

Overview of the Hungarian Drought and Water Scarcity Monitoring System

OUR WATER VISION

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Beyond Scarcity Workshop



Average annual damage by excess water:	15,2 billion HUF (44 million €)
Average annual damage by drought:	39,3 billion HUF (113 million €)
Altogether:	54,5 billion HUF

Controversial hystorical aspect

Well developed operational control and protection system for **excess waters**.

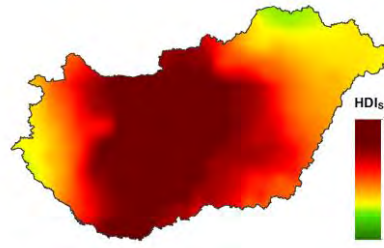
No **drought** monitoring system developed in the past.

Hydrological extremities

**Increase in:
PROBABILITY
DURATION
INTENSITY**



Overview of the system

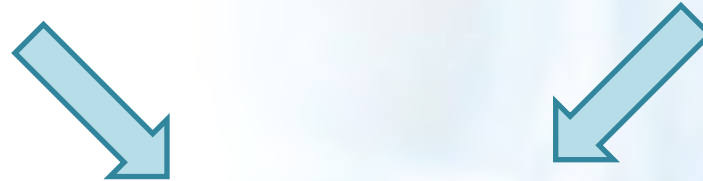


Detection

- 100 monitoring stations (2021)
- GPRS remote system
- Database (OVF)
 - Air temperature and humidity
 - Precipitation
 - Soil moisture, soil temperature
- Web service / queries

Evaluation

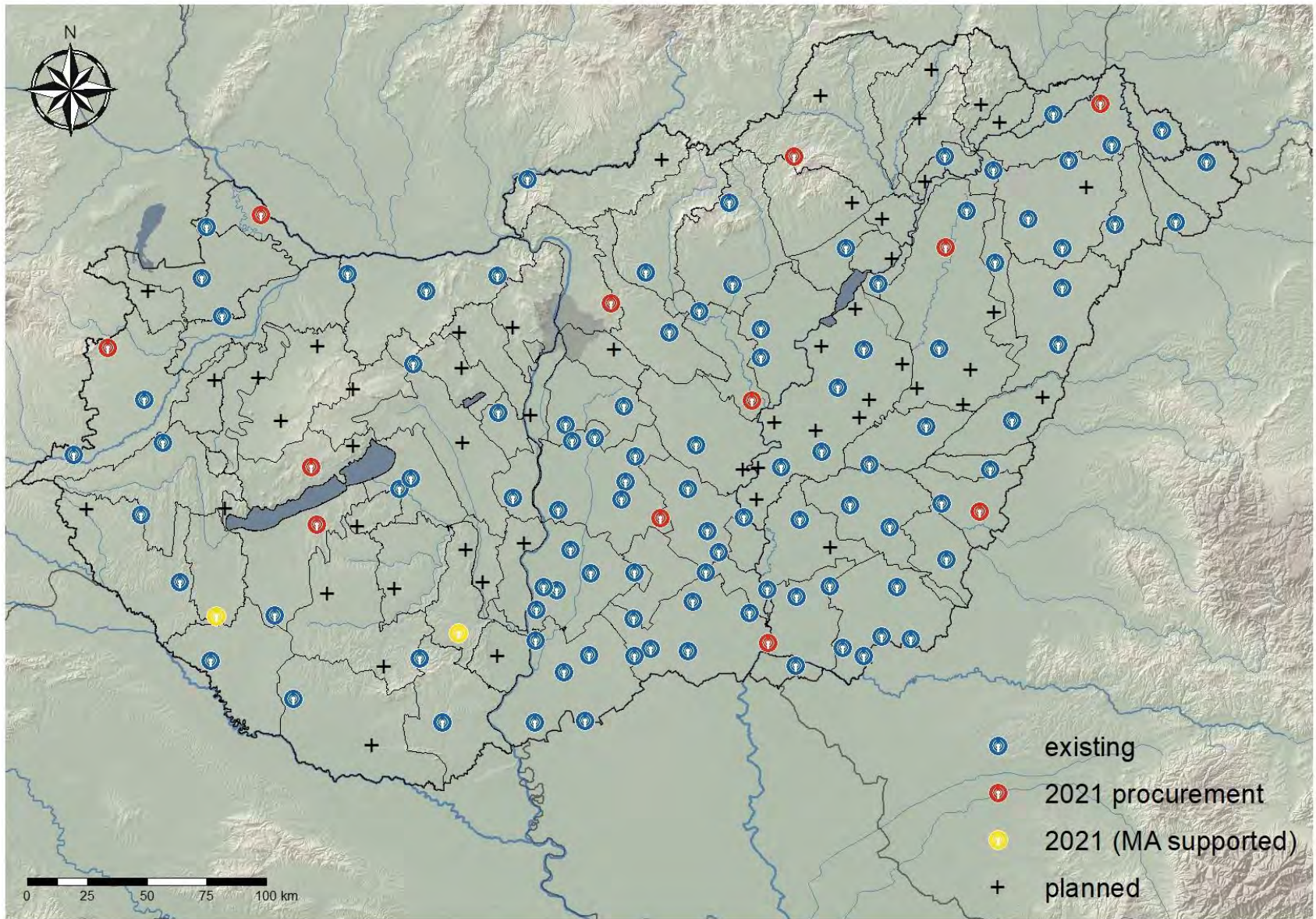
- Hungarian Drought Index (HDI)
- Measured soil moisture
- Evaluation of water shortage (based on measured data)



