CzechGlobe

Central European drought monitoring efforts

On behalf of the whole team
presented
by Miroslav Trnka

OP Výzkum a vývoj pro inovace 2007–13

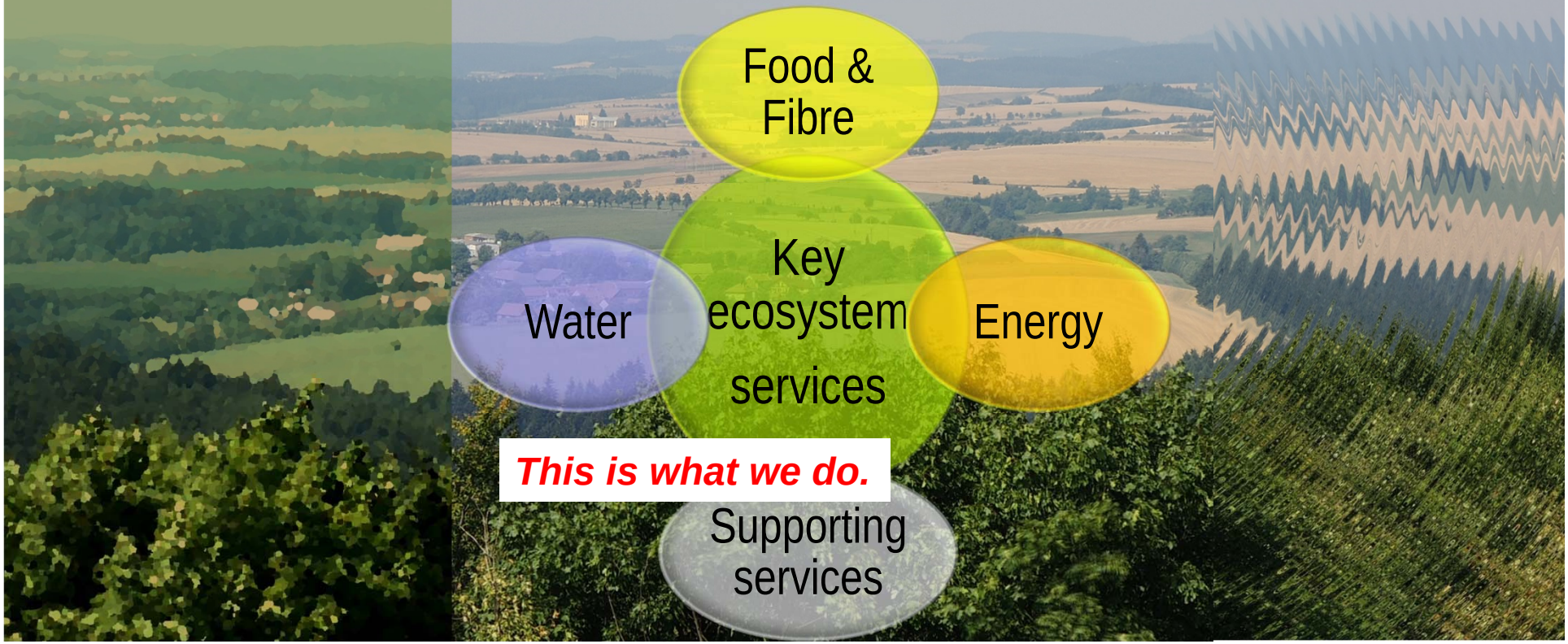
MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY

EVROPSKÁ UNIE
EVROPSKÝ FOND PRO REGIONÁLNÍ ROZVOJ
ŠANCE PRO VÁŠ ROZVOJ

CzechGlobe

Research focus

PAST 500 BC - 2016	PRESENT 2016	FUTURE 2016~ 2100+
UNDERSTANDING PAST CLIMATE	PRESENT STATUS, FORECASTS & WARNING	TRENDS & RISKS
Natural proxies, documents, models, instrumental records,	Field and landscape scale experiments Models Observations & Monitoring&Forecast	Models & experiments Forecasts & projections



