

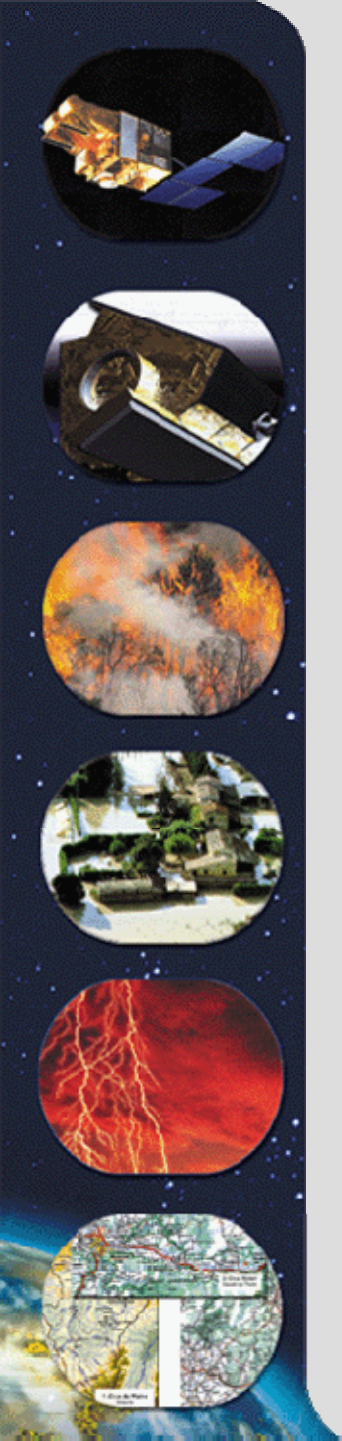
G. Bálint & A. Csík:
**Development and Testing of the
Hydrological Forecasting System for the
Central Danube River Basin**



PREVIEW

WP4320 Medium Range Plain Flood Forecasting

Development and Testing of a Hydrological
Forecasting and Modelling Tool for the Central
Danube River Basin
(Operational version)





Major steps:

Development of the visualisation and publication tool for Hydrological Forecasting and Flood Warning in the Central Danube River Basin

In cooperation with the Hungarian Meteorological Service

Downscaling and visualisation for analysis of the meteorological and snow input

Deterministic flow/water level forecast

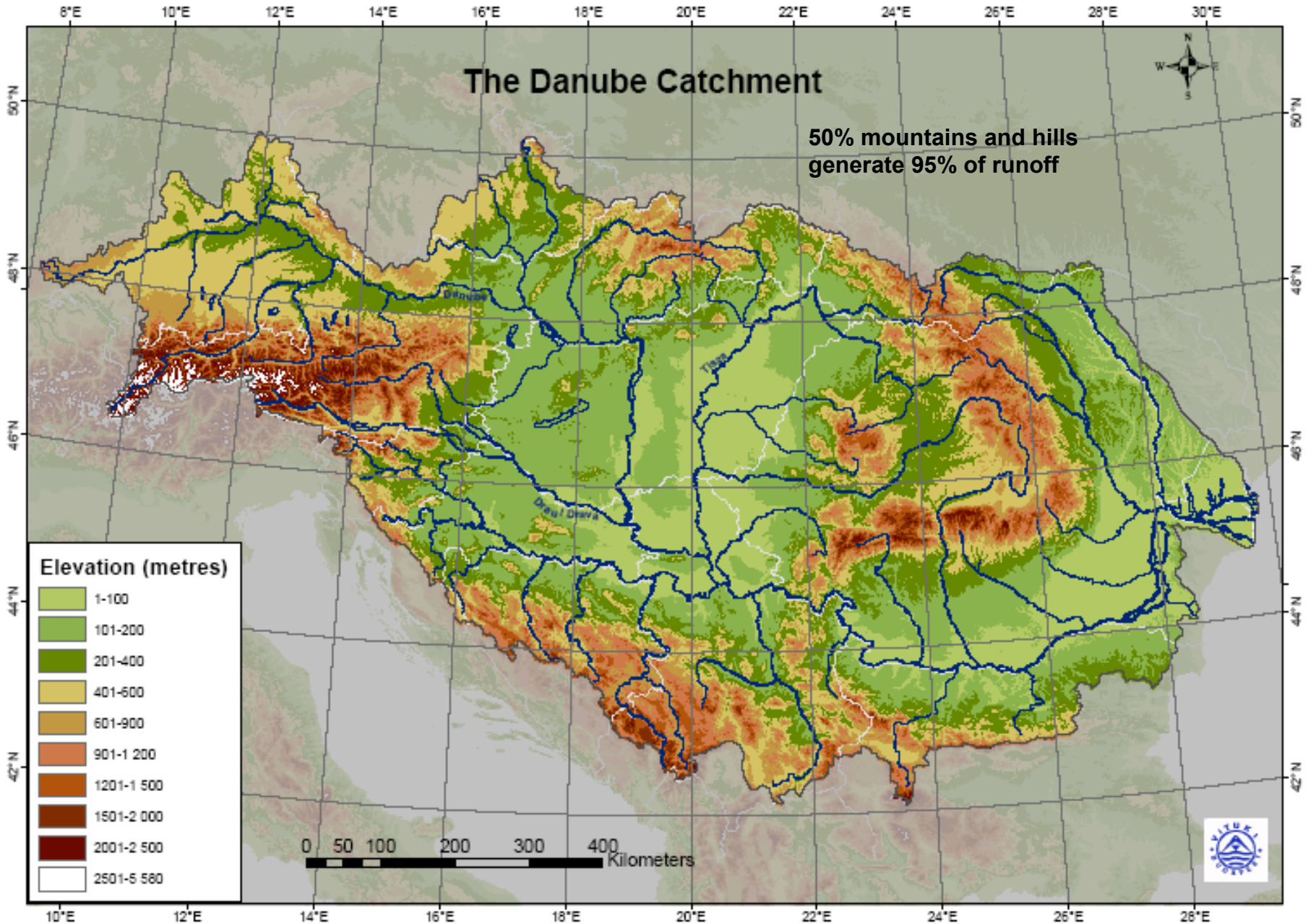
Hydrological ensembles – water levels

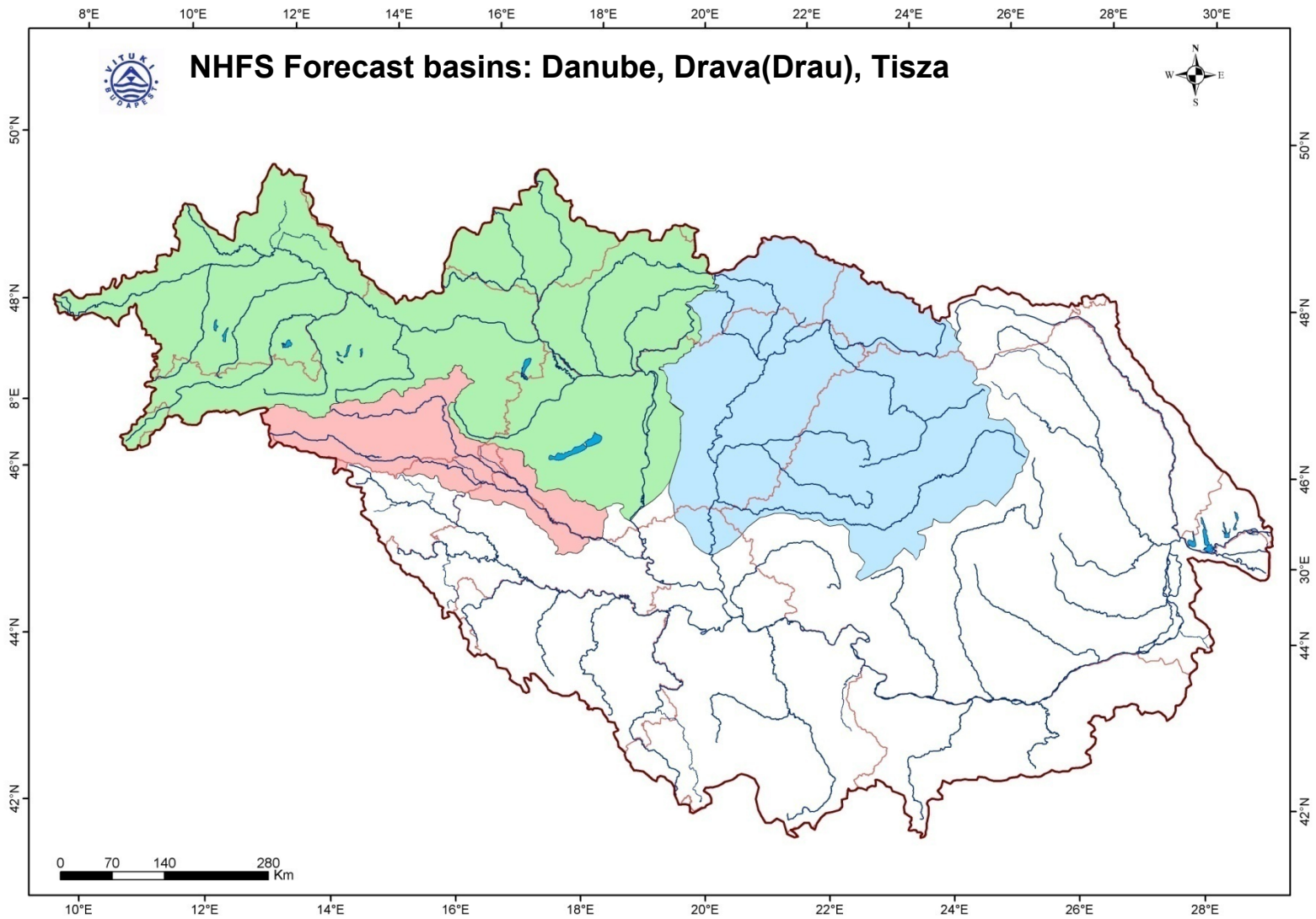
Exceedance tables

Testing, Near Real Time Runs, July-September 2008

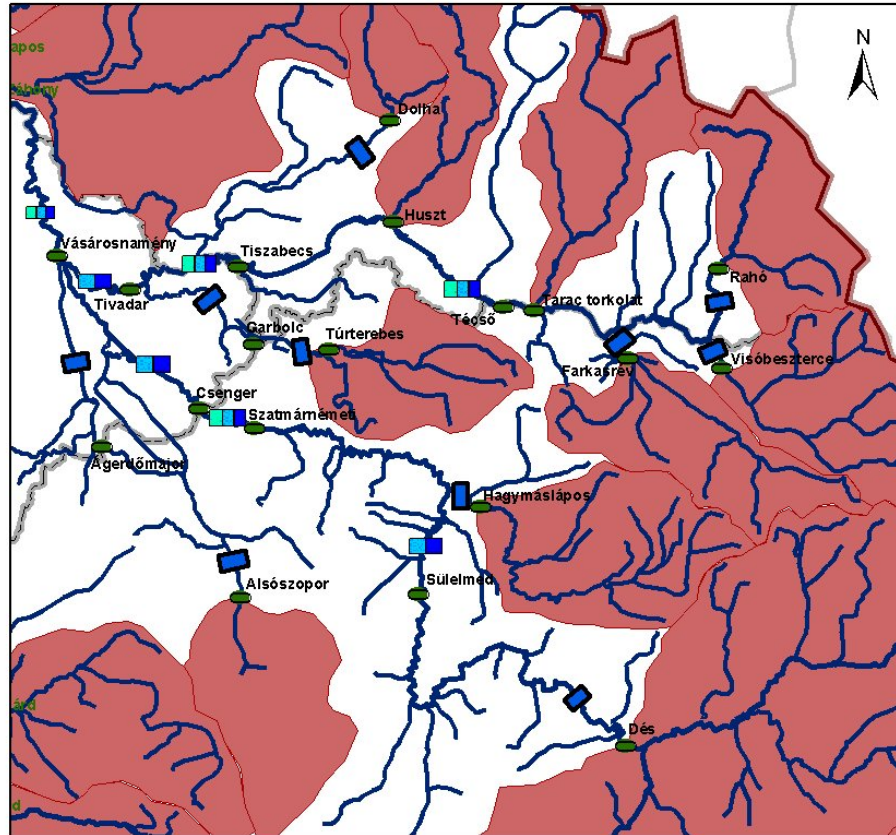
The Danube Catchment

50% mountains and hills
generate 95% of runoff



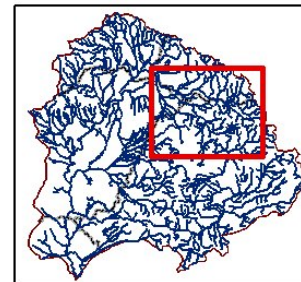


A fragment of the scheme
of the Forecasting System of the National Hydrological Service
of Hungary