Intervention practices



Structure of network



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5 TM sensors (Decagon)
soil moisture, soil temperature

6 depth:

upper layer: 10-20-30

lower layer: 45-60-75 cm

calibrated values



Drought Index Analyses

Meteorological drought

(precipitation, temperature, evaporation)

Agricultural drought

(soil moisture, vegetation response)

Hydrological drought

(runoff, discharge, snow cover)

Hungarian indices	PAI	fAPAR	SRI
	PaDI	pF	SWSI
	GVM	NDVI	RD
	PDSI	NDWI	
	SPI	CMI	
	SPEI	ETDI	
	BMDI	SMDI	
	RAI	SVI	

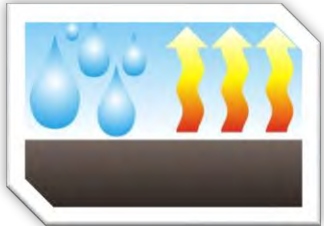
- Combined indices: CDI (**EU**), ADI
- Classification scheme (**USA**)
- Economical indices (loss index)?

Barely involved:

- **Soil moisture measurement**
- **Daily data analysis**



Hungarian drought index



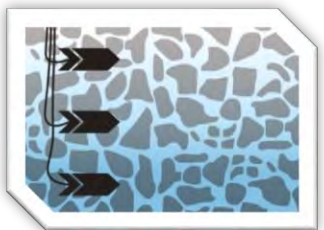
HDI₀

(water balance)



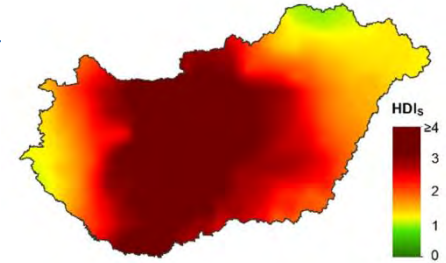
HDI_s

(absence of evaporable water)



HDI

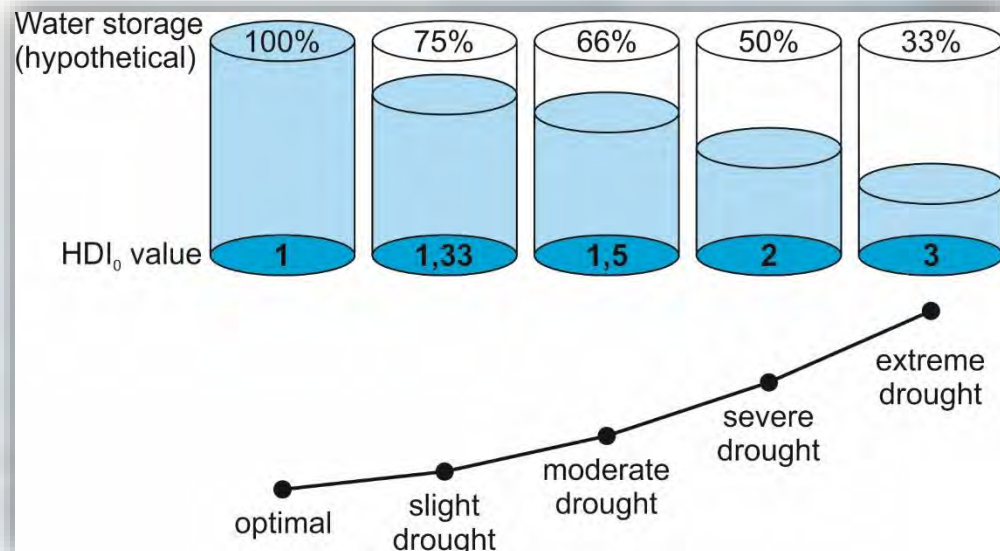
(soil moisture)



