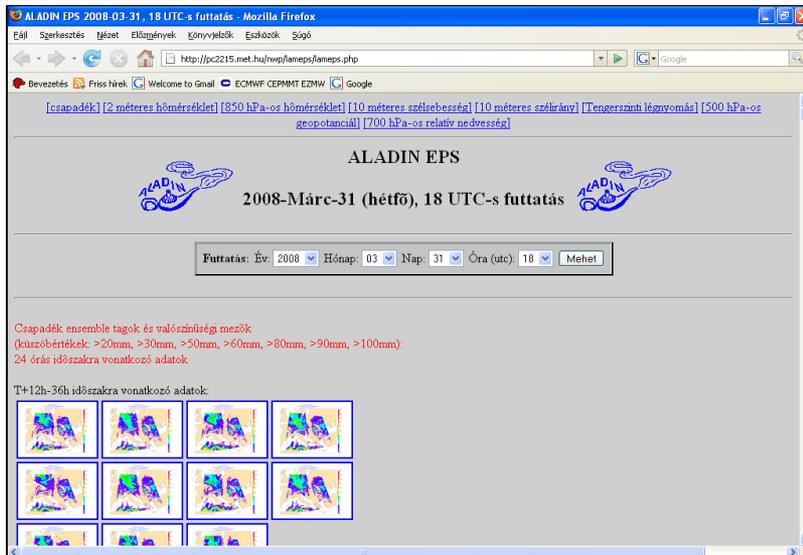


The ARPEGE/ALADIN LAMEPS system

- **Horizontal resolution: 12 km**
- **Number of vertical levels: 46**
- **Integration domain covering large part of Continental Europe, 240×216 gridpoints**



The ARPEGE/ALADIN LAMEPS system



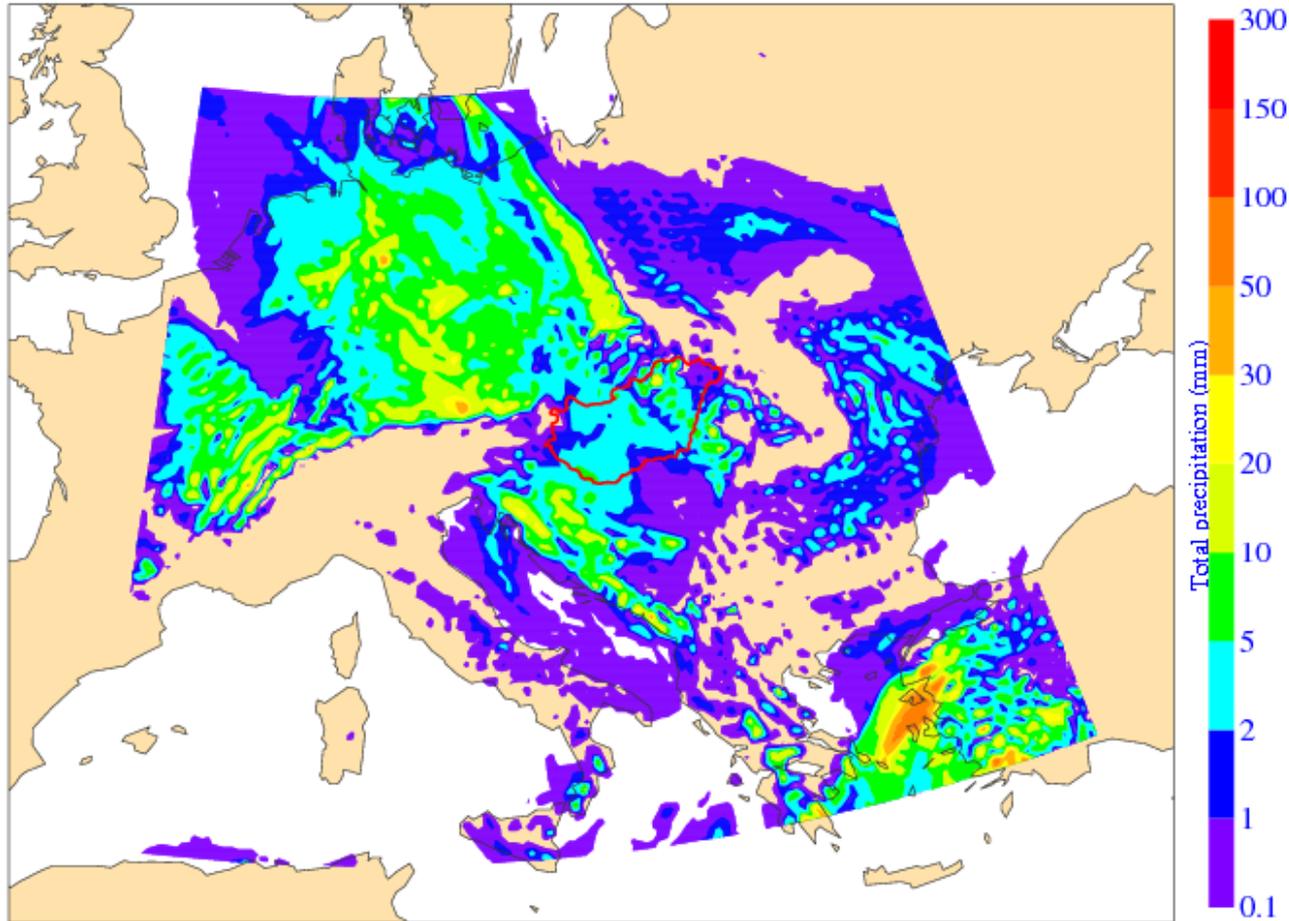
- So far forecasts are available through a web page on HMS intraweb
- In the future they will be available in HAWK (the visualization system of HMS used by the forecasters)
- The following parameters are visualized ⇒