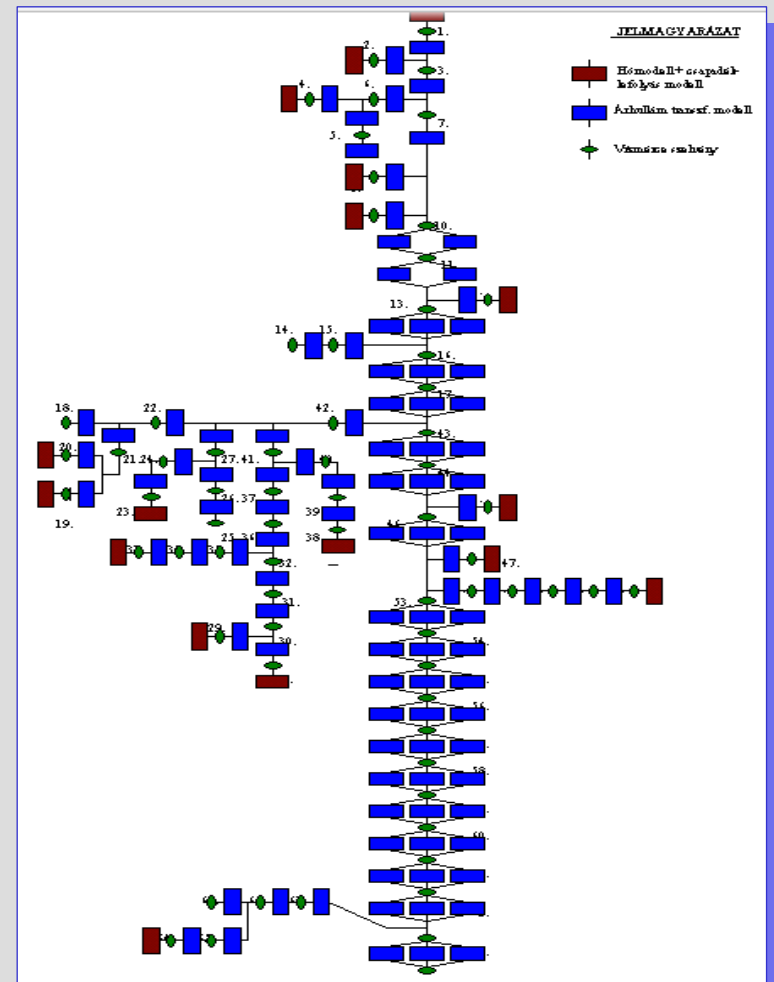
Legend

- gauging station
- subcatchments
- river
- countryborder
- flow routing modul
- flow routing modul for low and high flow
- flow routing modul for low, middle and high flow

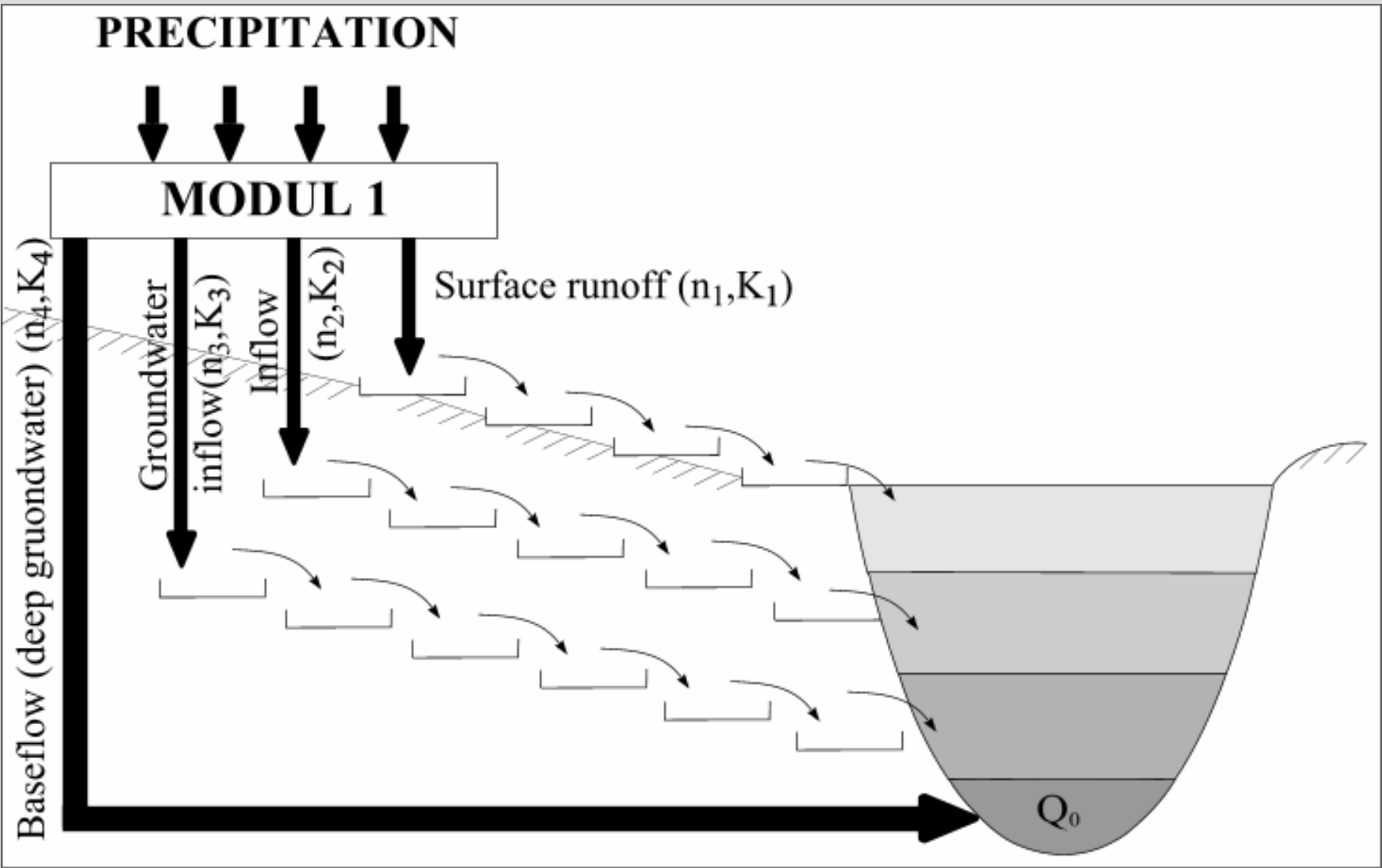


Scheme of the hydrological forecasting system

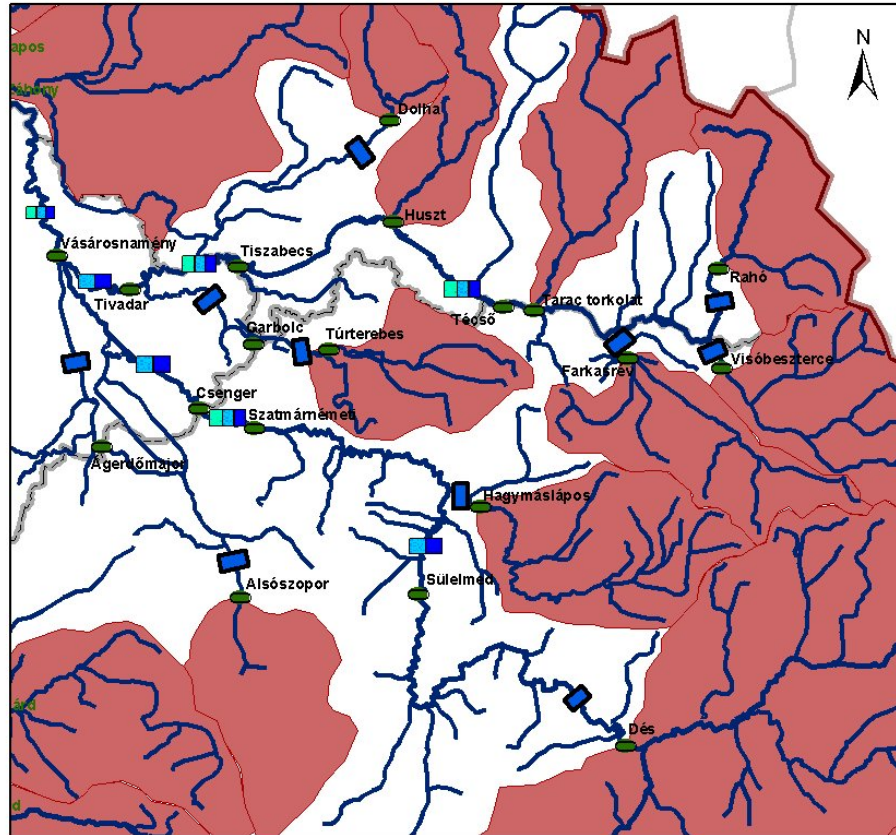
- ECMWF EPS
- Conceptual hydrological models
 - Snow accumulation and ablation + soil frost
 - Rainfall - runoff module;
 - Flood routing module;
 - Backwater module
- Error correction



NHFS Hydrological modelling system

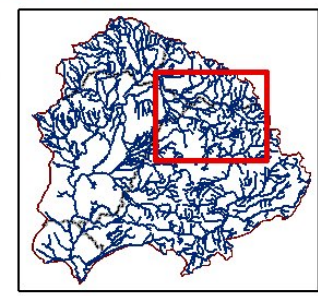


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Legend

- gauging station
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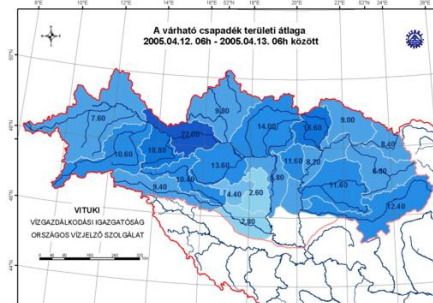
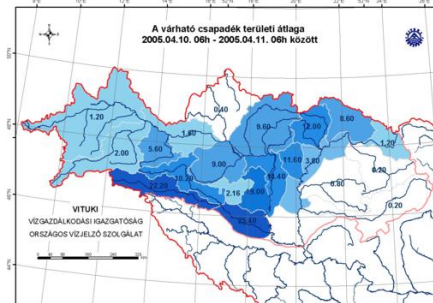
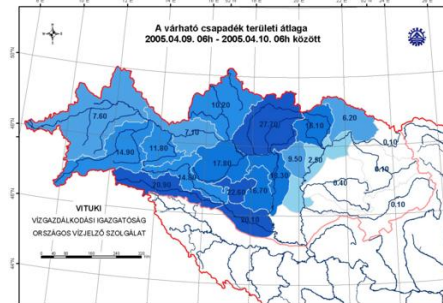
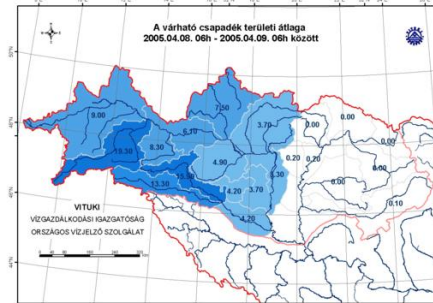
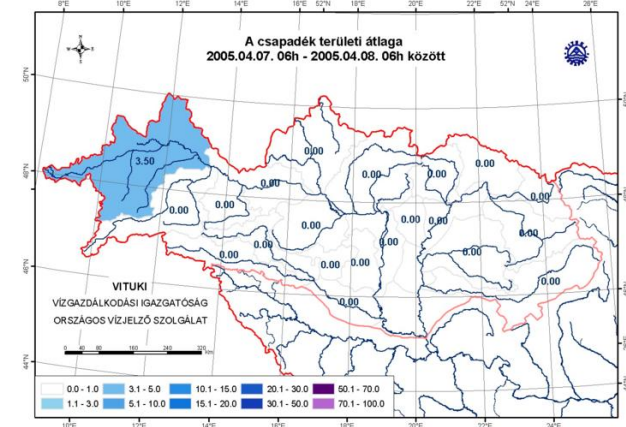




Development of a Hydrological Forecasting and Modelling Tool for the Central Danube River Basin