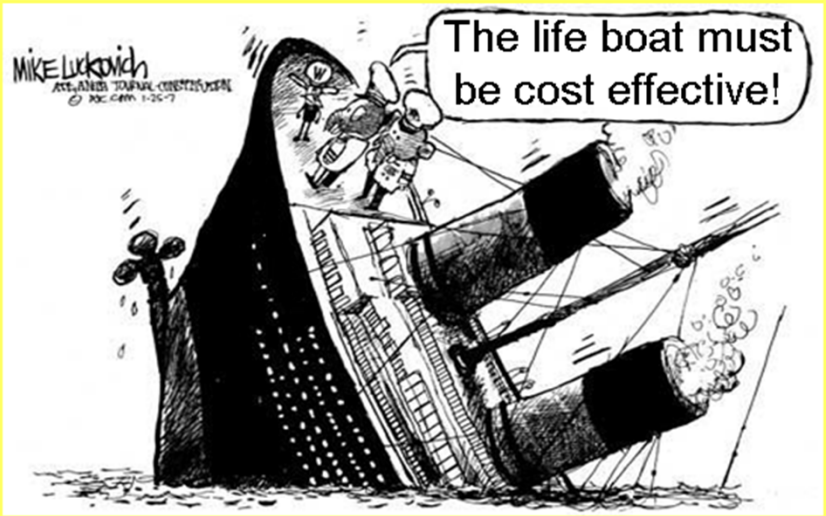
This is what we do.