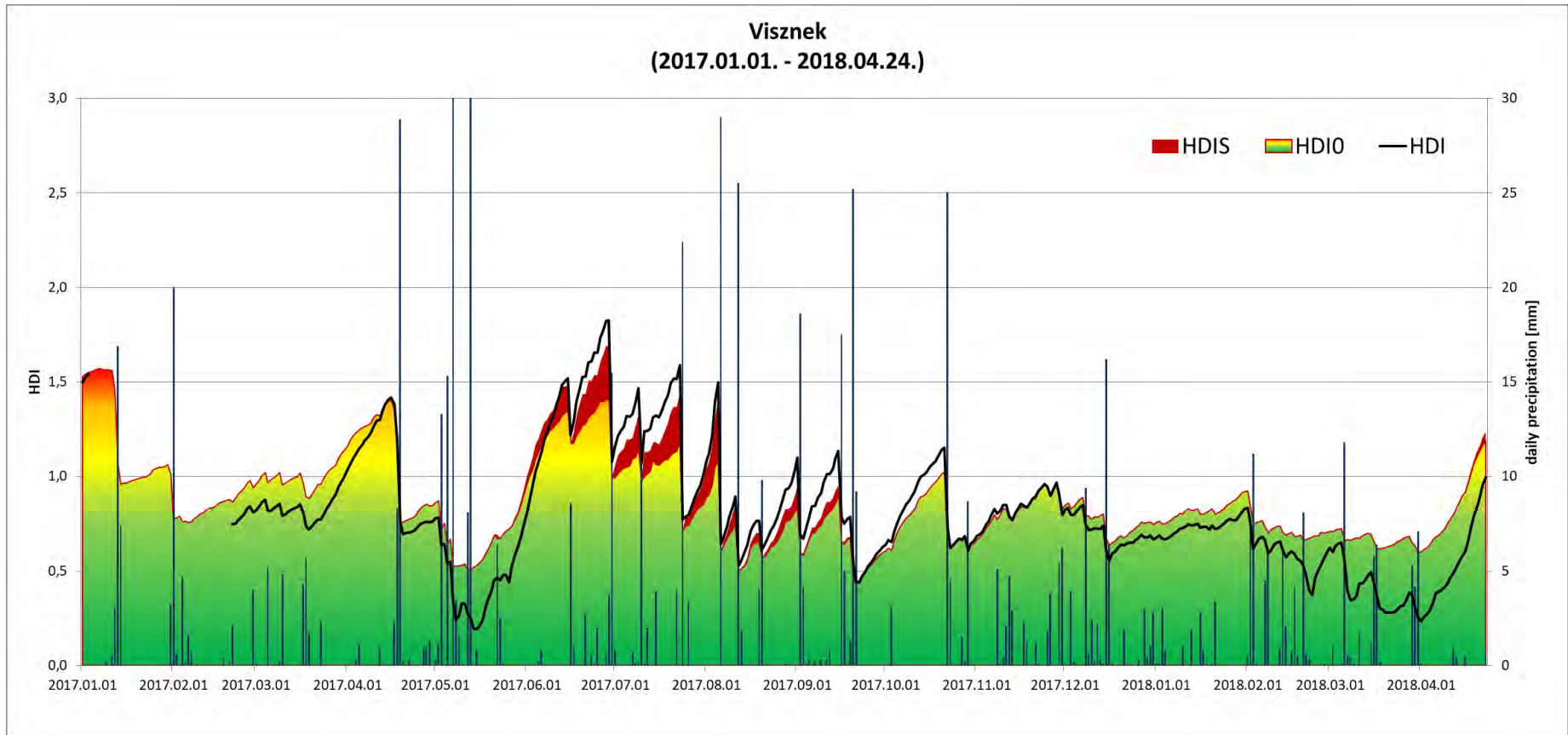
$$\text{Water storage (WS)} = \text{WS}_{(-1)} + P - ET$$

(actual day)

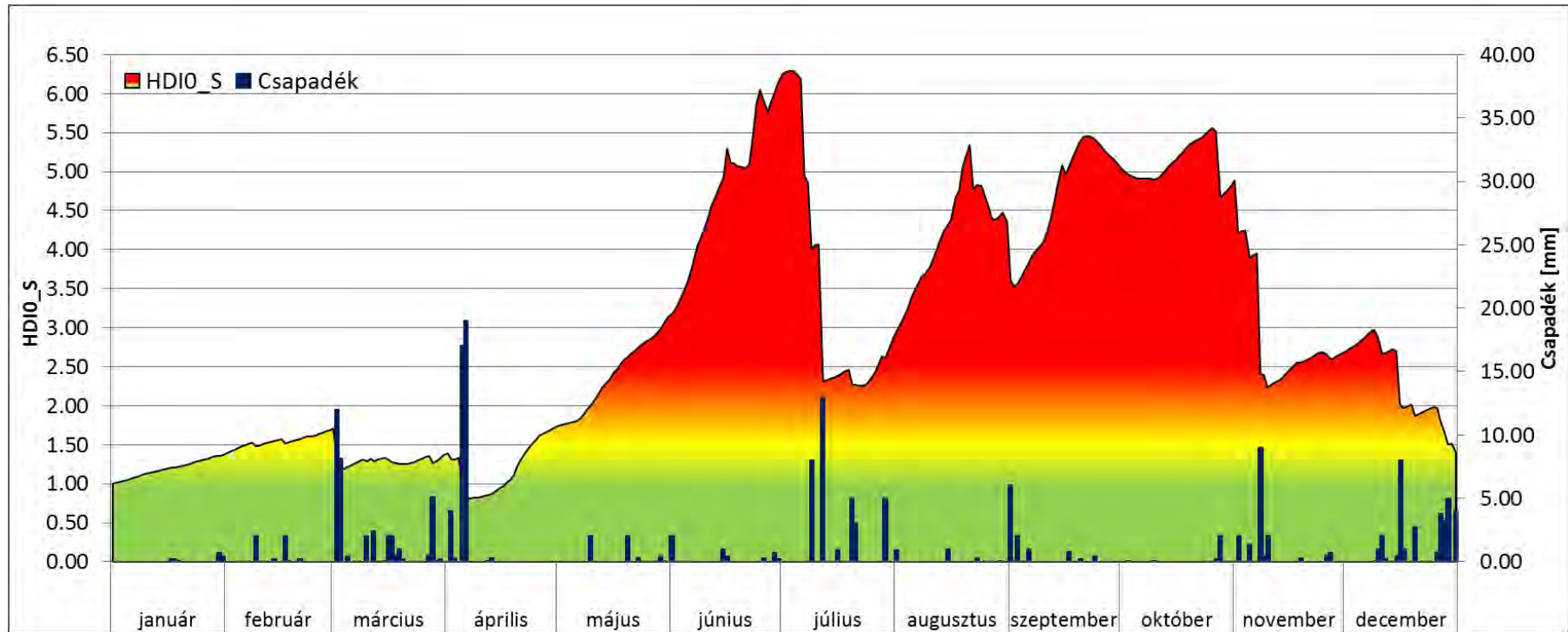
	WS (now)	WS (average)	HDI ₀
2017.05.31	48	48	1,00
2017.06.30	29	39	1,34