The ARPEGE/ALADIN LAMEPS system

- **Precipitation:** ensemble members and probability maps (thresholds: 20, 30, 50, 60, 80, 90 and 100 mm/24h)
- **10 meter wind speed:** ensemble members, probability maps (thresholds: 5, 10, 15, 20 and 25 m/s)
- **850 hPa temperature:** ensemble members
- **10 meter wind direction:** ensemble members
- **700 hPa relative humidity:** ensemble members
- **2 meter temperature:** ensemble members
- **500 hPa geopotential:** ensemble members
- **Mean sea level pressure:** ensemble members



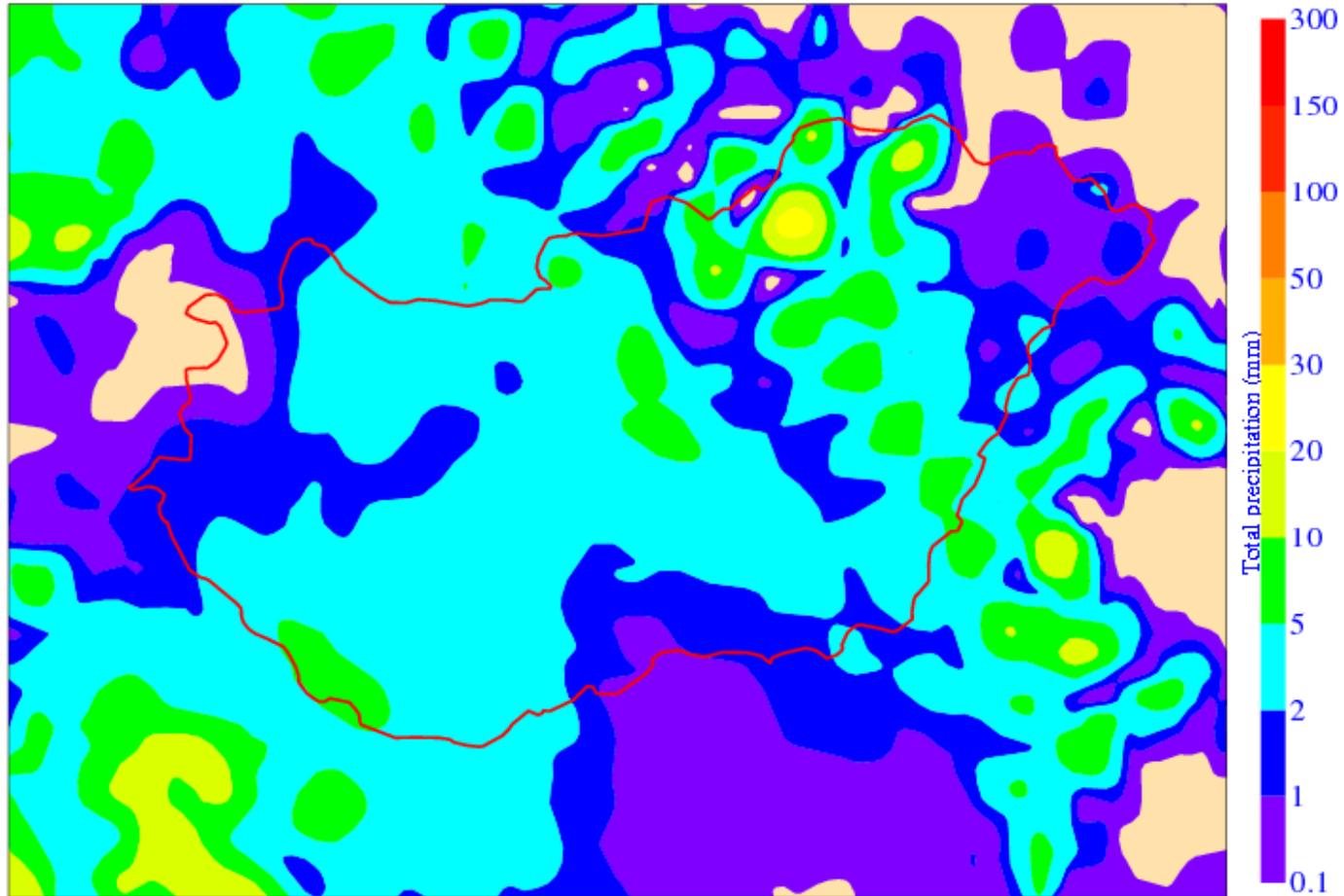
Ensemble mem: 1/11
31/03/2008 18UTC - VT: 03/04/2008 06UTC
parameter: prec/24h, level: sfc