Same data – different responses

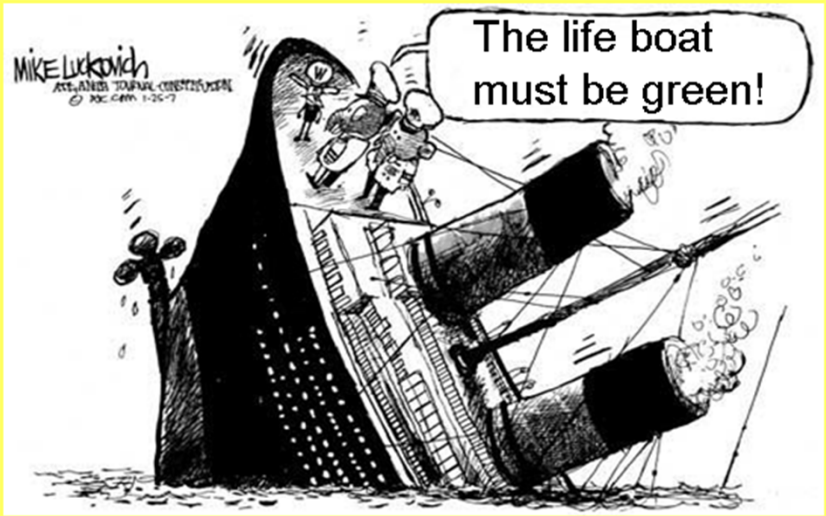
Contrarians

Climate scientists

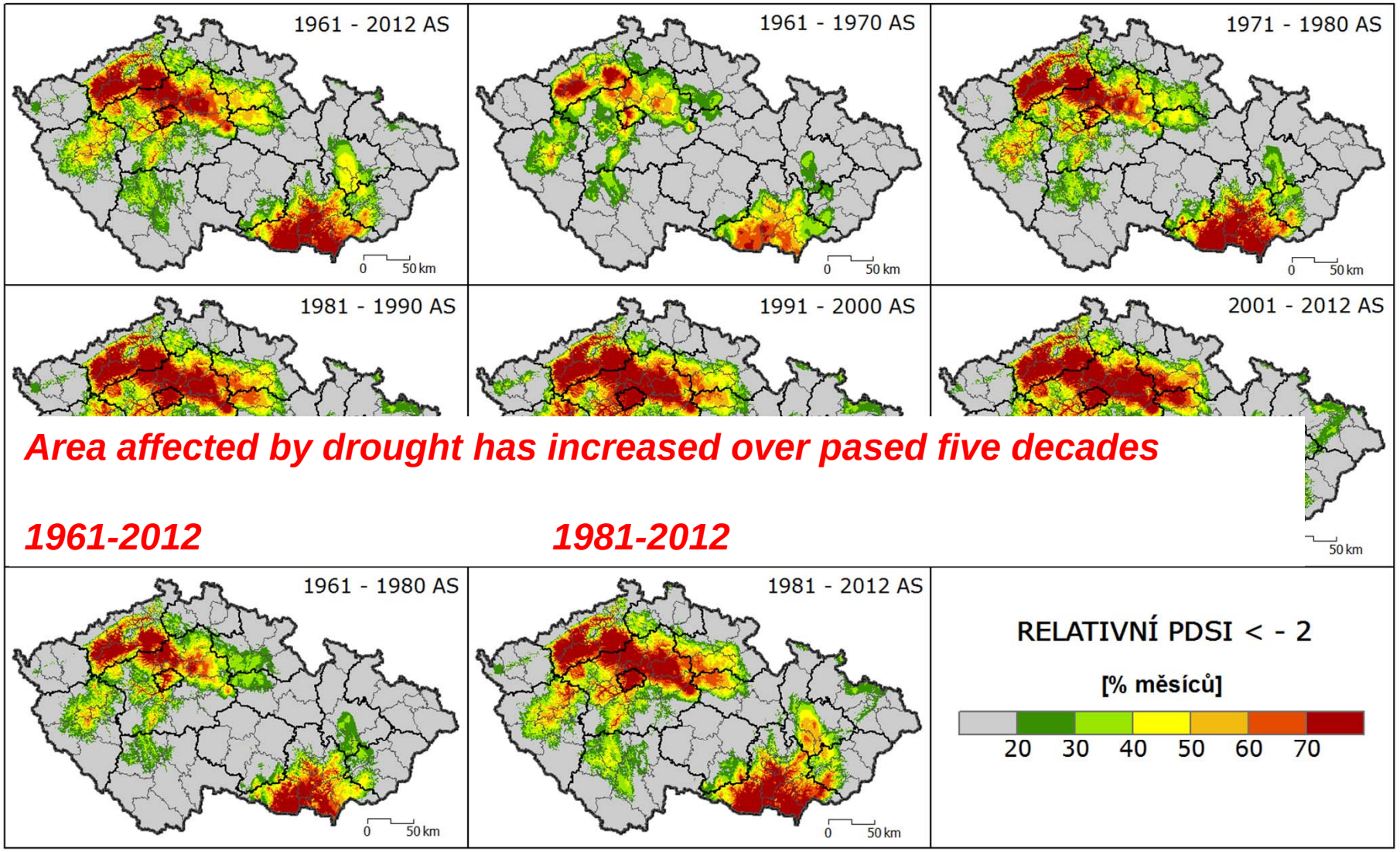
No regret



Environmentalists



How serious are problems in Czechia?