HDI time series



2000 – „The Drought Mountain”



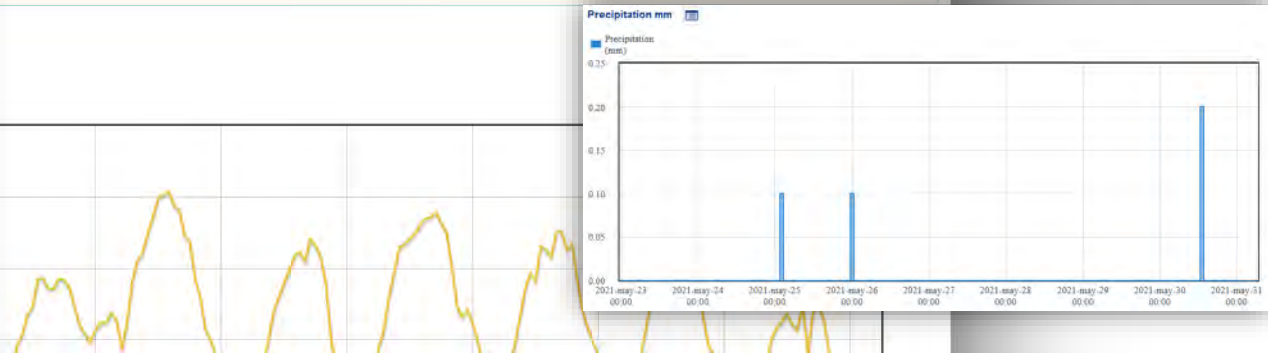
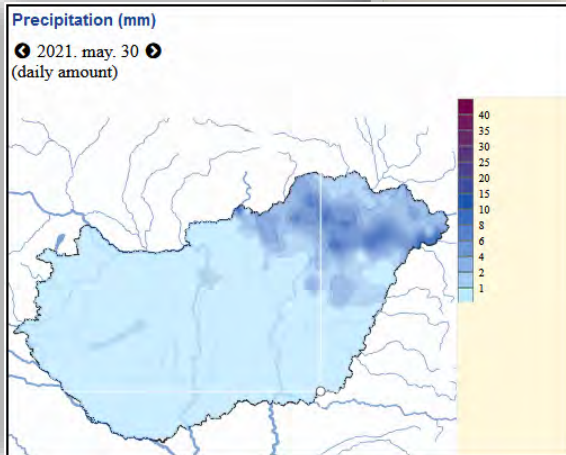
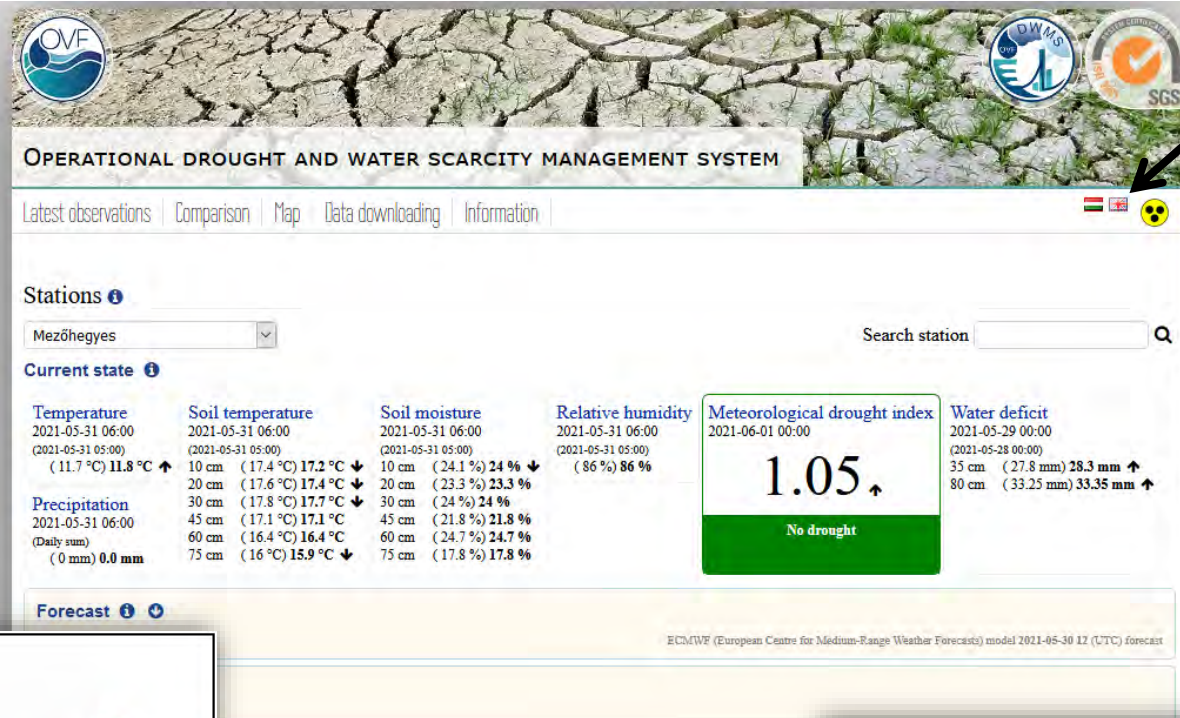
2000 Szeged: 216 mm annual precipitation
(long term average = 550 mm)