24h accumulated precipitation for a given member, whole domain

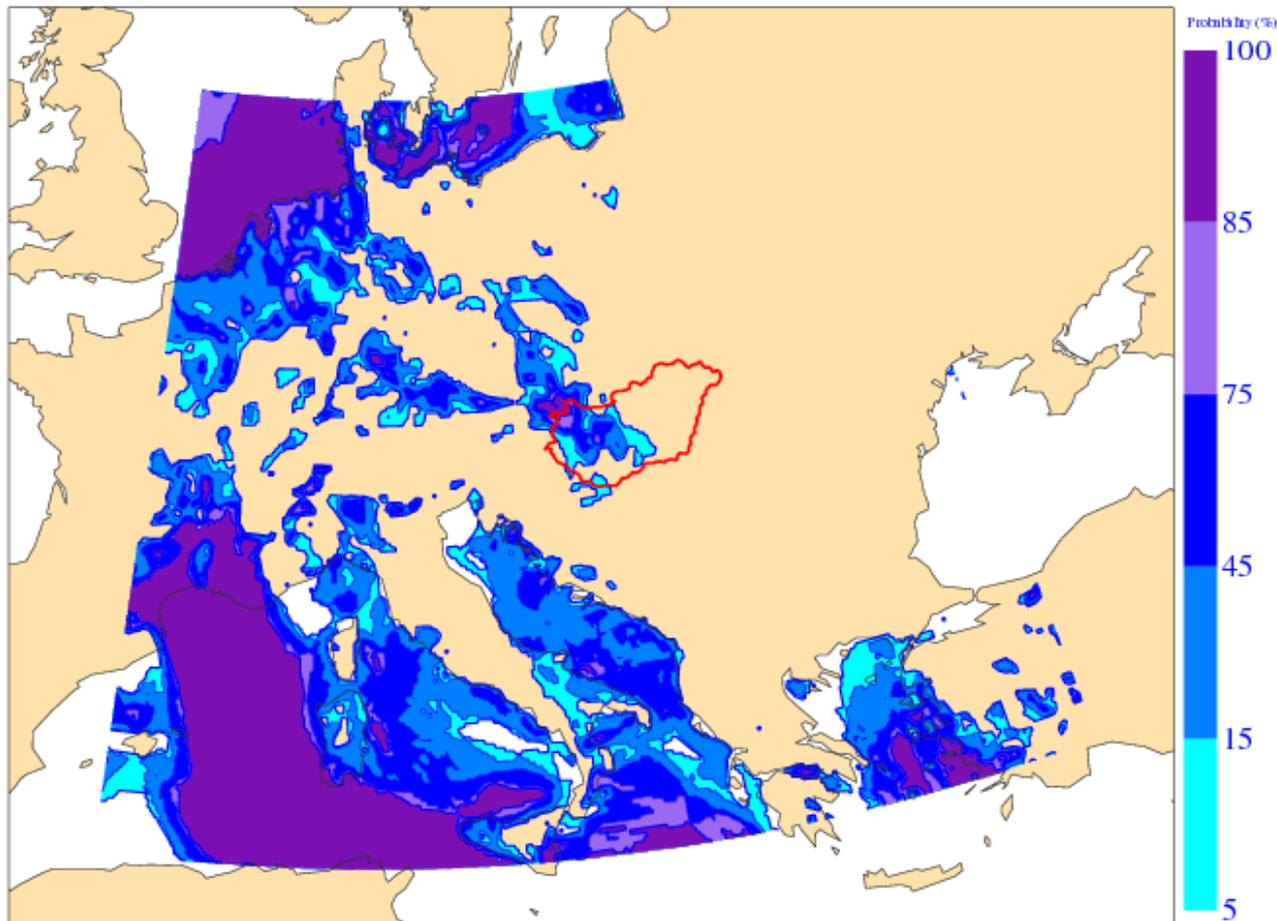


Ensemble mem: 1/11
31/03/2008 18UTC - VT: 03/04/2008 06UTC
parameter: prec/24h, level: sfc