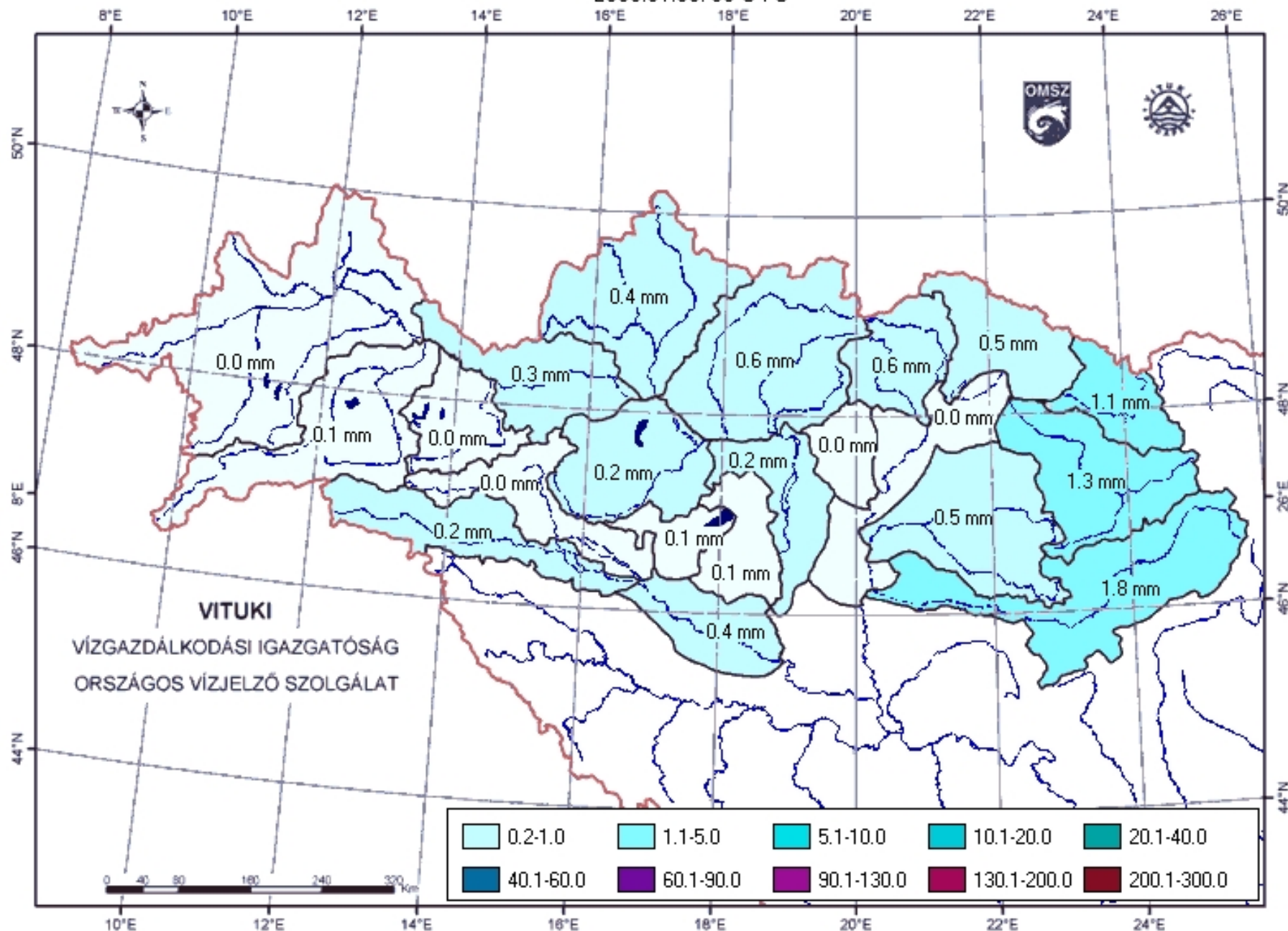
- Visualisation and analyses of the meteorological and snow input
Development of the Rainfall - Runoff Part
 - Snow depth analyses
 - Snow water equivalent estimates
 - Temperature fields
 - Surface water input = snowmelt + rainfall