Interpretation, data validation



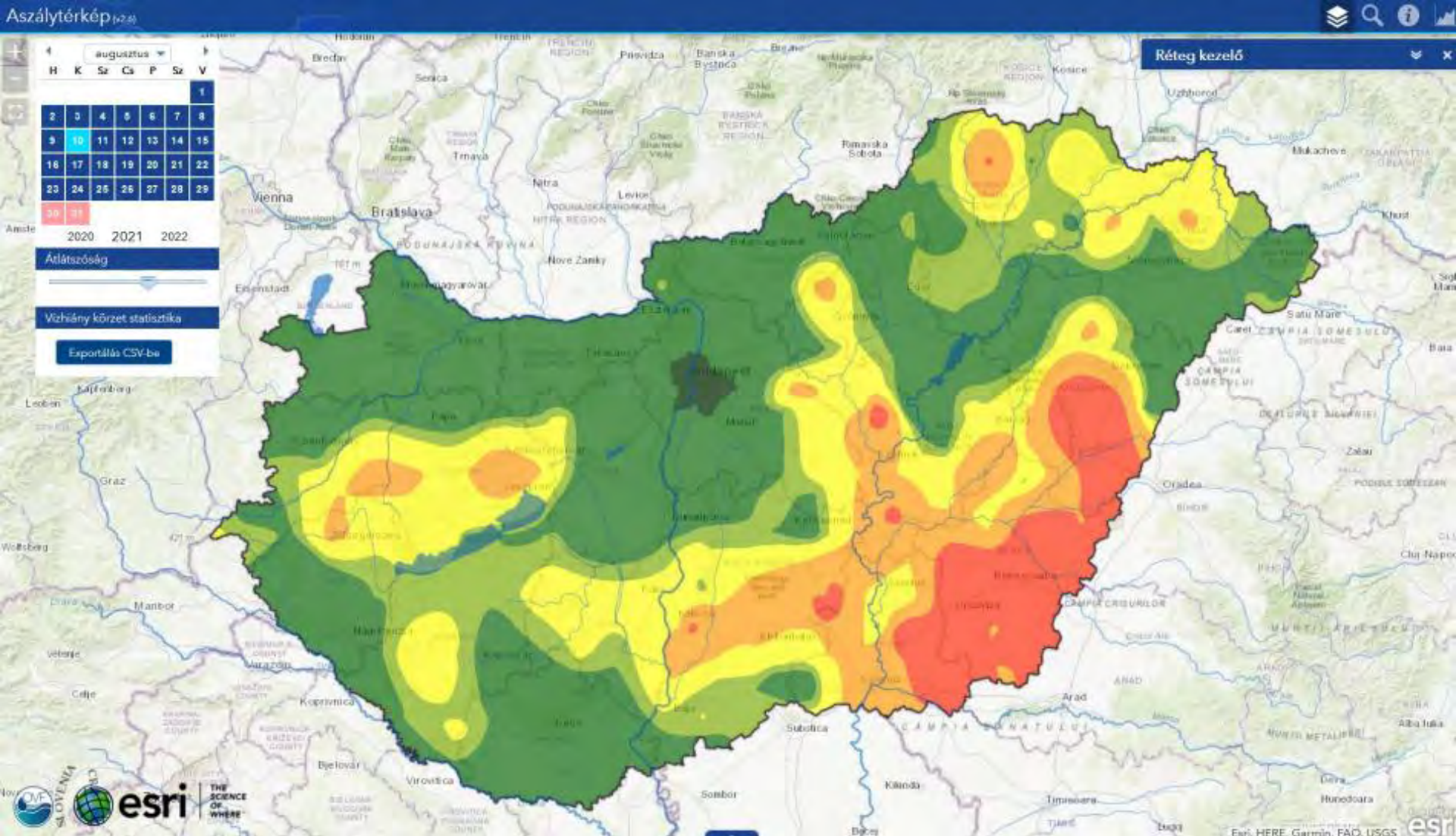
<http://aszalymonitoring.vizugy.hu>



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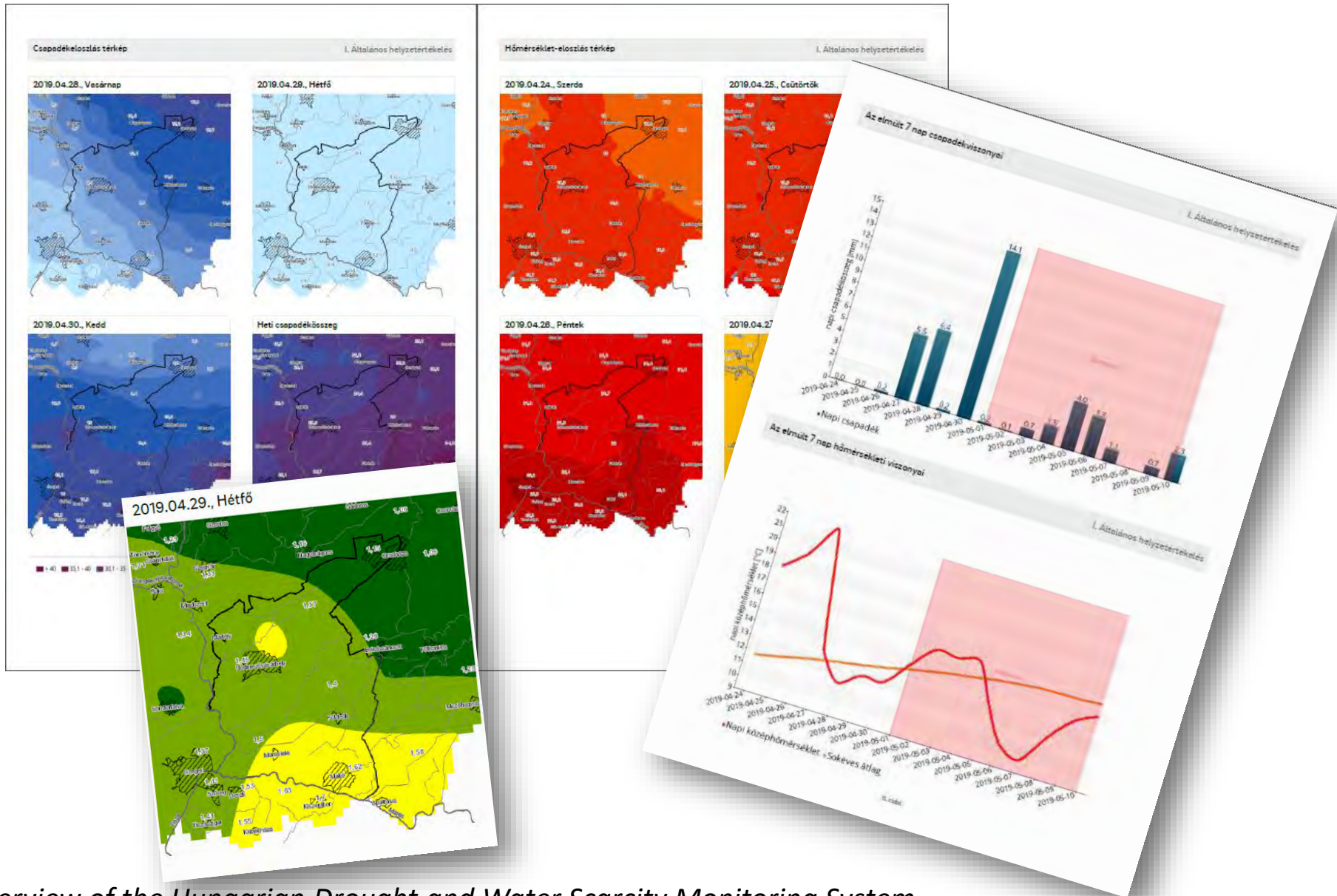
Interpretation, data validation