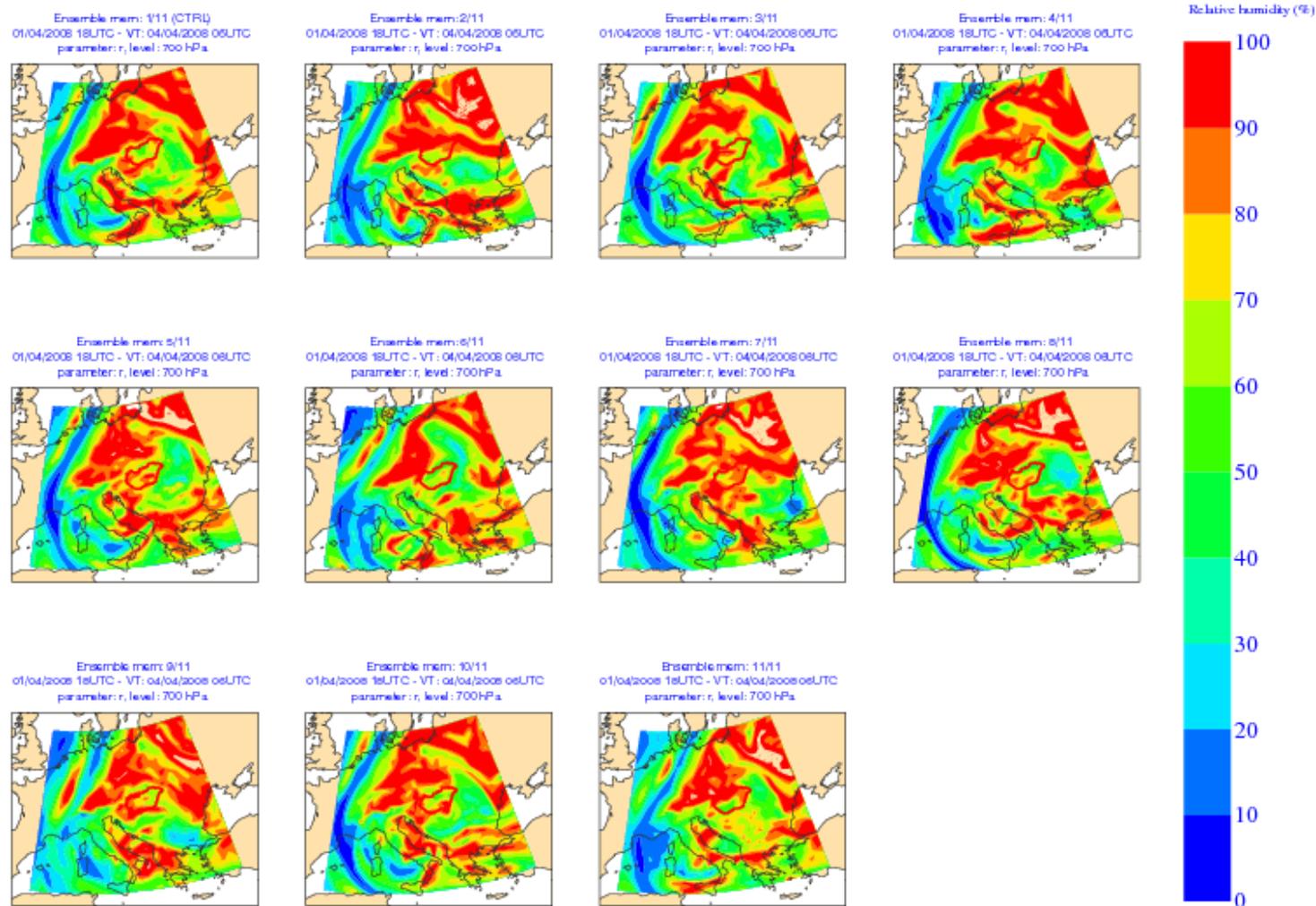
24h accumulated precipitation for a given member, zoom over Hungary

Probability map
31/03/2008 18UTC - VT: 03/04/2008 06UTC
parameter: wind, level: sfc, Threshold: 5



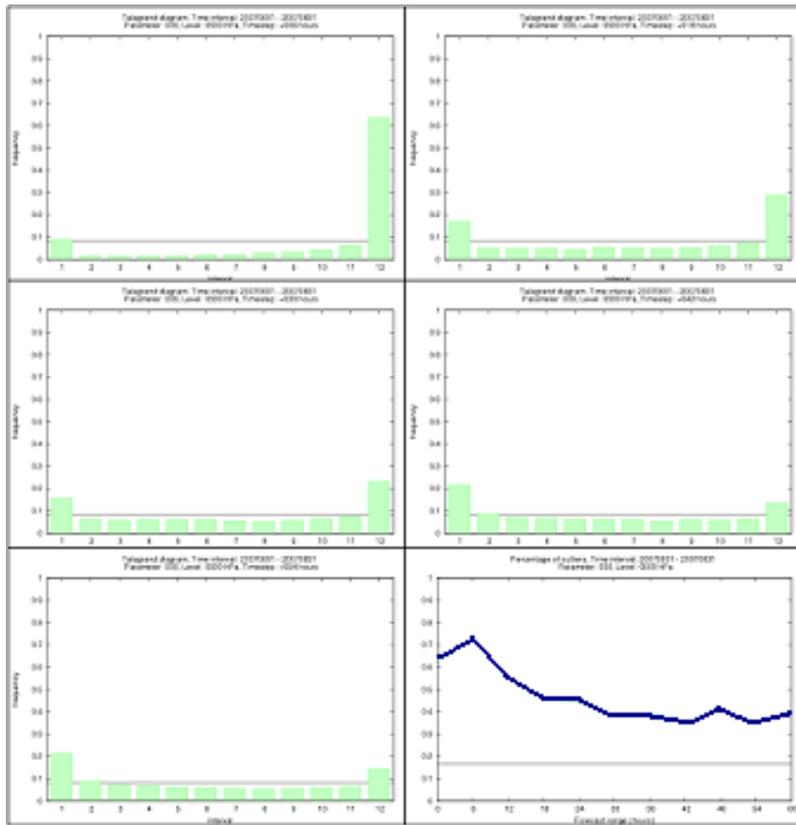
Probability map, 10m wind speed > 5m/s, whole domain