Lumped presentation of medium range QPF

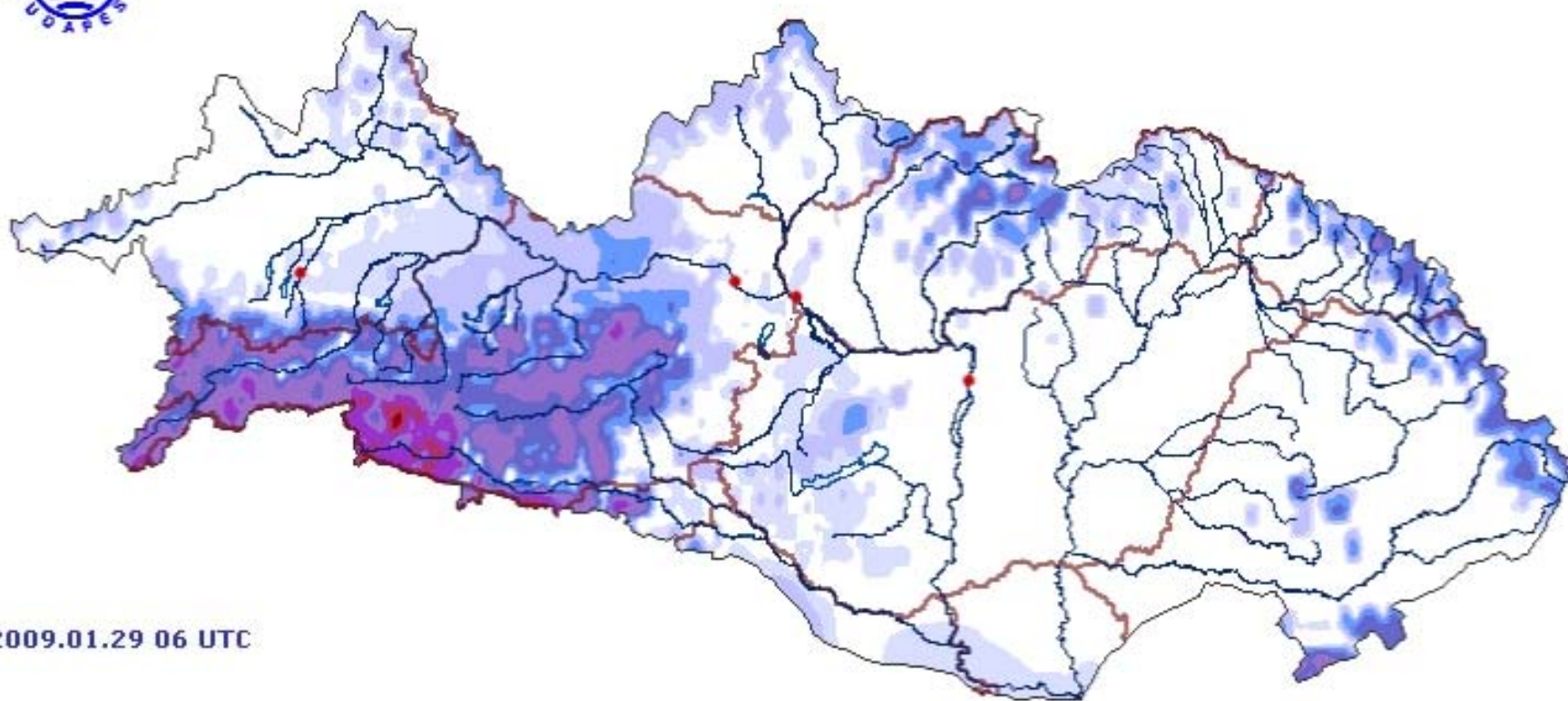


A következő 24 órában várható területi csapadékátlagok

2009.01.30. 06 UTC



Hóvastagság

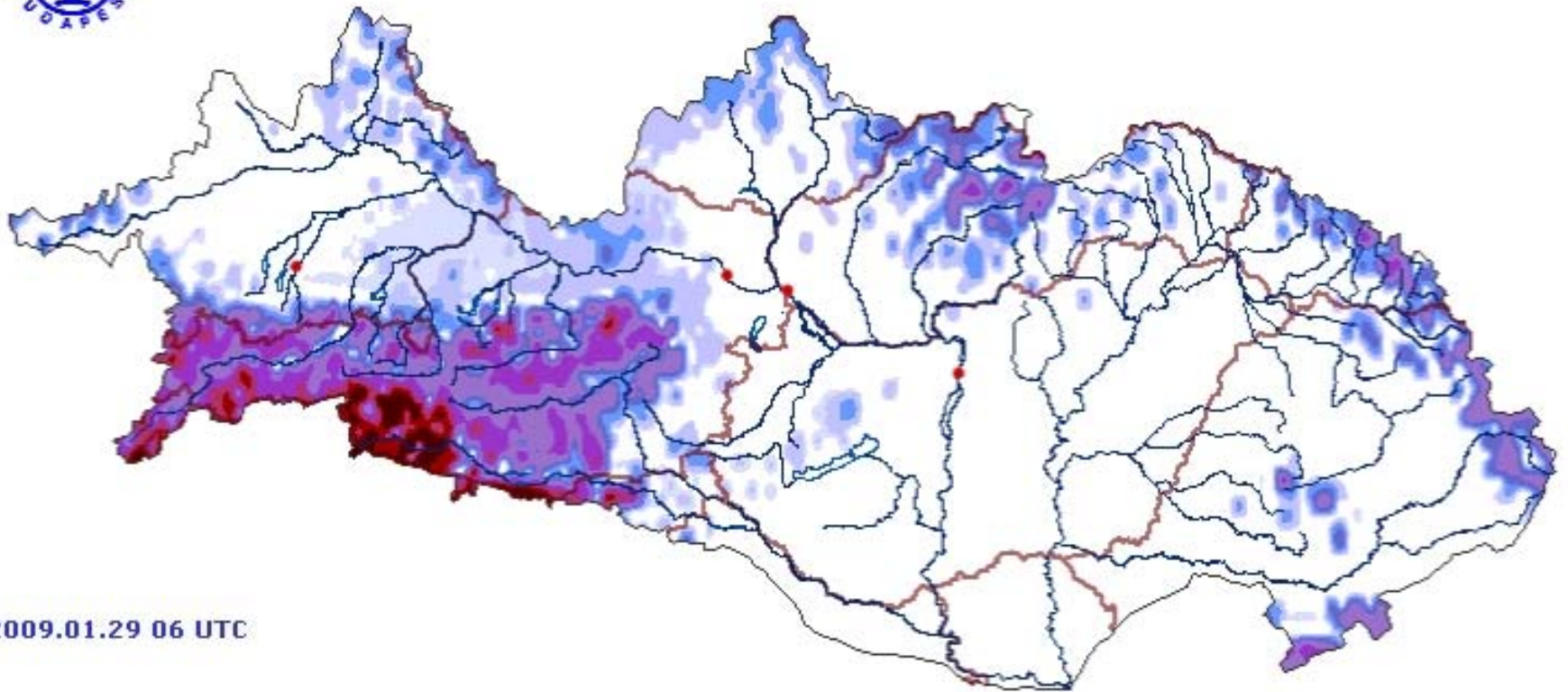


2009.01.29 06 UTC

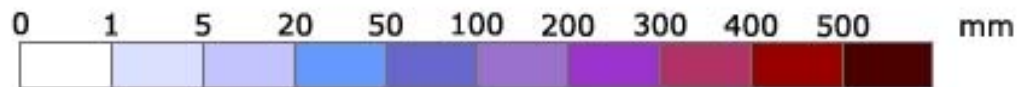


Snow water equivalent

Hóvízegyenérték



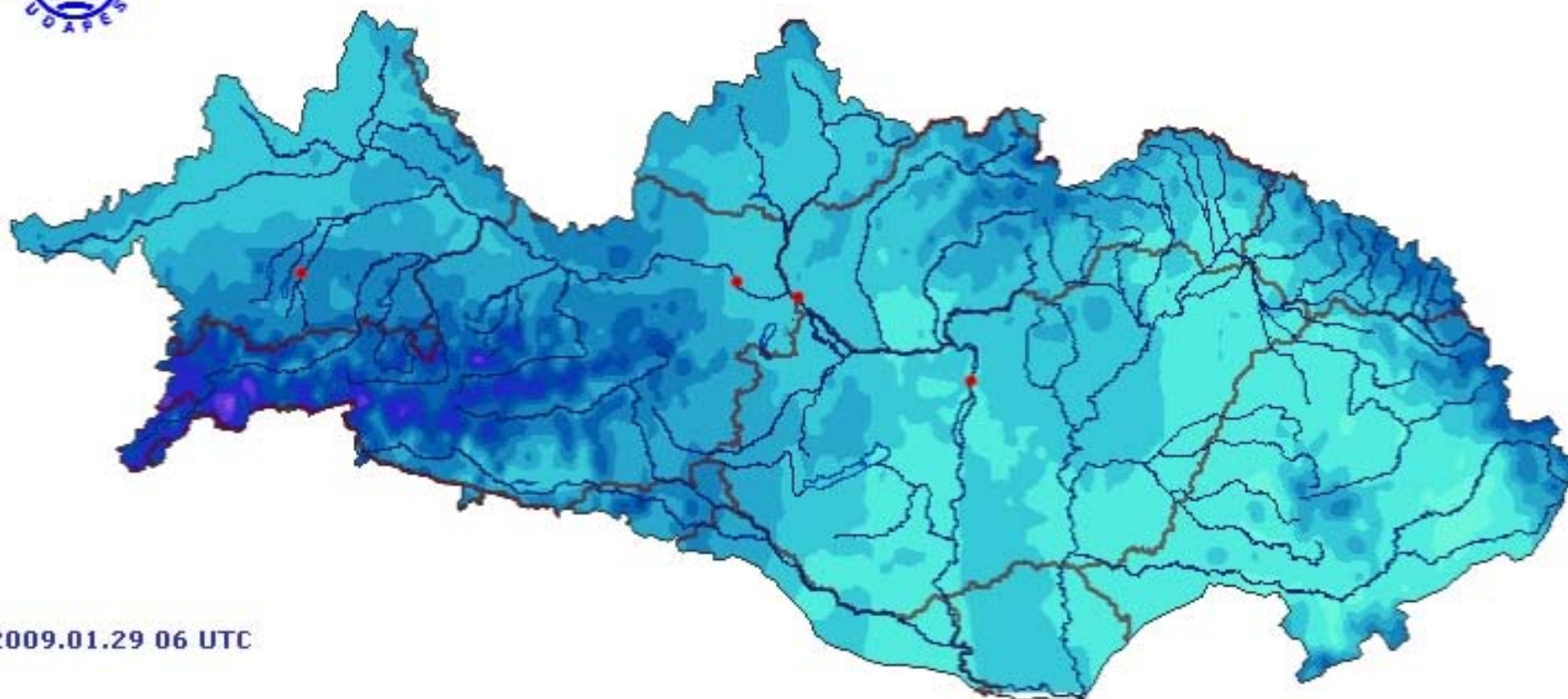
2009.01.29 06 UTC



Forrásadatok: OMSZ

Minimum temperature forecast for the next 6 days

A következő 6 napban várható legalacsonyabb hőmérséklet



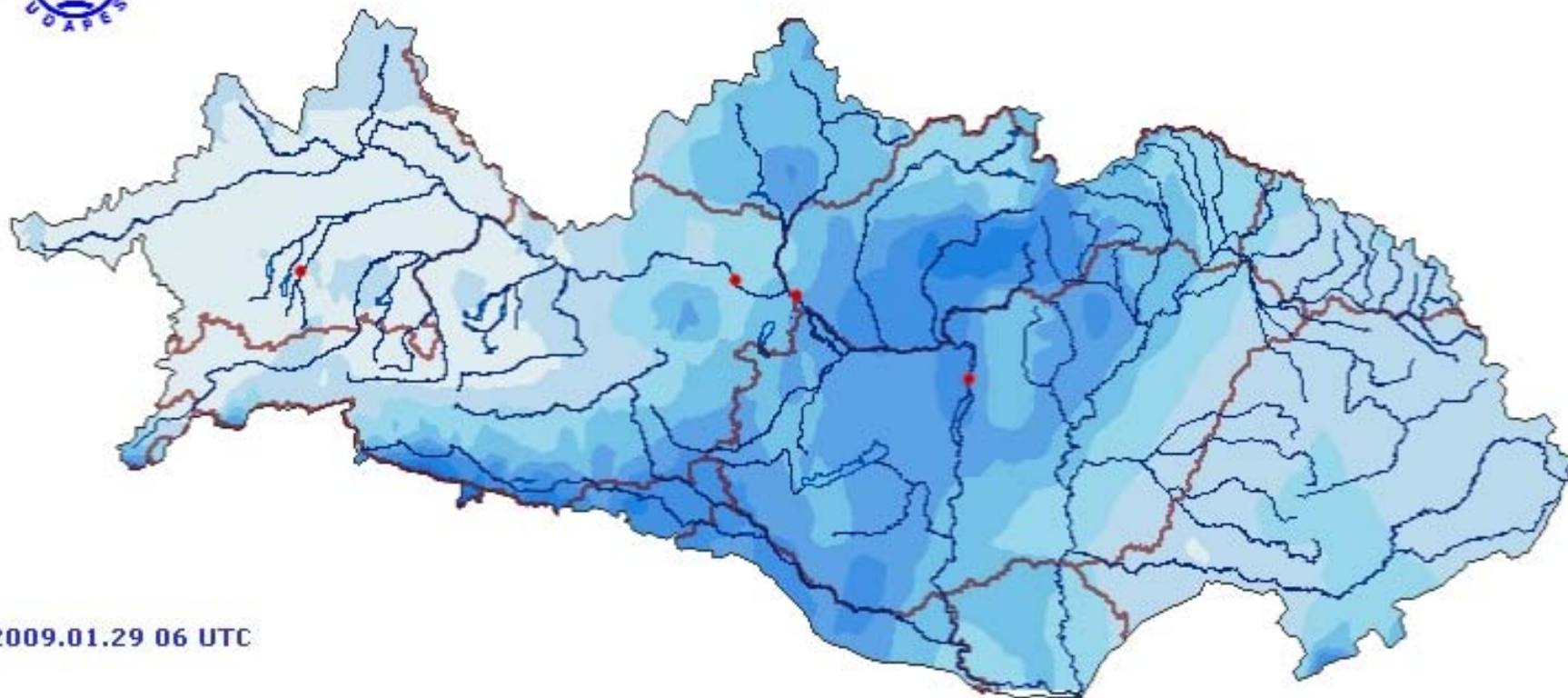
2009.01.29 06 UTC



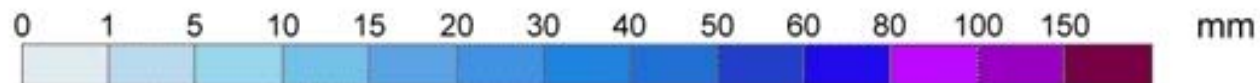
Forrásadatok: OMSZ