<https://vizhiany.vizugy.hu>

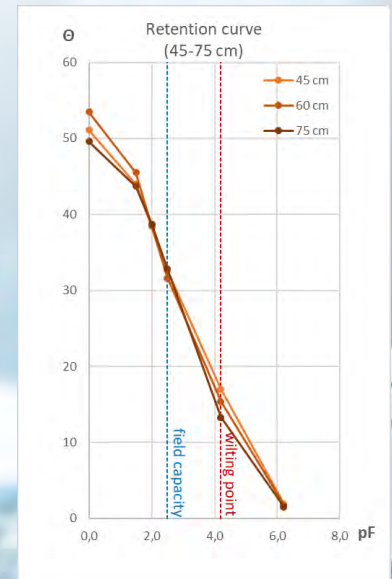
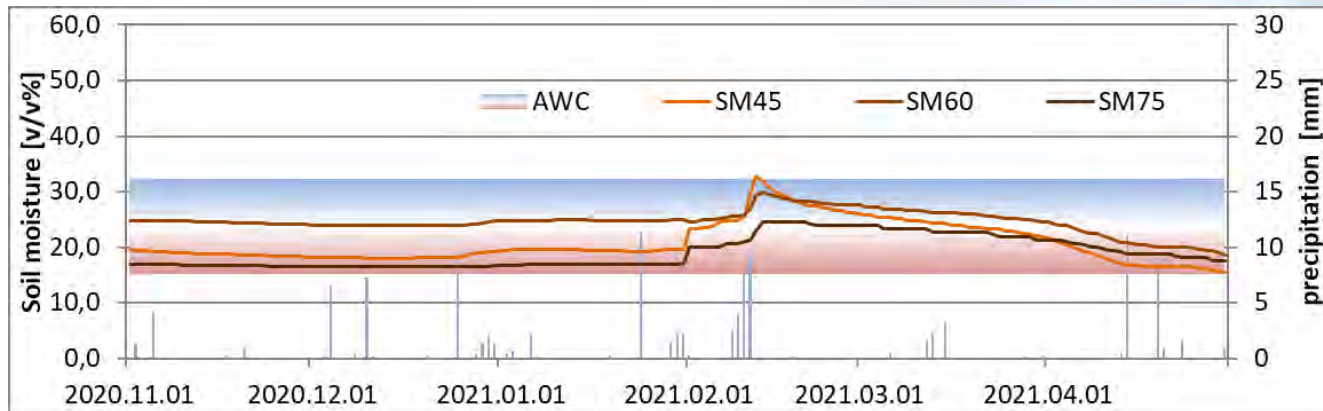
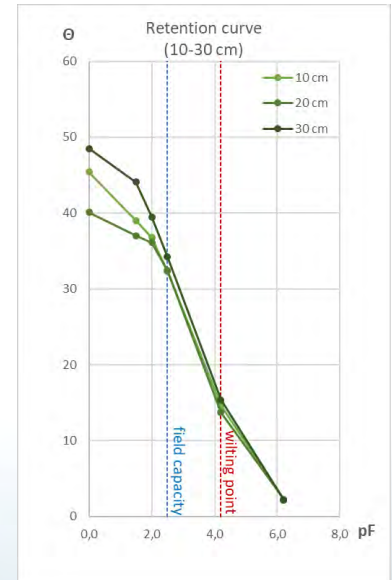