„Stamp diagram” with all members for 700 hPa relative humidity

Preliminary verification results



- **Ranked histograms** (for T+06h, T+18h, T+30h, T+42h and T+54h) and **percentage of outliers diagram** for 500 hPa geopotential.
- **Verification period is JJA2007.**
- **Percentage of outliers is large even at T+54h**
- **Results are worse for surface parameters, especially for T2**

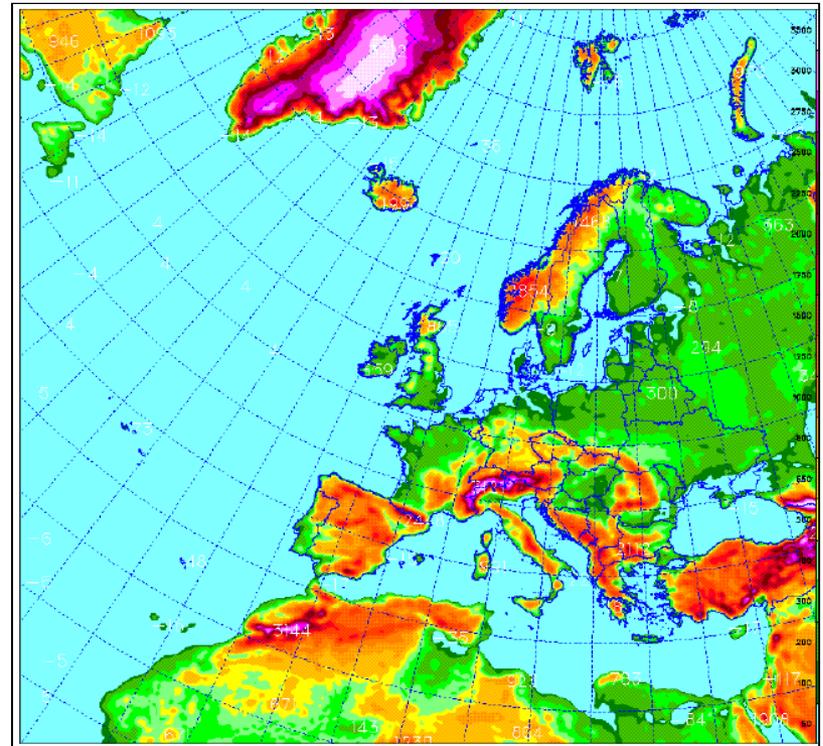
The ECMWF/ALADIN LAMEPS system

- Common project of **Hungary** and **Belgium**, started in early 2008
- **ALADIN contribution to GLAMEPS**
- Downscaling of **20 ECMWF EPS members** with the ALADIN model on ECMWF supercomputer HPCE (using the Belgian SBU quota)
- Integration of **20 ensemble members every day at 00 UTC** with the ALADIN model up to **54 hours**