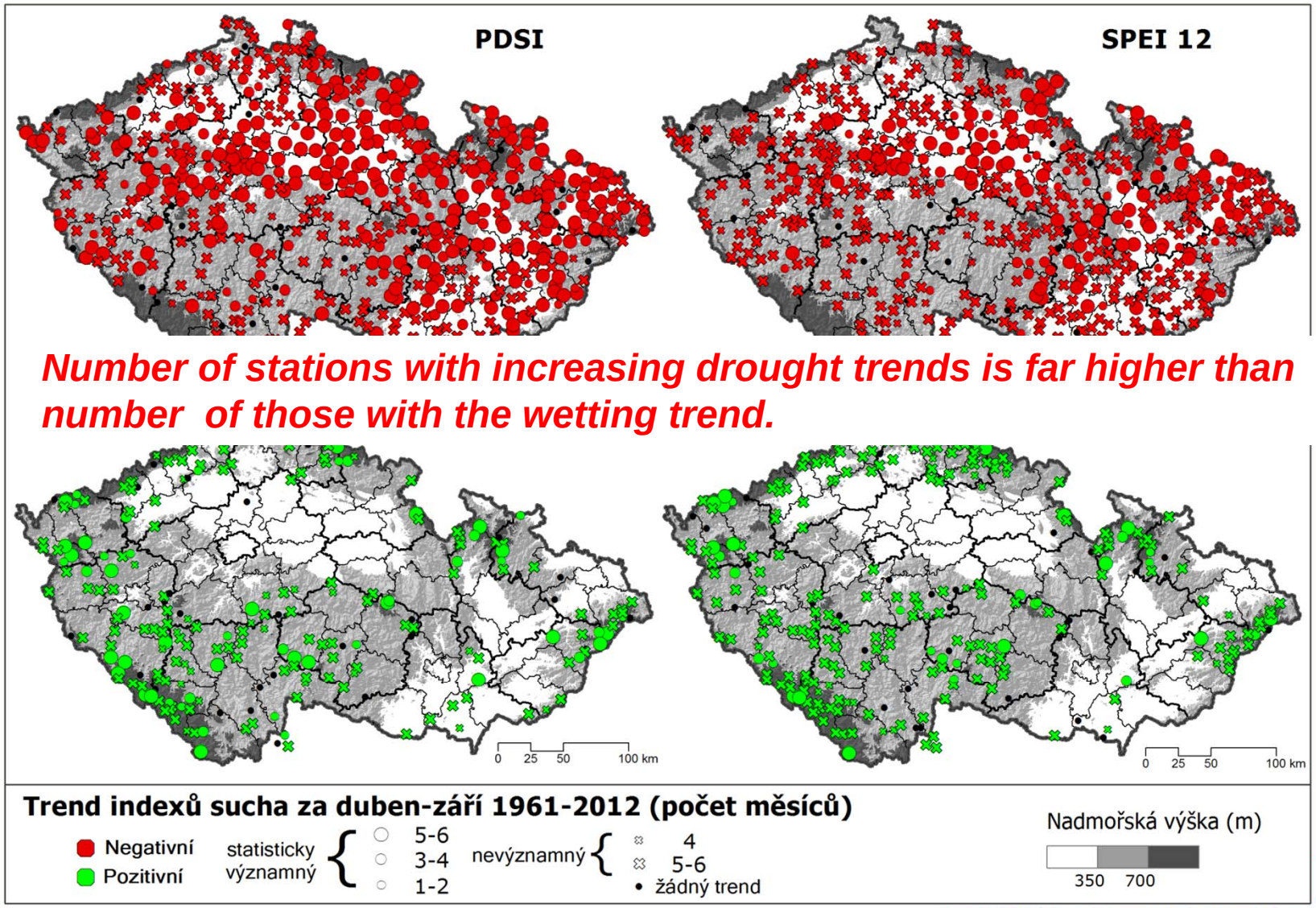
Education, awarness, dissemination

Droughts in the past

Real time drought monitoring

Brázdil a Trnka *et al.*, 2015, Drought in the Czechlands