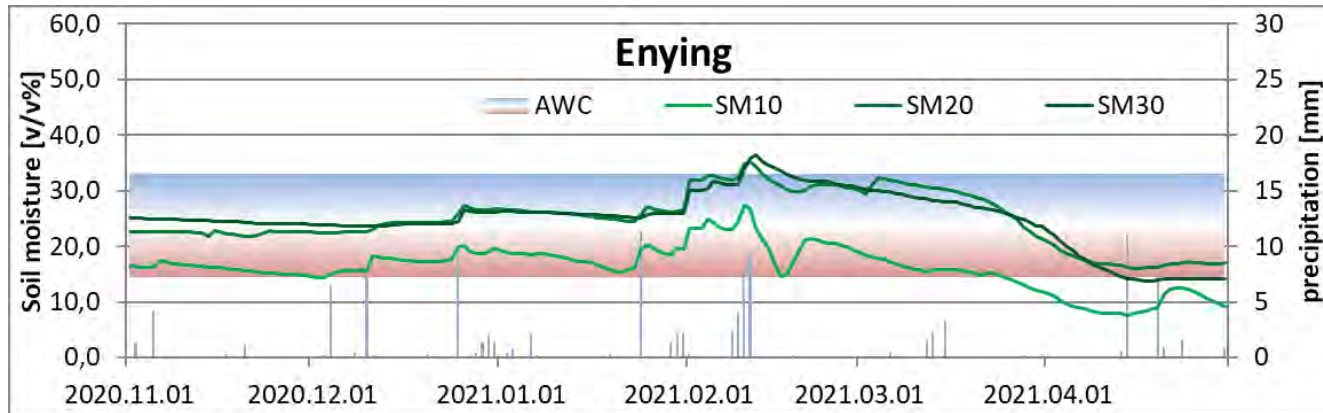


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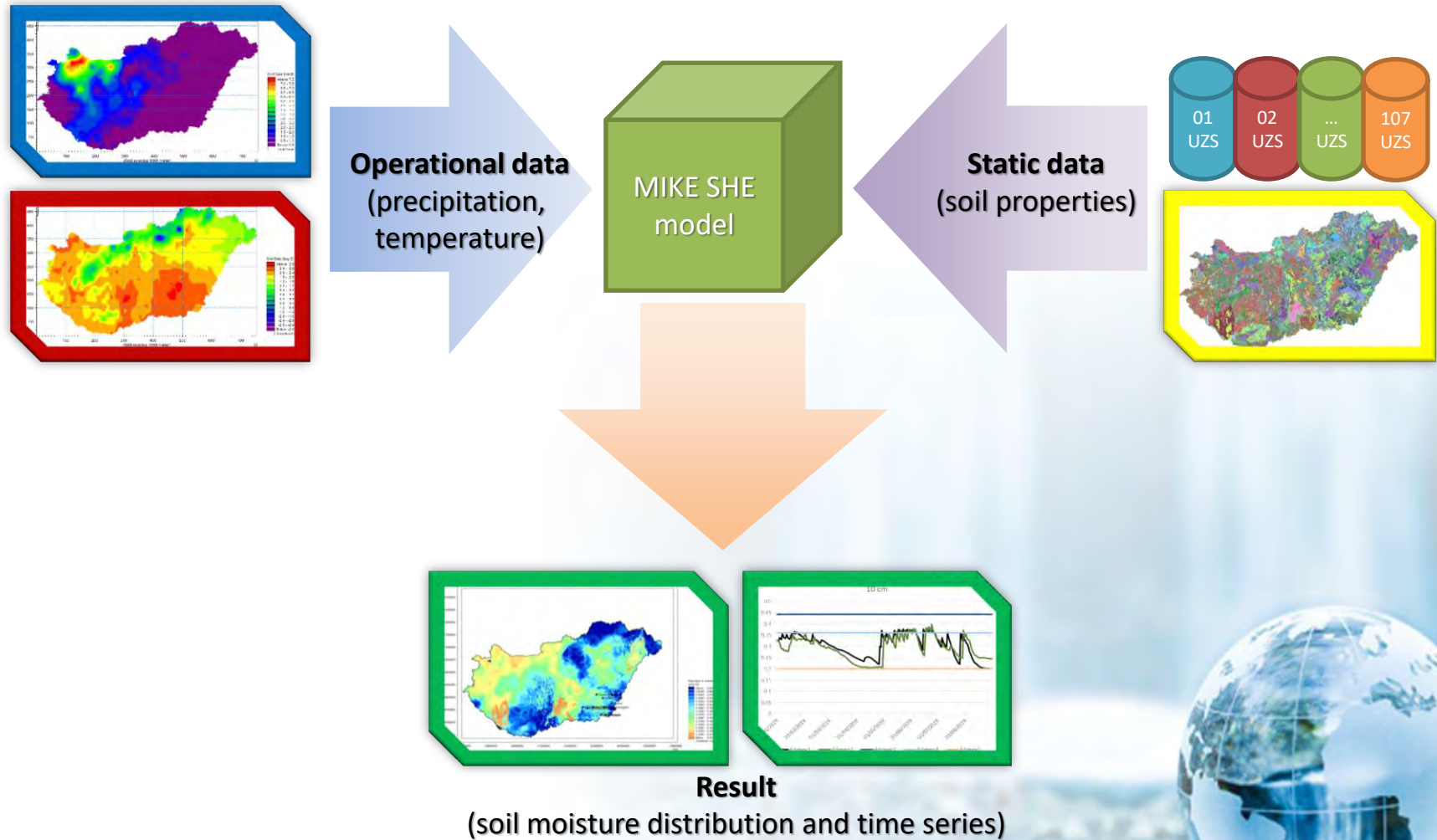
Weekly drought reports