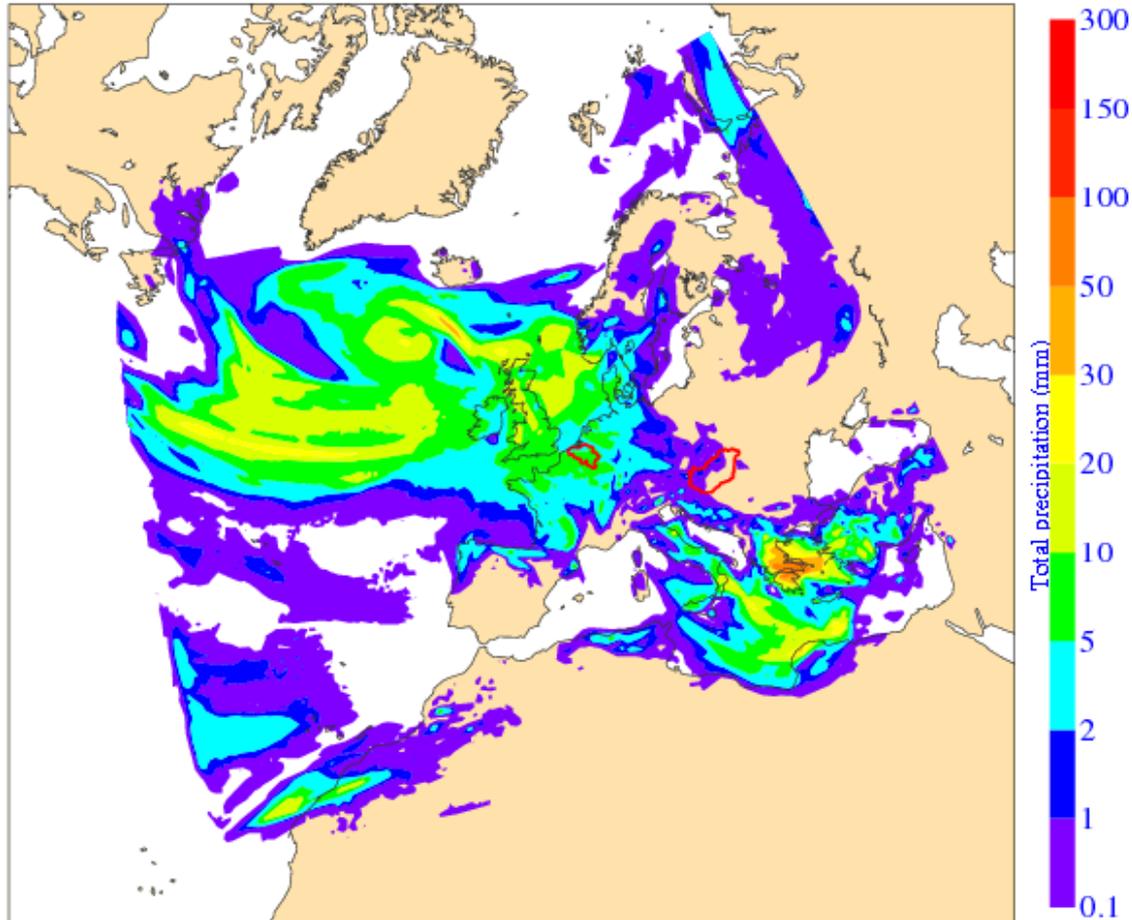


The ECMWF/ALADIN LAMEPS system

- Horizontal resolution: ~22 km
- Integration domain covering Europe, North Africa and part of the Atlantic ocean, 320×300 gridpoints (GLAMEPS domain)



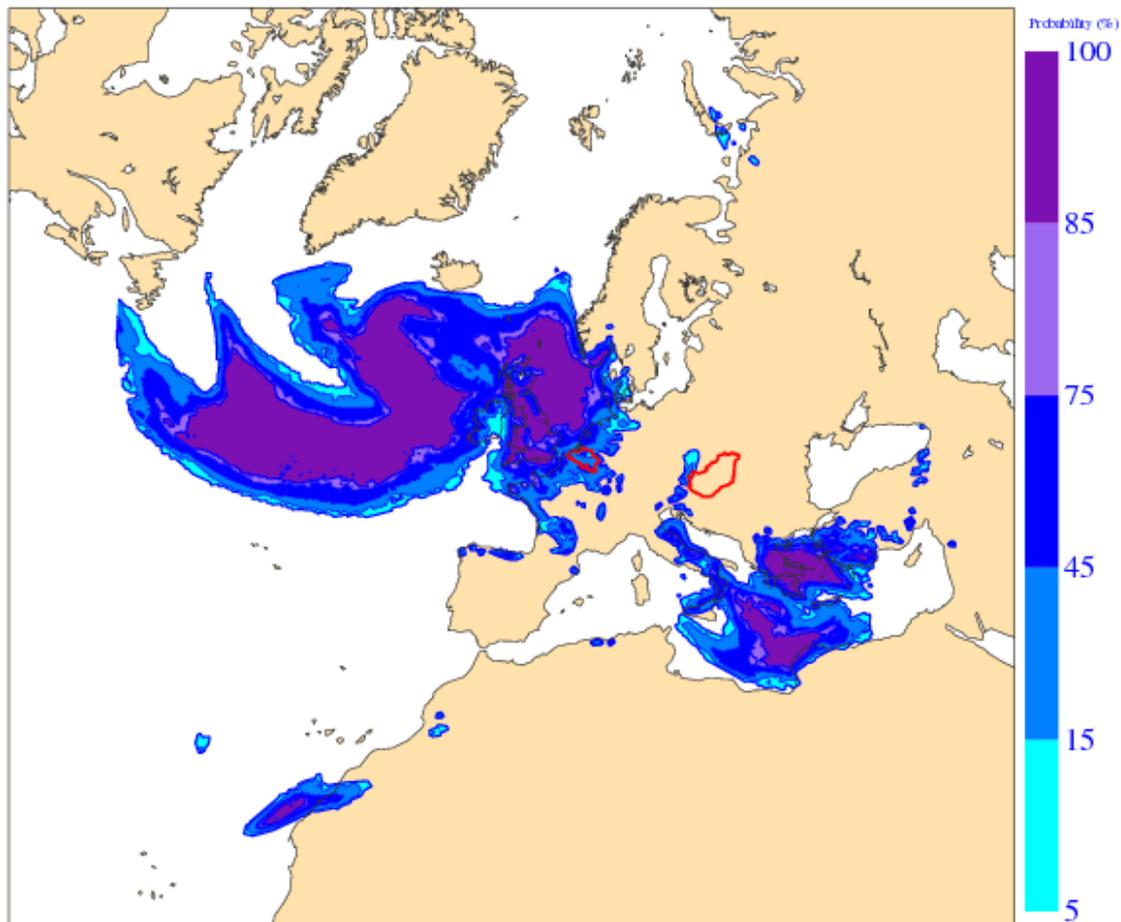
Ensemble mem: 1/20
27/03/2008 0UTC - VT: 29/03/2008 06UTC
parameter: prec/24h, level: sfc