Precipitation forecast for the next 6 days

A következő 6 napban várható csapadék

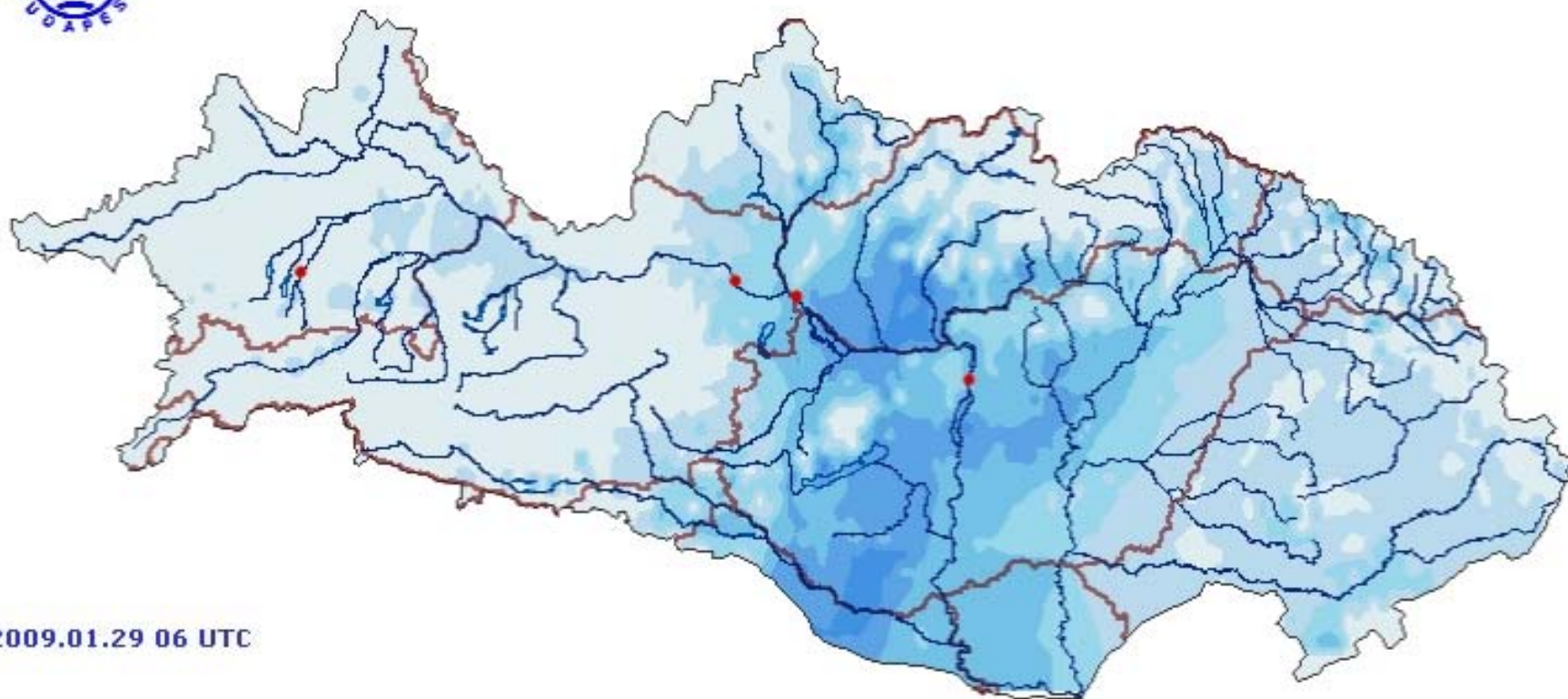


2009.01.29 06 UTC



6-day snowmelt + liquid precipitation

A következő 6 napban várható felszíni vízbevételek

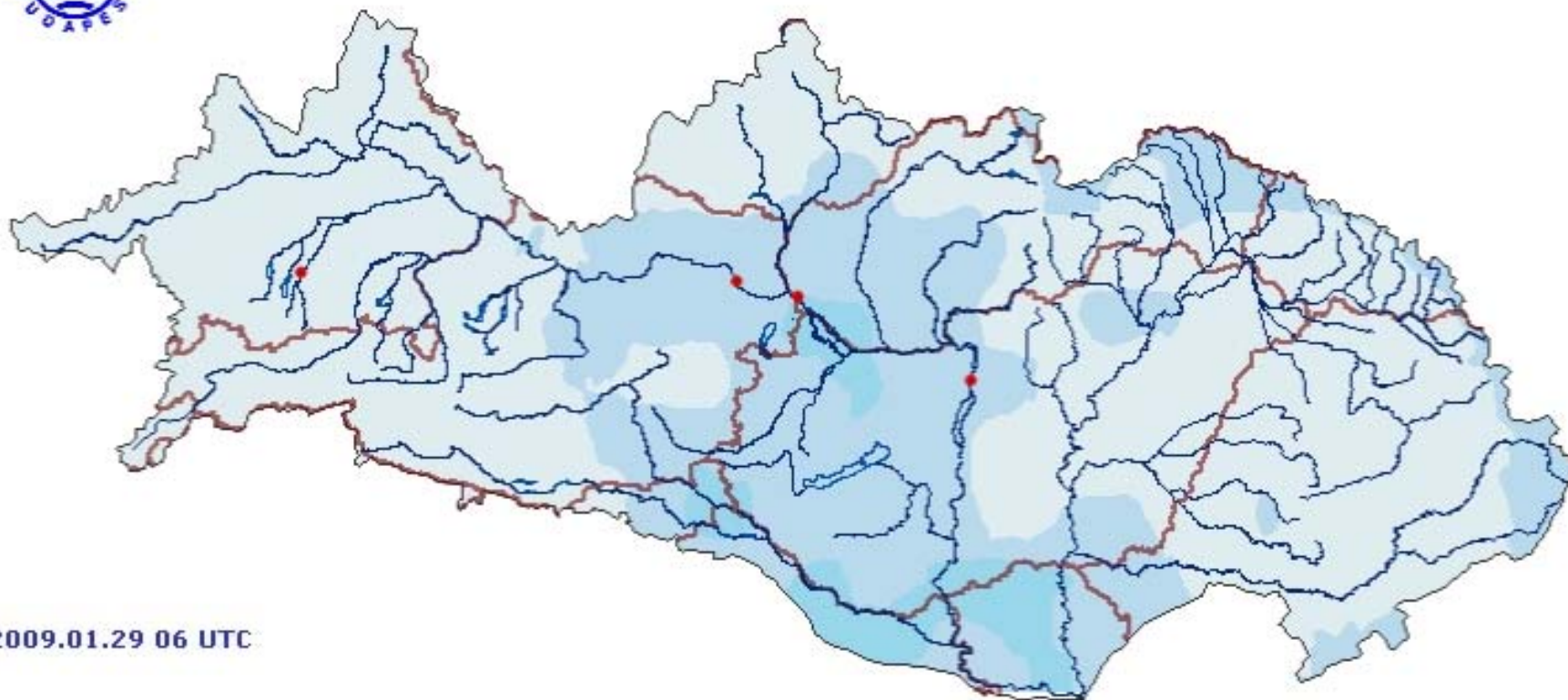


2009.01.29 06 UTC



Precipitation 24 hours ahead

A következő 24 órában várható csapadék



2009.01.29 06 UTC



Forrásadatok: OMSZ

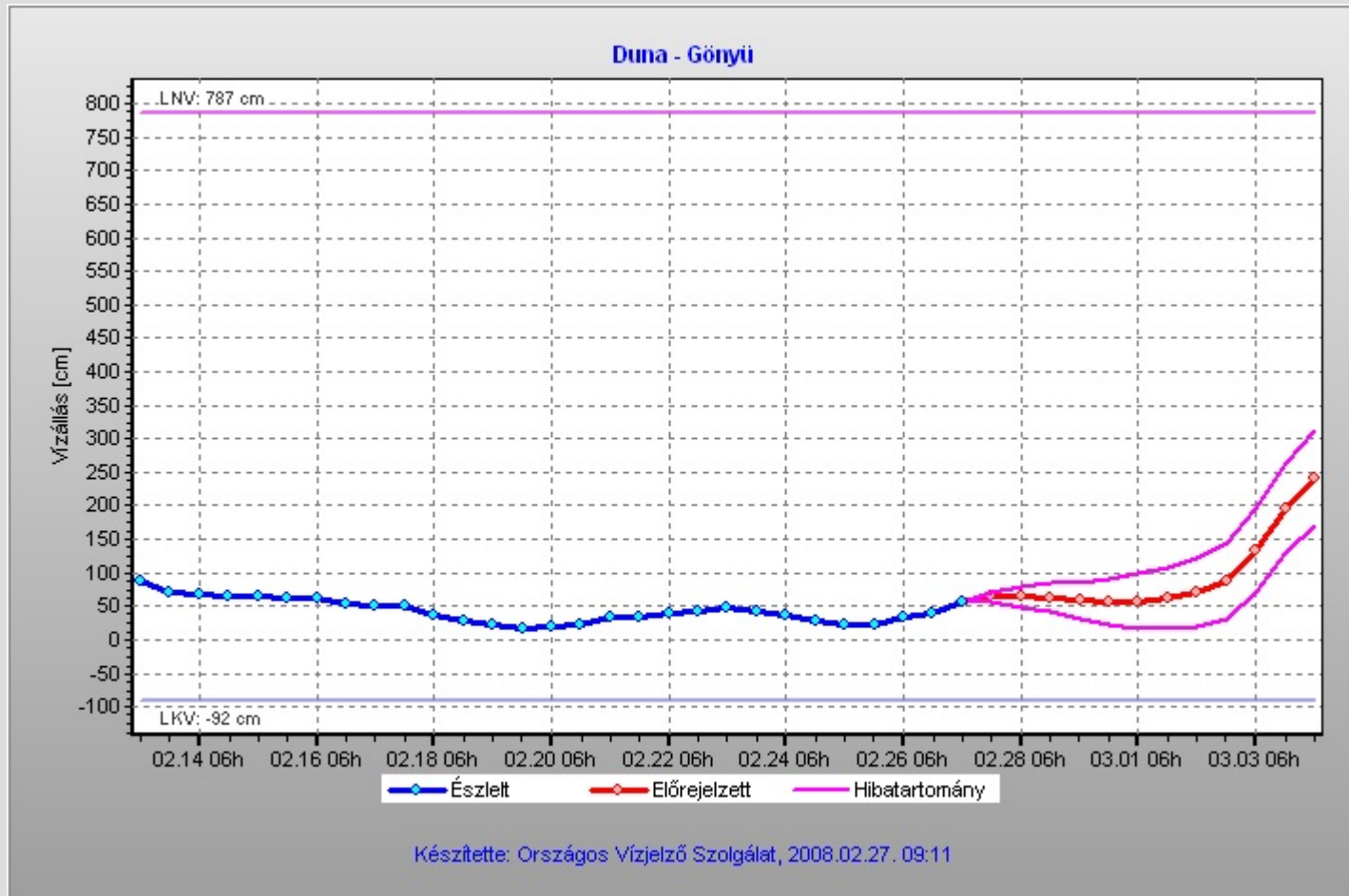


Development of a Hydrological Forecasting and Modelling Tool for the Central Danube River Basin

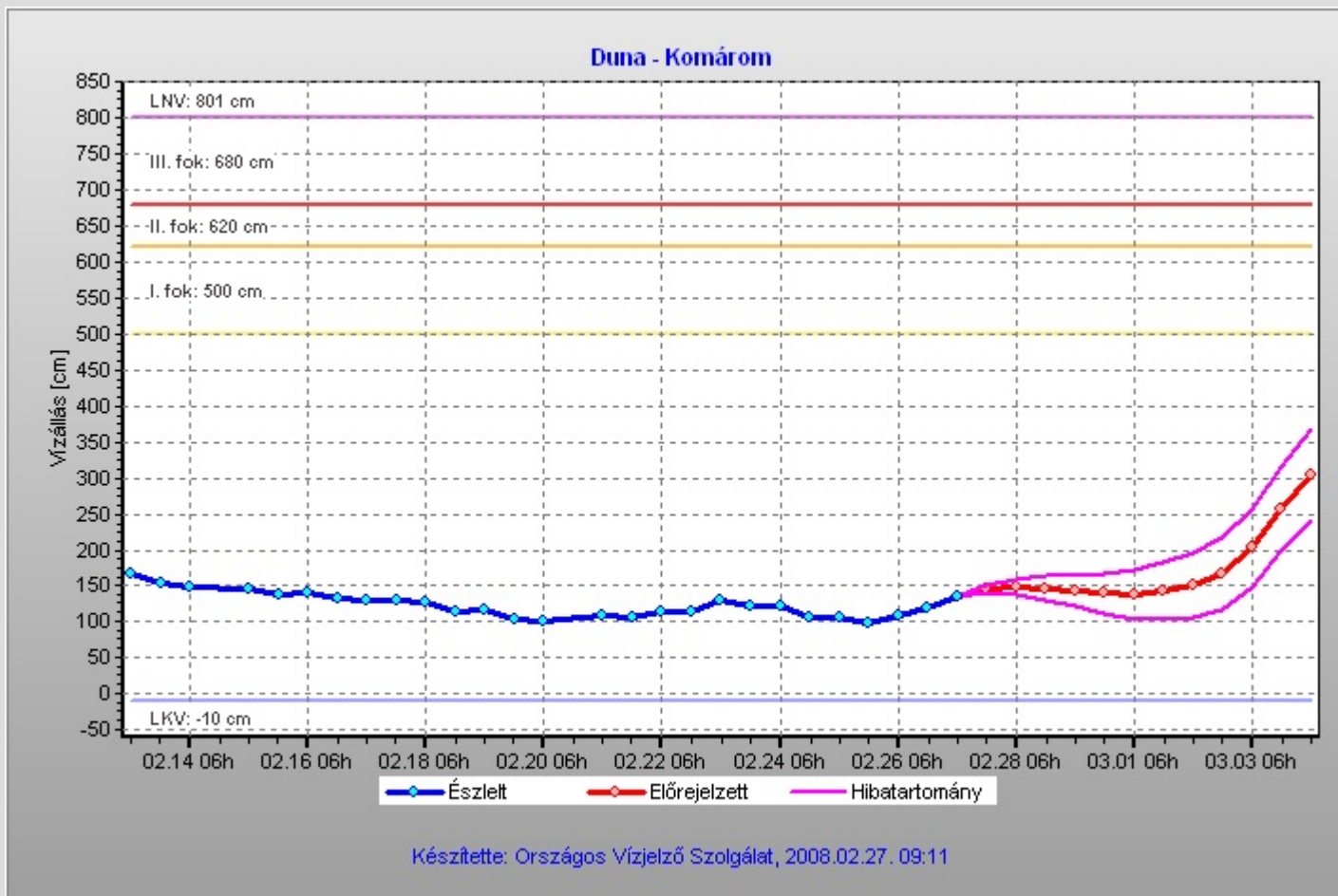
- Deterministic flow/water-level forecast