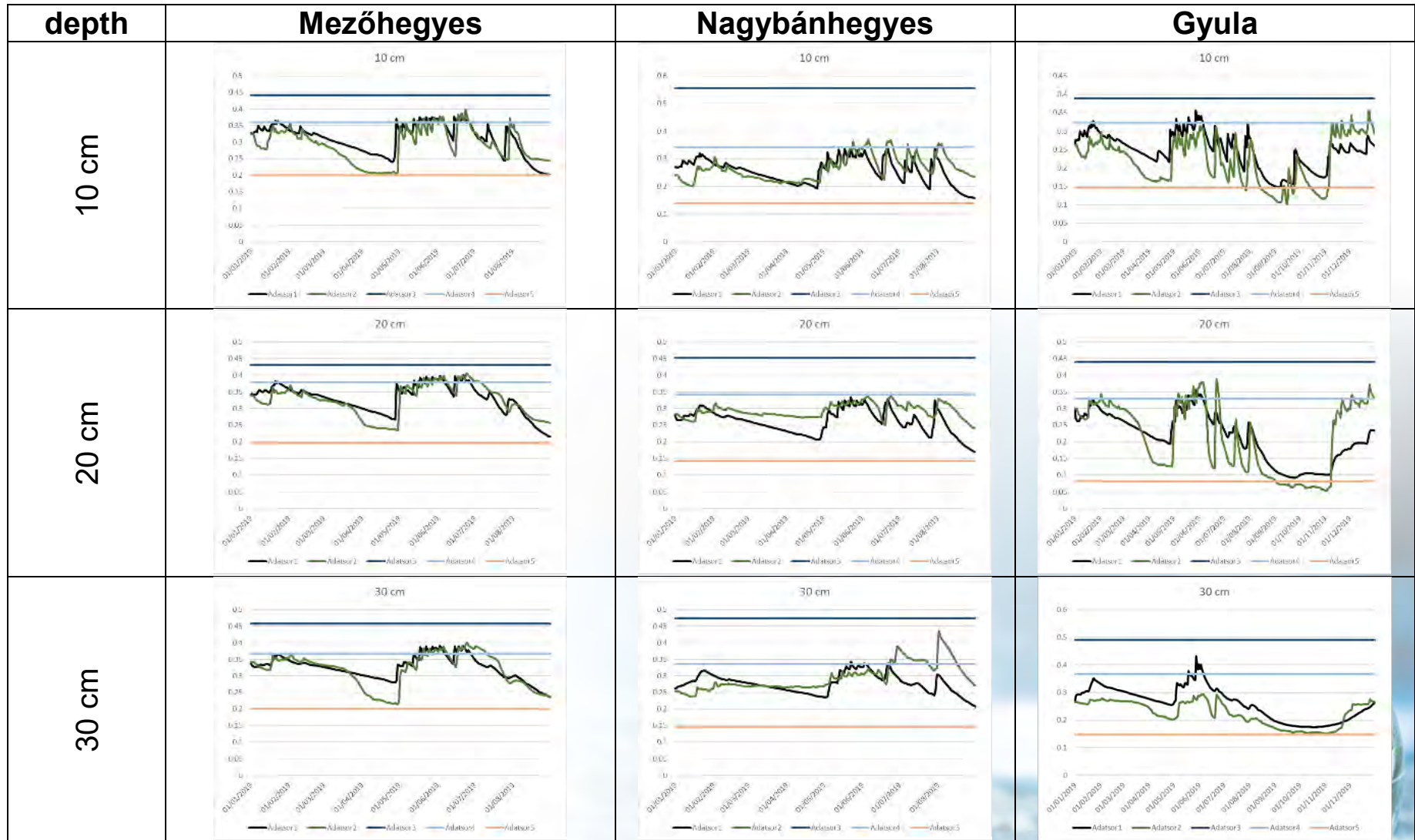
Soil moisture measurements



Soil moisture modeling



Soil moisture modeling – Calibration



- Create the possibility of decision support
- Alarm System (I., II., III. levels)
- Water Control/Water restriction, irrigation support
- Research and Development



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**Thank you for your
attention!**