How serious are problems in Czechia?



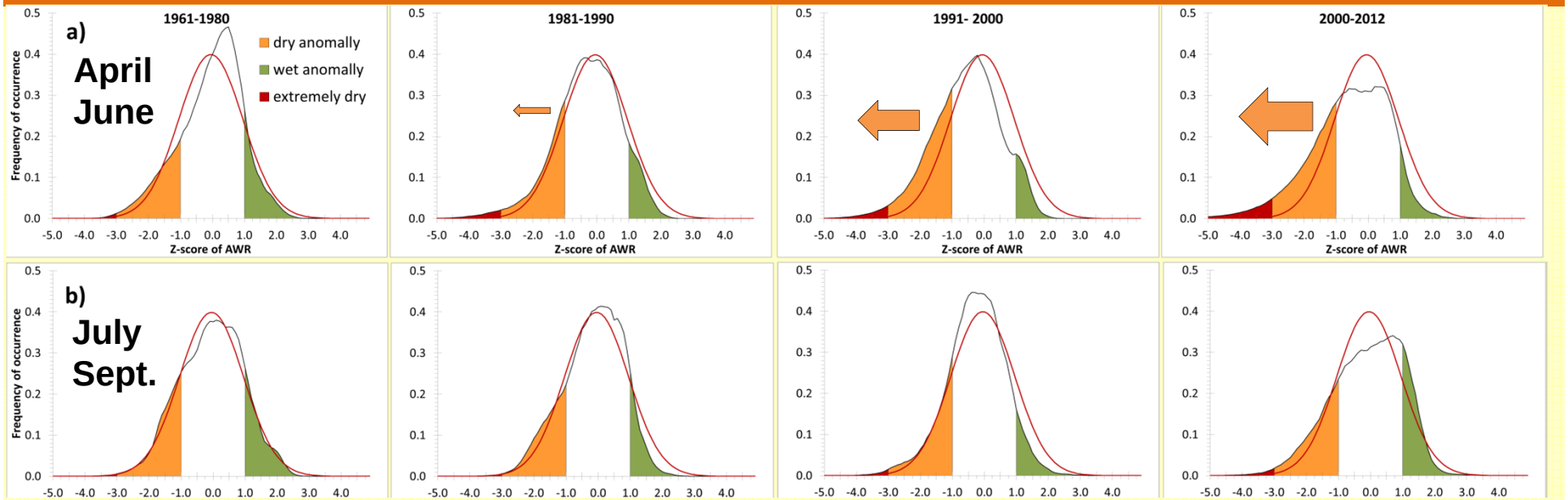
Number of stations with increasing drought trends is far higher than number of those with the wetting trend.