$$1 * STD = f(t_{\text{forecast}})$$

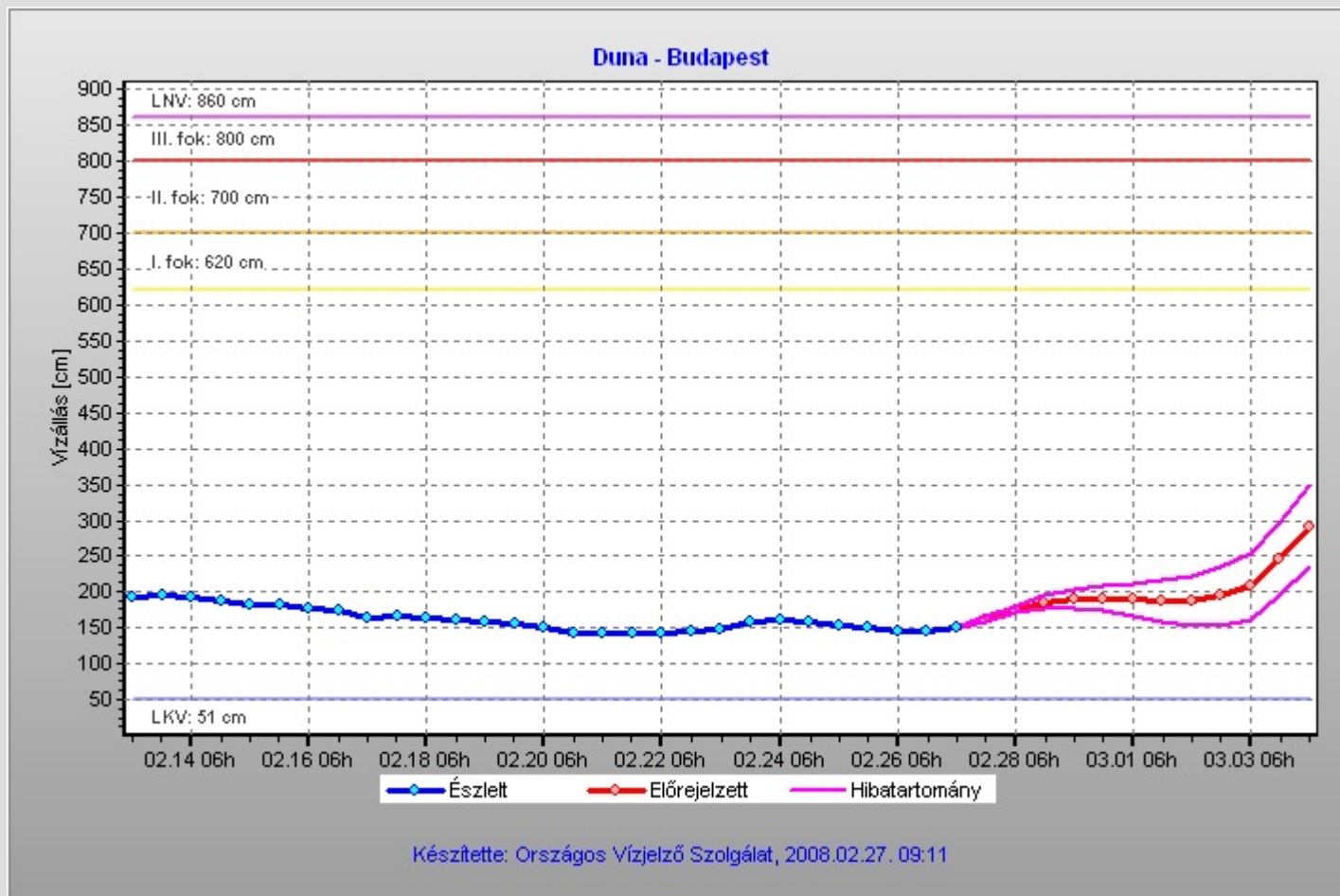
Hydrological forecast
Danube - Gönyű

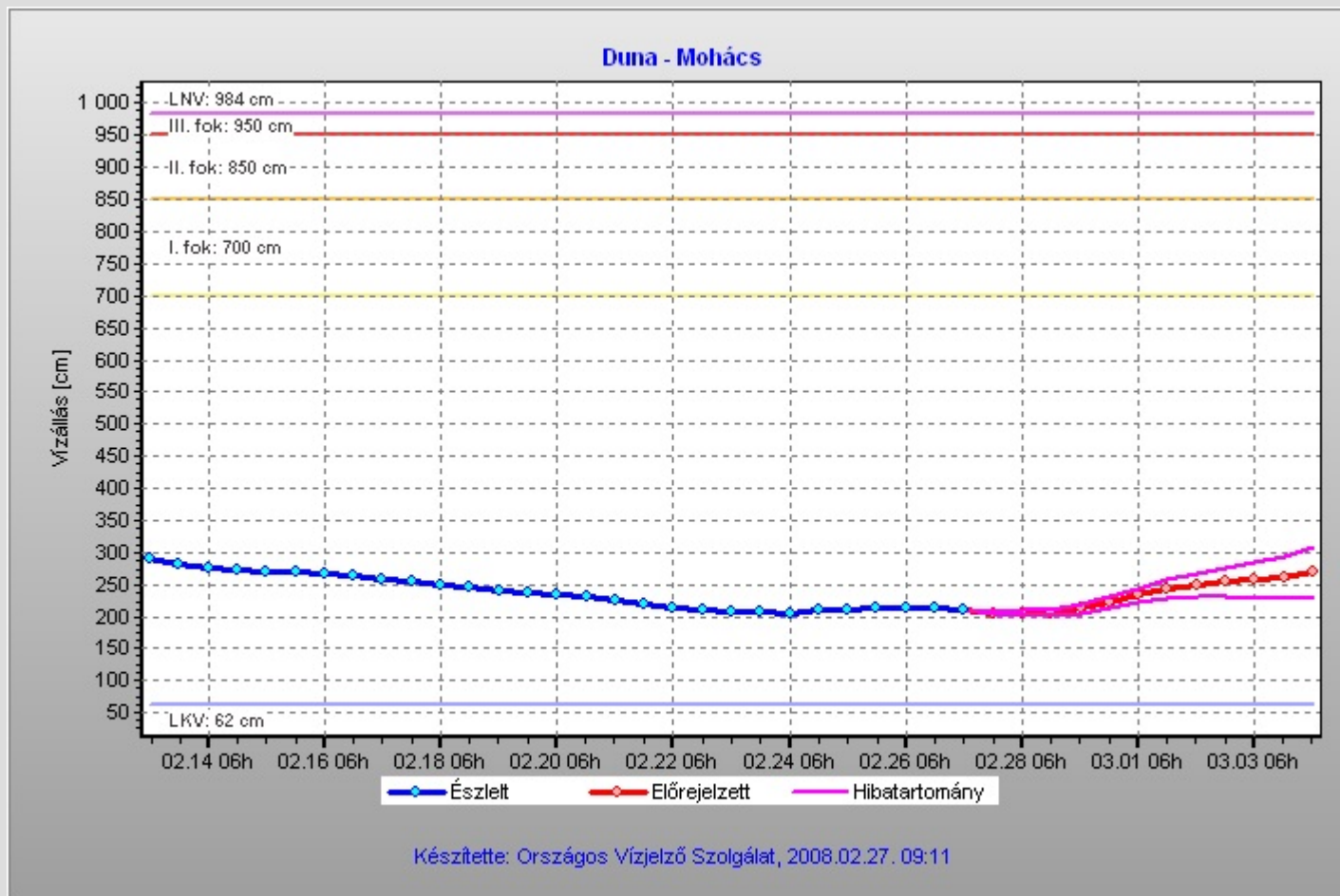


Hydrological forecast
Danube - Komárom

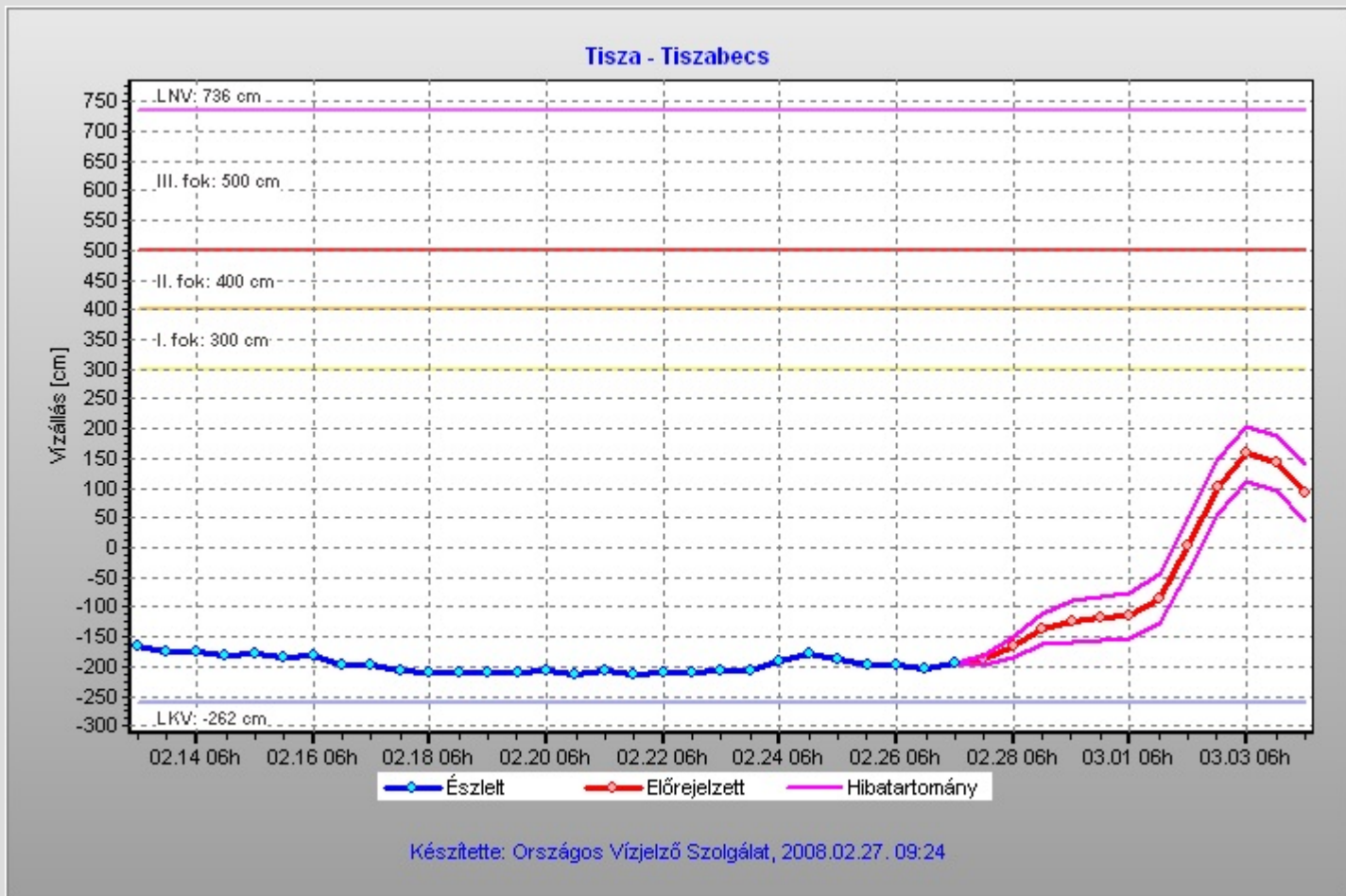


Hydrological forecast
Danube - Budapest

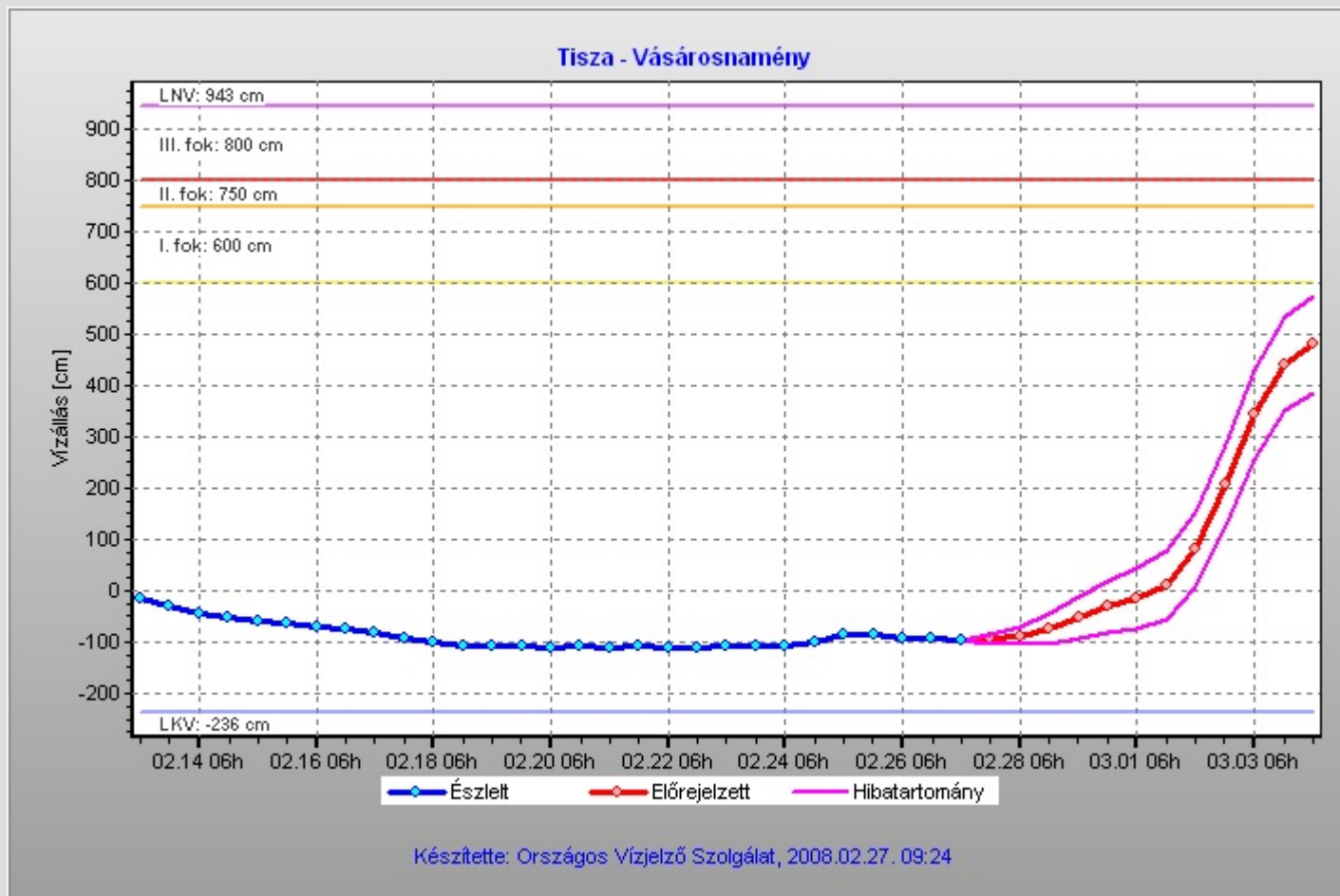




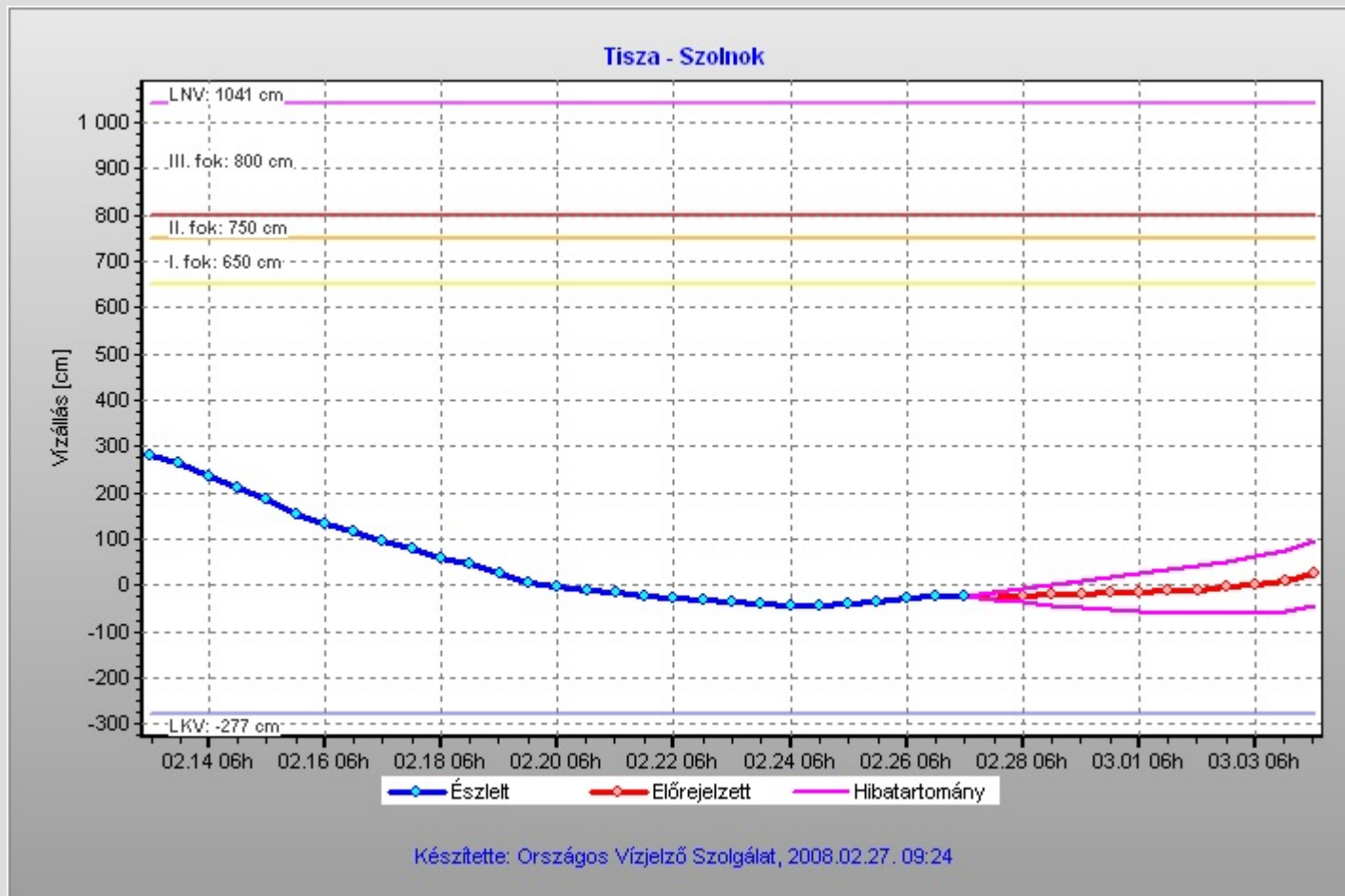
Hydrological forecast
Tisza - Tiszabecs



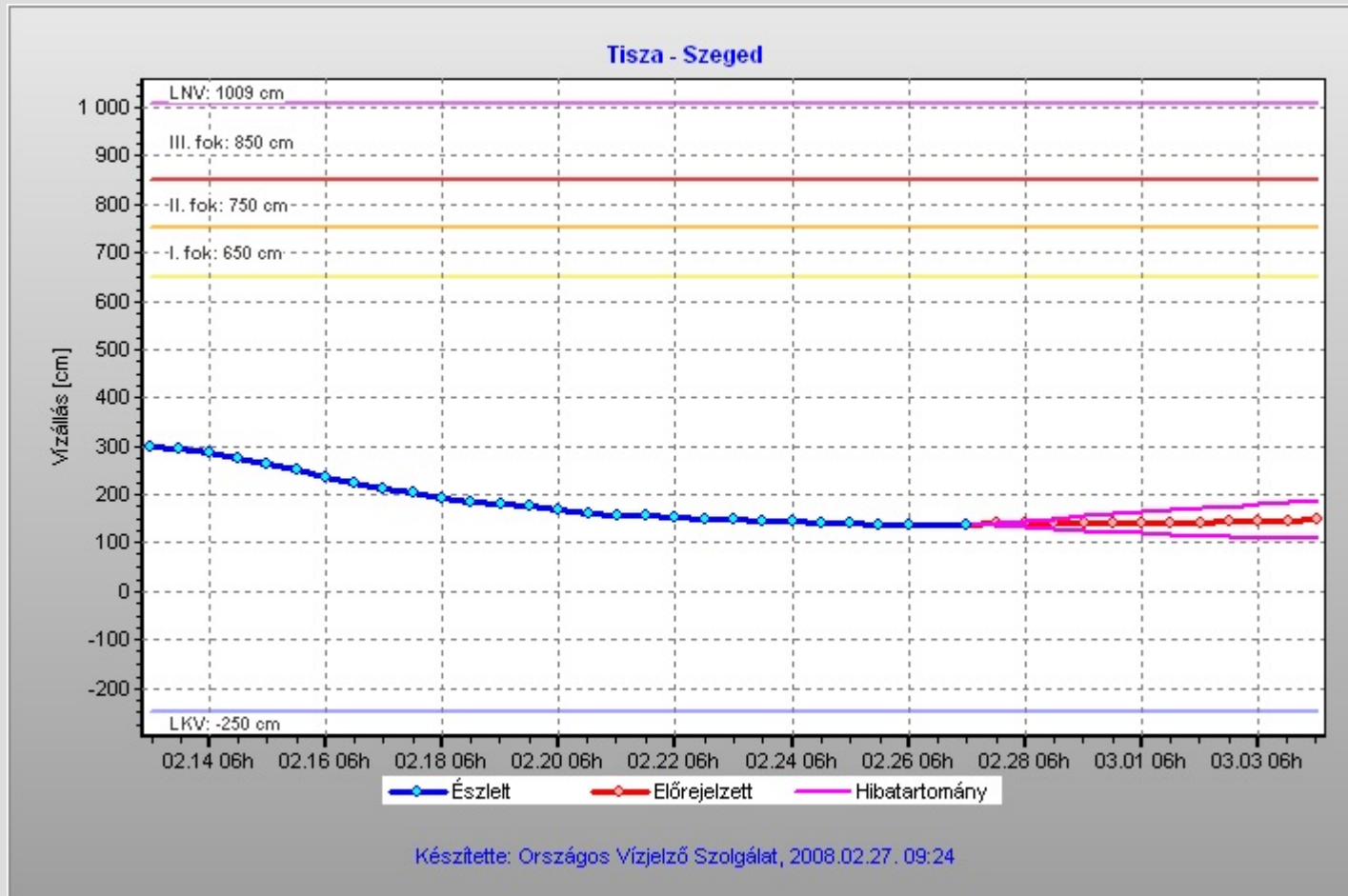
Hydrological forecast