24h accumulated precipitation for a given member, whole domain



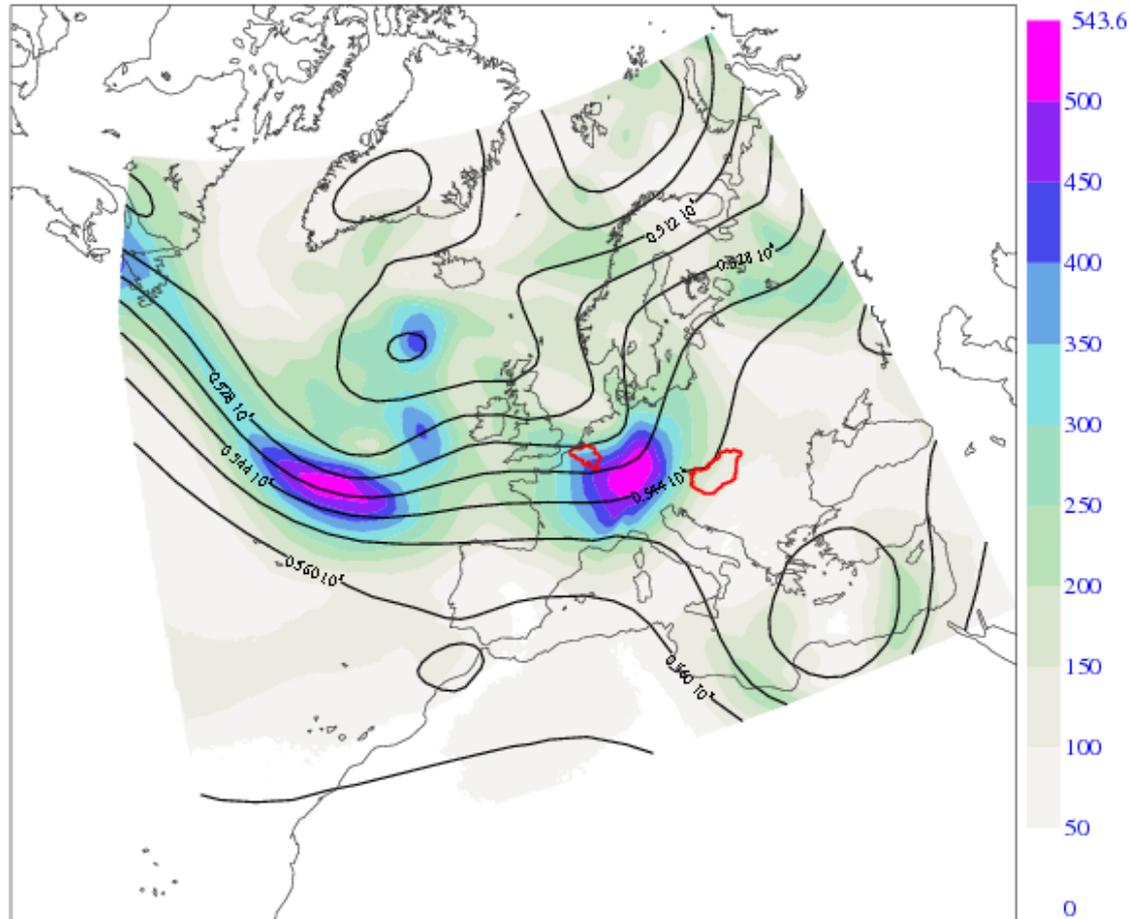
Probability map
27/03/2008 0UTC - VT: 29/03/2008 06UTC
parameter: prec/24h, level: sfc, Threshold: 5



Probability map, 24h accumulated percipitation > 5 mm, whole domain



Standard deviation around the mean (shade) and ensemble mean (isolines)
27/03/2008 0UTC - VT: 29/03/2008 06UTC
parameter: z, level: 500 hPa



Standard deviation around the mean and the ensemble mean, z500

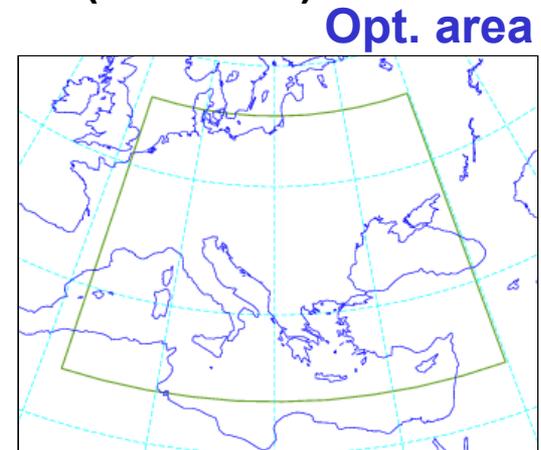
Further research with ALADIN

- Experiments with **singular vectors** computed with the ALADIN model
- So far SV computation only, combination of SVs to generate perturbations is not yet solved
- Experiments with different SV optimization domains, optimization times, horizontal resolutions
- Comparison with ARPEGE, IFS, HIRLAM SVs