Education, awarness, dissemination

Droughts in the past

Real time drought monitoring

Drought trends - Are climate dice loaded??



During April-June period drought has become more frequent – CLIMATE DICES ARE LOADED TOWARD DROUGHT EVENTS!

Education, awarness, dissemination

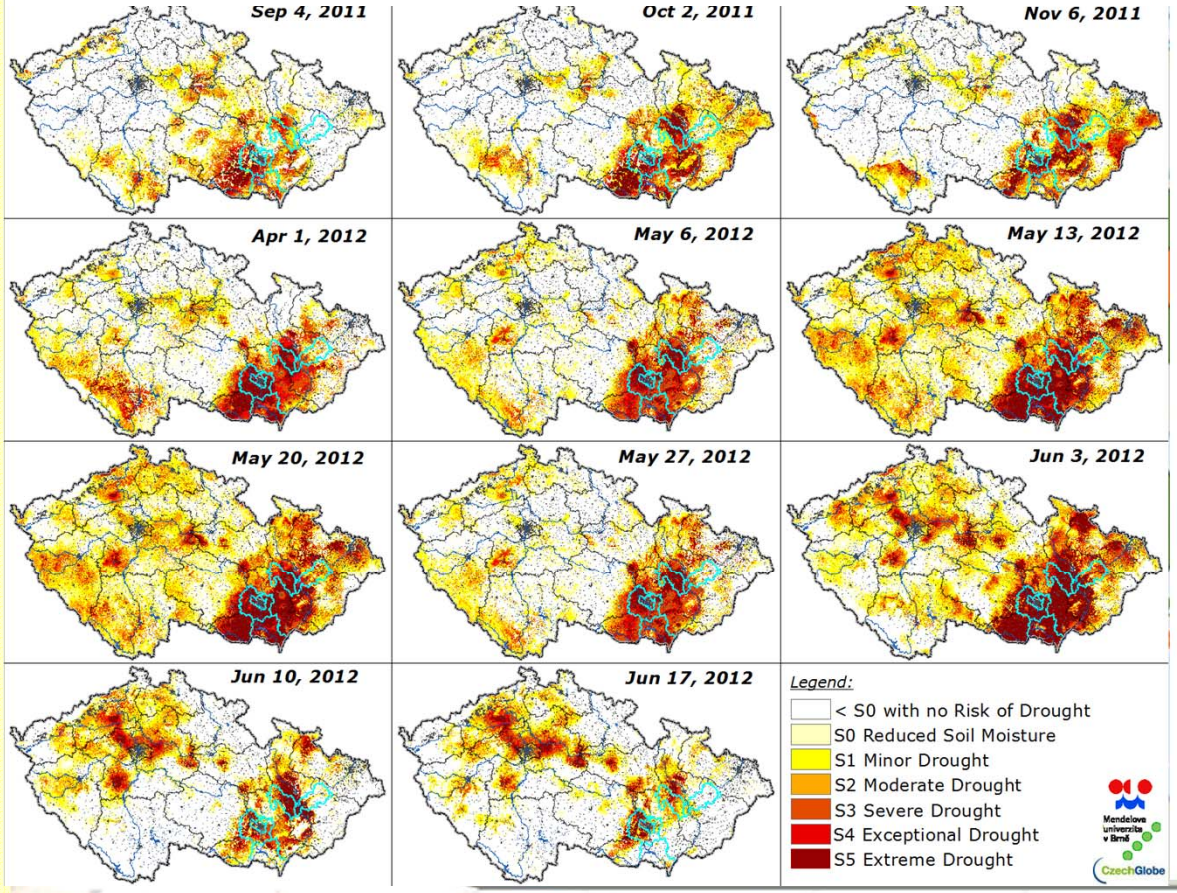
Droughts in the past

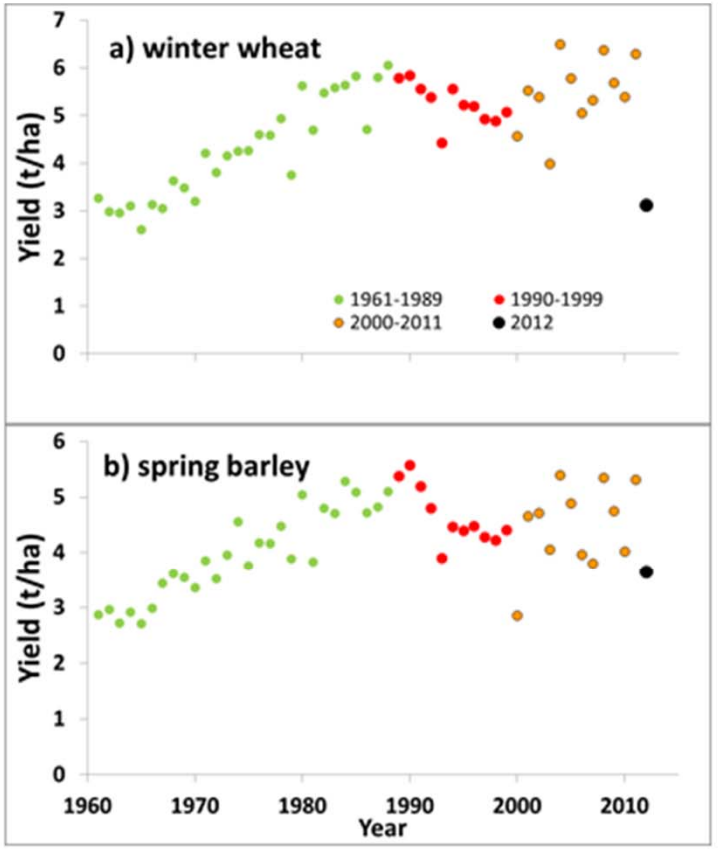
Real time drought monitoring

Trnka *et al.*, 2014, International Journal of Climatology, accepted

Why to bother?

We depend on few producing regions for crops like Wheat…and most of them will likely be drier…..