Tisza - Vásárosnamény



Hydrological forecast
Tisza - Szolnok



Hydrological forecast
Tisza - Szeged

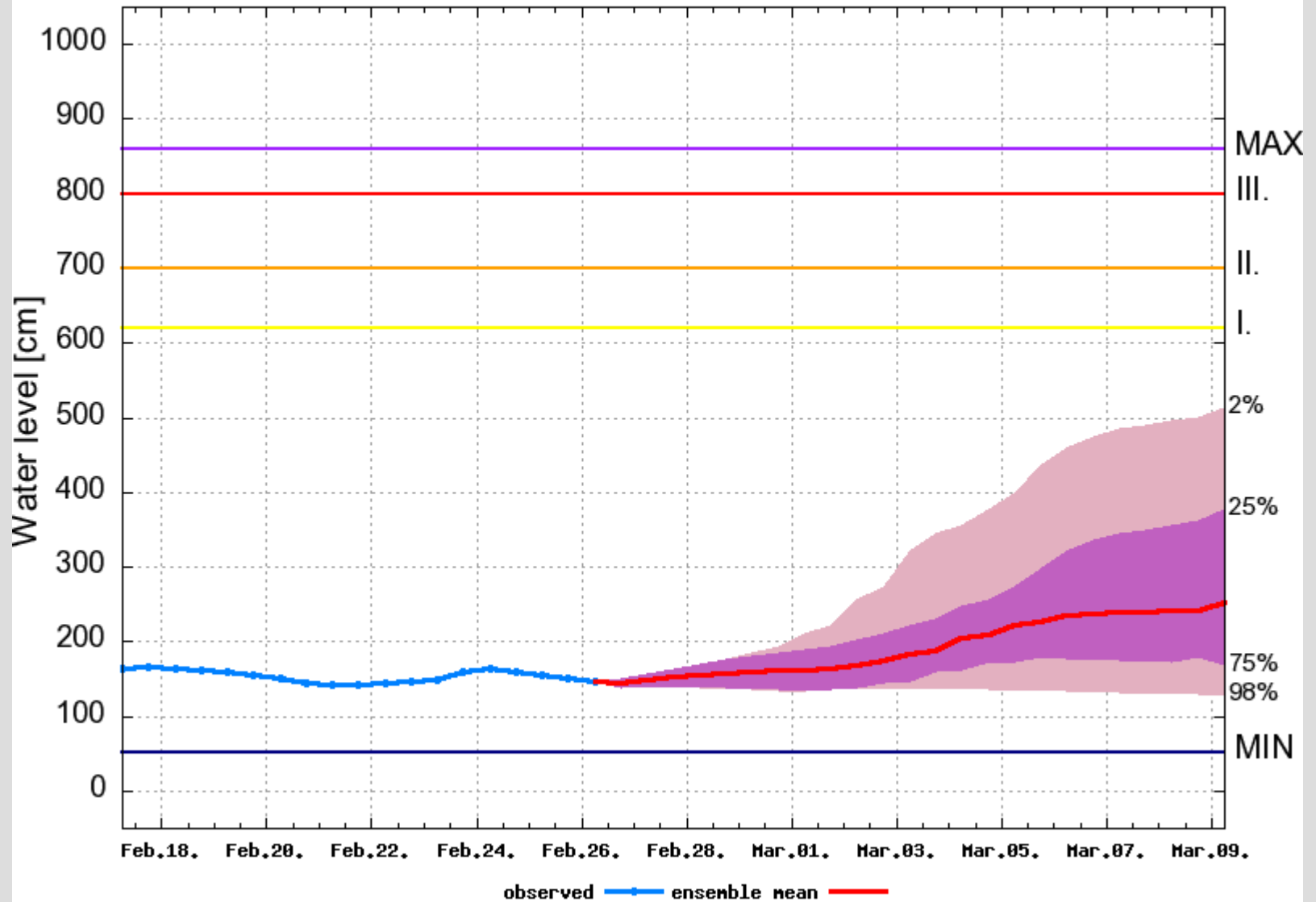


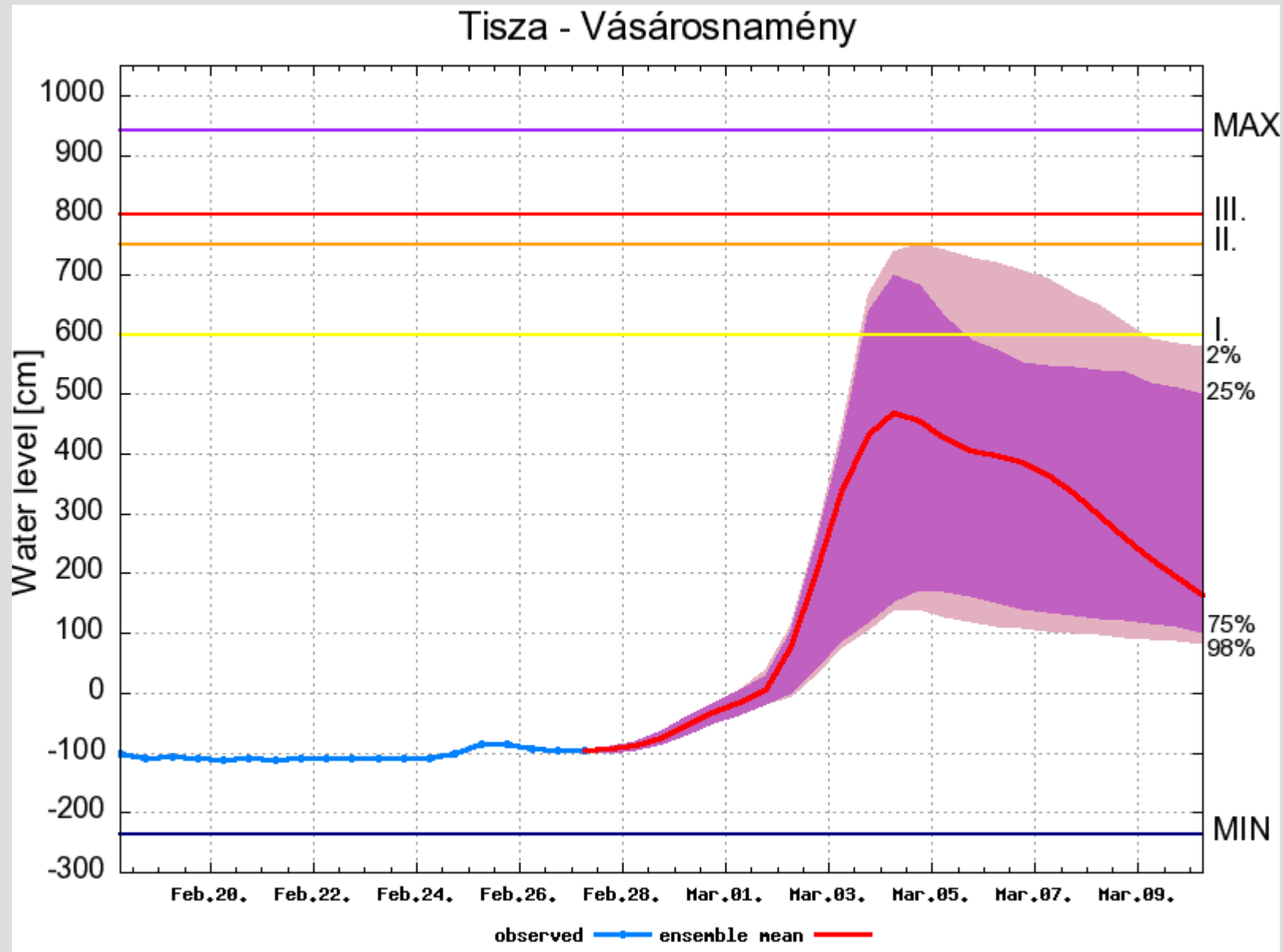


Development of a Hydrological Forecasting and Modelling Tool for the Central Danube River Basin

- Hydrological ensembles – water levels

Danube - Budapest



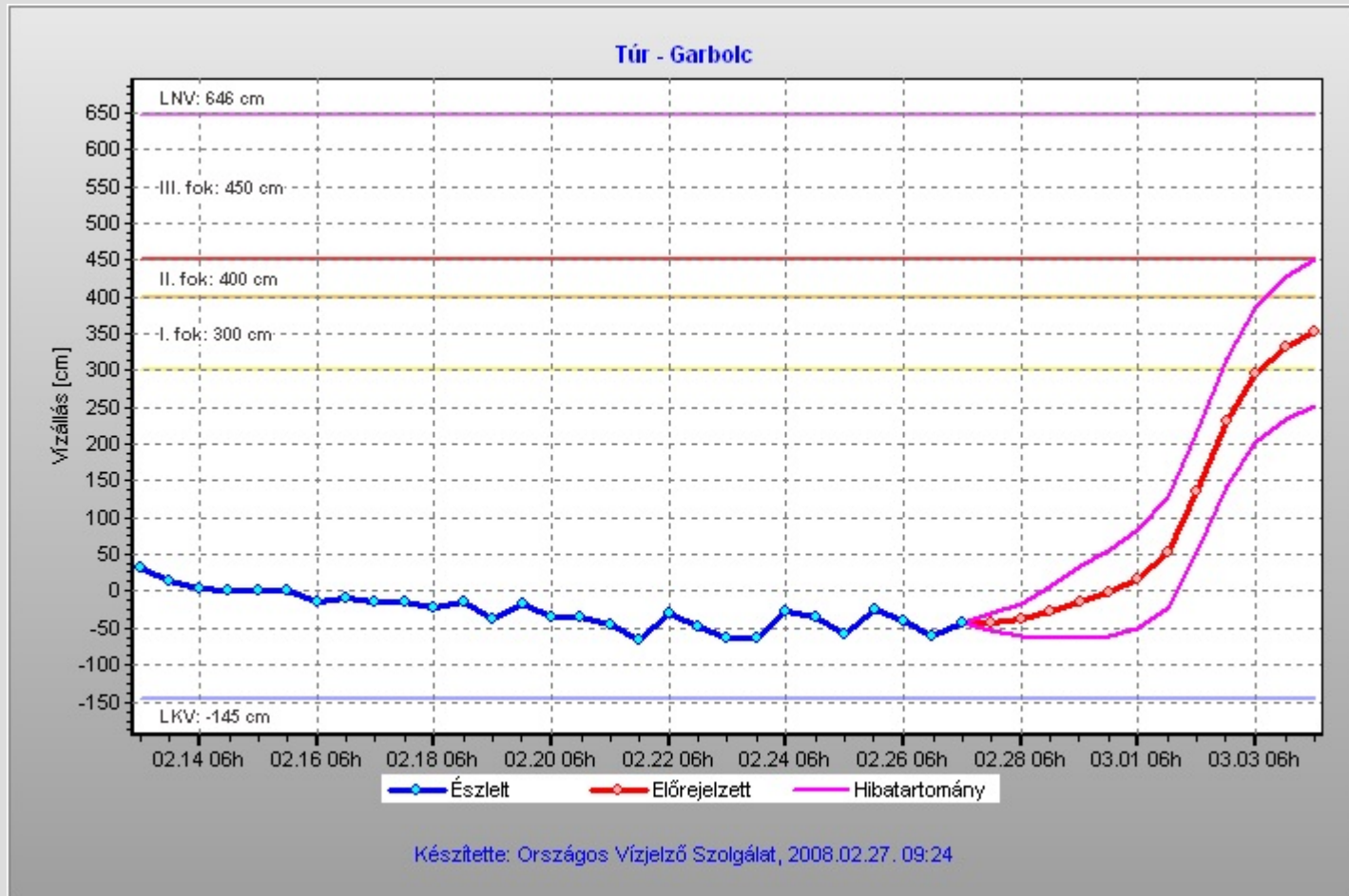




Development of a Hydrological Forecasting and Modelling Tool for the Central Danube River Basin