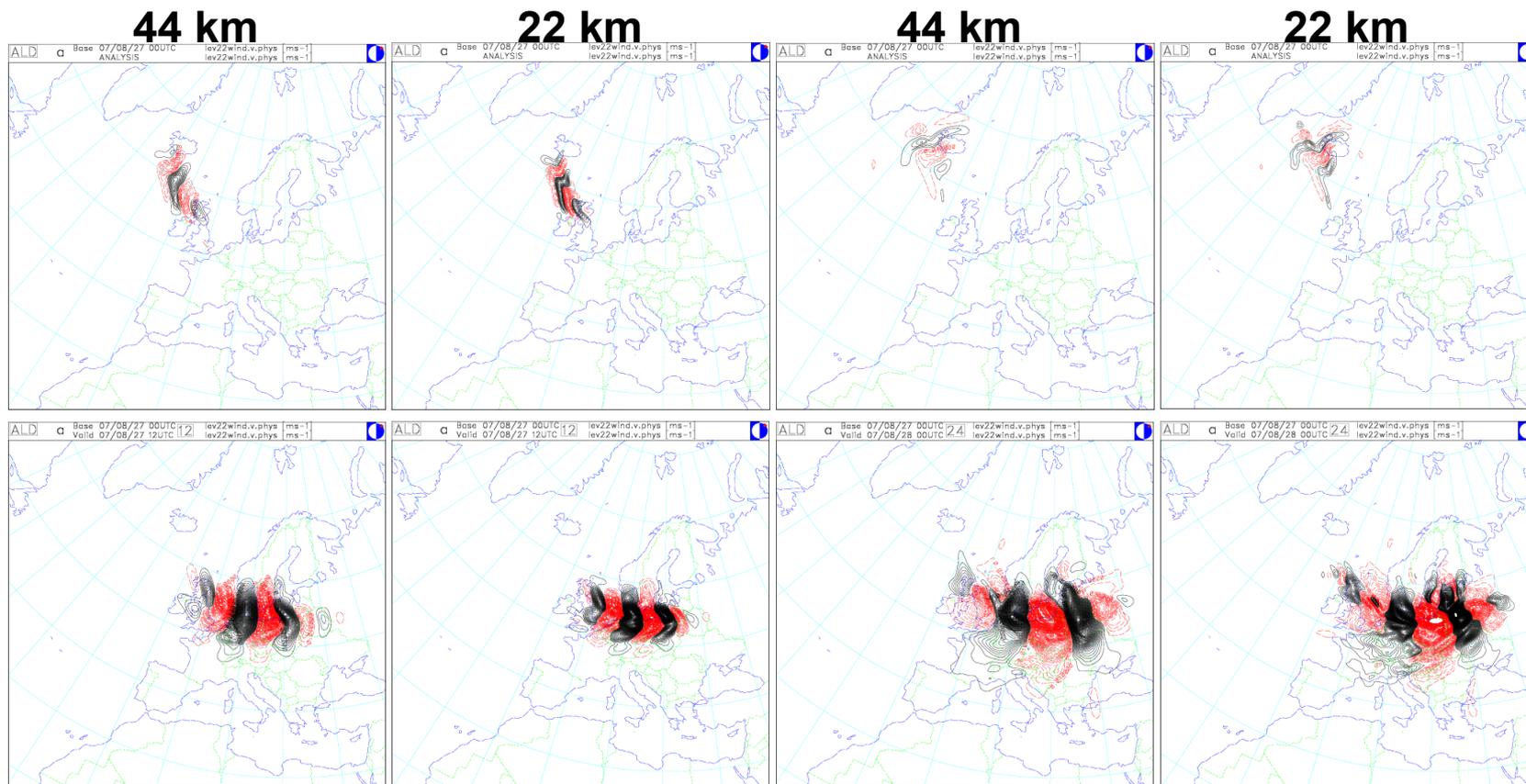


Case study – 27 August 2007, 00 UTC

- **ALADIN SVs - Our choices for the case study:**
 - **Norms:** total energy norm (initial and final time)
 - **Optimization area:** 56N/34S/2W/40E
 - **Optimization time:** 12 and 24 hours
 - **Vertical optimization:** between level 1 and 46 (all levels)
 - **Resolution:** 22 and 44 km
 - **LBC Coupling:** every 3 hours (ARPEGE)



Case study – ALADIN SVs



ALADIN leading singular vector at T+0h (top) and evolved singular vector at T+12h and T+24h (bottom) for wind v at model level 22.

Further plans

- **Operational plans:**
 - Further development, verification and fully operational application of the **ARPEGE/ALADIN LAMEPS** system in the first half of 2008
 - Further development, verification and operational application of the **ECMWF/ALADIN LAMEPS** system by the end of the year
- **Research plans:**
 - Further experiments with the **ALADIN SVs**, computation of perturbations in order to run **ALADIN ensemble** with such ICs



Thank you for listening!