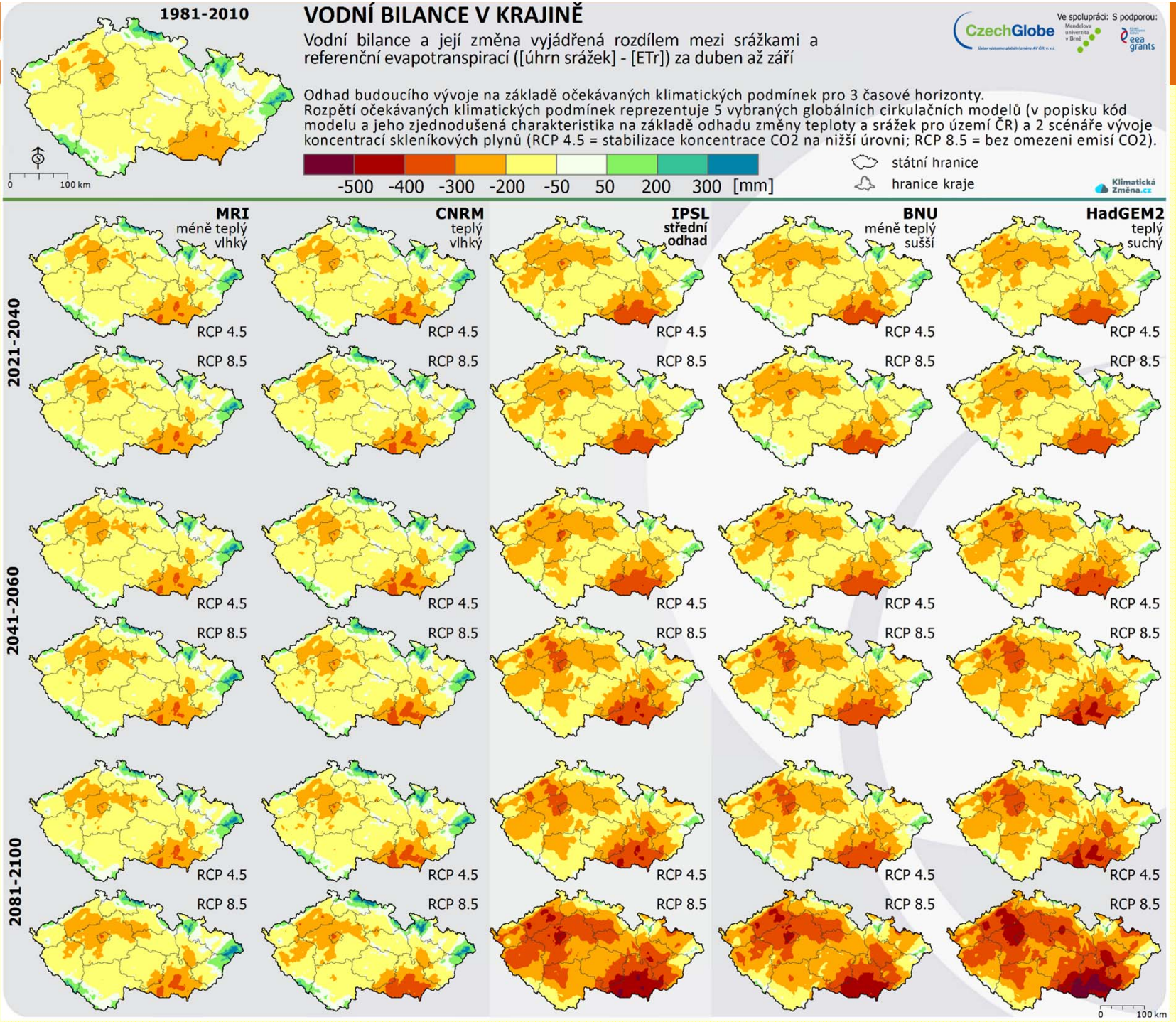




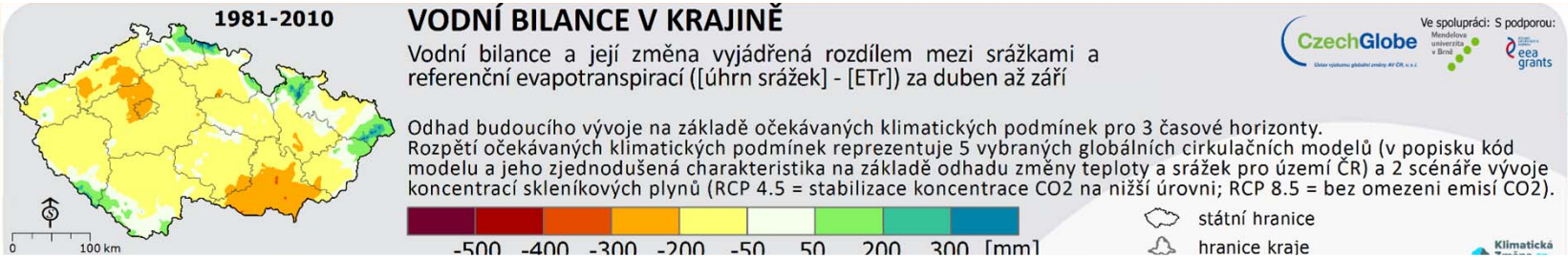
Czech Republic is significant wheat exporter – relatively short drought in 2012 cut yields in some eastern districts by 30 to 60%.