- Exceedance tables

Hydrological forecast
Túr - Garbolc



Flood alert



River	Station	2008.03.01 6:00	2008.03.01 18:00	2008.03.02 6:00	2008.03.02 18:00	2008.03.03 6:00	2008.03.03 18:00	2008.03.04 6:00
Túr	Garbolc	16	53	135	230	295	331	352
Bodrog	Bodrogszerdahely	355	376	439	535	617	663	685
	Felsőberecki	268	288	346	425	484	524	547
	Sárospatak	281	294	335	402	458	496	512
Fekete Körös	Tenkefűrdő	129	163	302	408	436	415	361
	Talpas	145	162	305	593	703	736	721
	Nagyzerénd	136	146	192	322	511	693	781
	Ant	75	94	143	264	411	565	663

Flood alert



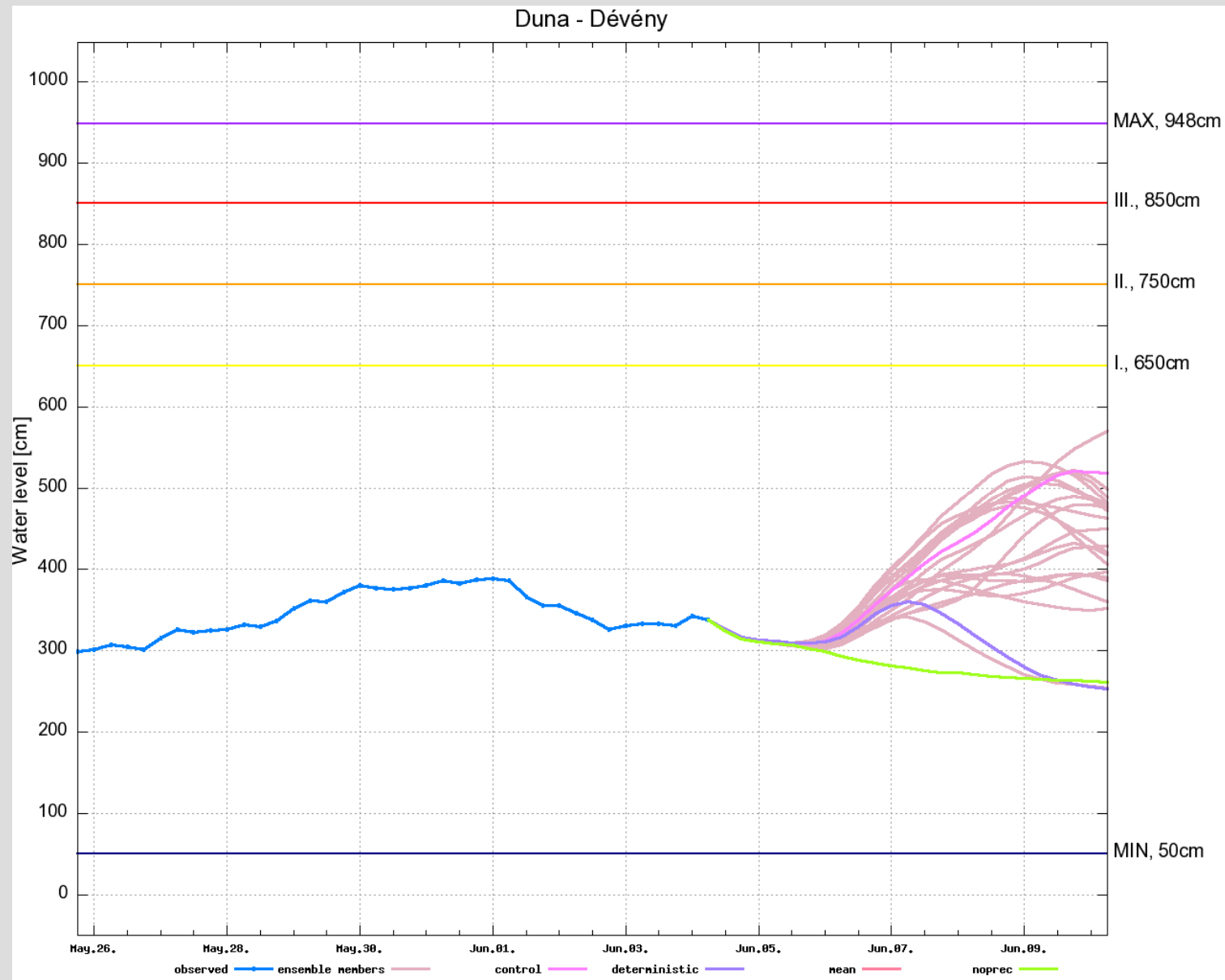
River	Station	2008.03.01 6:00	2008.03.01 18:00	2008.03.02 6:00	2008.03.02 18:00	2008.03.03 6:00	2008.03.03 18:00	2008.03.04 6:00
Fekete Körös	Ant [H cm]	75	94	143	264	411	565	663
Fekete Körös	Ant I	0	0	0	4	9	35	42
Fekete Körös	Ant II	0	0	0	0	2	19	31
Fekete Körös	Ant III	0	0	0	0	0	7	10
Fekete Körös	Ant LNV	0	0	0	0	0	0	1



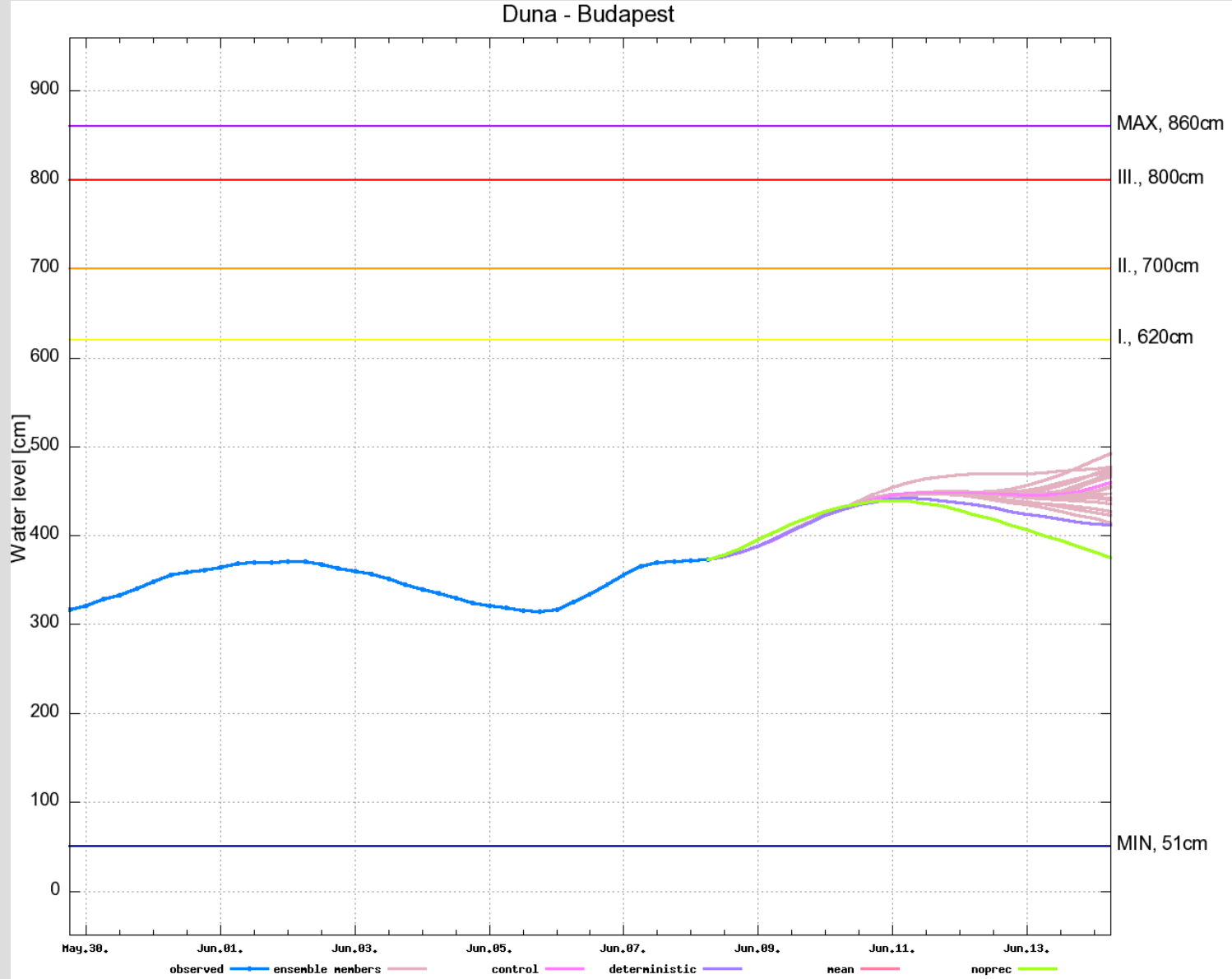
Development of a Hydrological Forecasting and Modelling Tool for the Central Danube River Basin

Testing, Near Real Time Runs,
July-September 2008

Danube – Devin 2008.06.04



Danube – Budapest 2008.06.06



balint@vituki.hu



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Hat napos minimum- és maximumhőmérséklet-előrejelzés [°C]

Kiadva: 2008. április 02.

Vízgyűjtő	1.nap		2.nap		3.nap		4.nap		5.nap		6.nap	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Duna az Inn tork. felett	3,6	7,9	1,2	6,0	1,1	7,2	1,5	8,7	1,1	6,7	-0,3	6,2
Inn	-1,4	3,3	-3,6	0,9	-3,7	2,9	-3,0	4,6	-2,3	4,0	-3,7	3,4
Traun és Enns	1,3	5,5	-0,4	4,6	-0,3	5,1	0,1	6,9	-0,5	5,9	-0,3	5,0
Bécsi medence	4,0	8,3	2,6	7,9	1,8	8,1	2,1	9,0	2,6	7,3	1,6	7,3
Morva	3,7	10,5	2,5	9,3	2,3	9,3	2,2	9,8	3,8	8,5	2,7	7,1
Rába-Répcé	5,5	11,6	4,2	10,5	4,0	10,5	4,3	11,2	4,3	10,2	3,9	9,3
Vág-Garam-Ipoly	1,9	9,1	0,9	9,7	1,9	10,5	3,5	10,1	2,4	9,1	3,0	7,9
Közép-Duna	4,0	12,4	3,3	12,2	3,9	13,9	5,5	13,2	3,1	14,6	6,0	11,4
Zala és Balaton	5,5	13,2	4,6	12,0	5,5	12,4	6,0	12,7	5,1	15,0	5,5	10,2
Sió-Kapos-Sárvíz	4,8	13,0	4,4	12,4	5,5	13,5	6,0	13,3	3,9	15,6	6,5	10,7
Felső-Tiszavölgy	-0,4	6,2	-0,2	8,6	-0,7	9,2	2,6	8,3	0,1	10,0	2,5	7,4
Szamos-Kraszna	1,4	7,3	0,2	10,0	0,1	11,7	2,5	11,0	1,1	12,0	3,4	11,2
Bodrog	2,8	8,3	2,0	10,5	1,4	10,1	4,5	9,1	1,1	11,6	3,7	6,8
Sajó-Hernád	3,9	9,9	3,3	9,5	3,1	10,7	4,2	10,1	3,3	11,2	4,4	8,9
Zagyva-Tarna	5,4	12,6	4,2	12,1	4,1	14,4	5,2	13,9	3,5	14,4	7,0	12,5
Közép-Tiszavölgy	5,5	12,7	3,9	13,3	5,0	14,9	5,7	14,1	4,2	15,2	8,1	13,3
Körösök	4,0	10,5	2,7	13,1	3,0	14,7	4,9	14,0	3,8	14,4	7,3	13,3
Maros	2,2	7,4	1,0	10,4	0,9	12,2	2,8	12,0	2,6	12,2	4,3	13,8
Mura	-0,4	6,0	-2,2	4,0	-1,6	5,4	-1,6	6,1	-1,2	5,6	-1,3	3,7
Felső-Dráva	2,6	9,9	0,4	8,7	2,5	10,0	2,1	9,7	1,8	10,6	3,5	6,9
Alsó-Dráva	5,7	12,9	4,5	11,8	6,2	12,7	6,3	12,9	4,6	15,8	6,8	9,8

Forrás: OMSZ