FAO, 2009

Dro

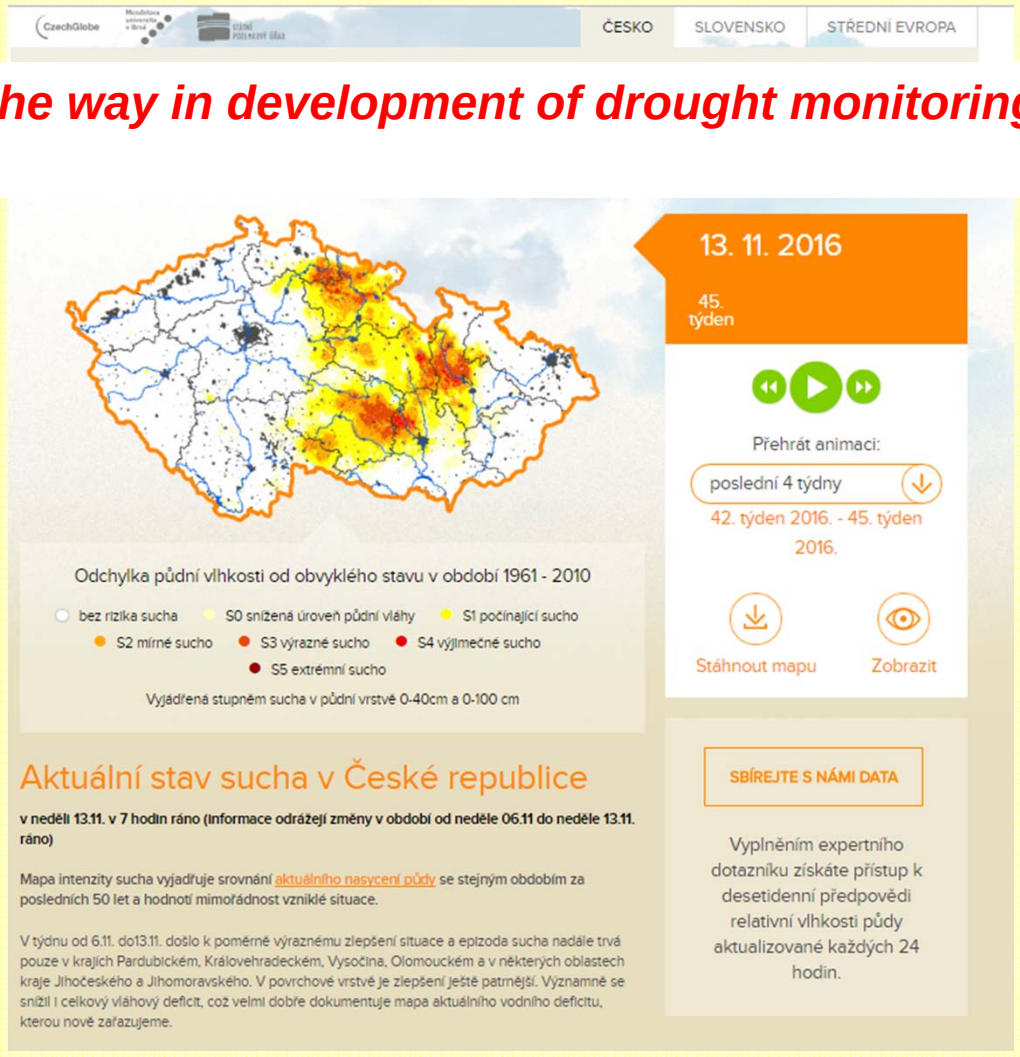

1981-2010
0
100 km
VODNÍ BILANCE V KRAJINĚ
Vodní bilance a její změna vyjádřená rozdílem mezi srážkami a referenční evapotranspirací ([úhrn srážek] - [ETr]) za duben až září
Ve spolupráci: S podporou:
CzechGlobe
eea grants
Odhad budoucího vývoje na základě očekávaných klimatických podmínek pro 3 časové horizonty.
Rozpětí očekávaných klimatických podmínek reprezentuje 5 vybraných globálních cirkulačních modelů (v popisku kód modelu a jeho zjednodušená charakteristika na základě odhadu změny teploty a srážek pro území ČR) a 2 scénáře vývoje koncentrací skleníkových plynů (RCP 4.5 = stabilizace koncentrace CO2 na nižší úrovni; RCP 8.5 = bez omezeni emisí CO2).
-500 -400 -300 -200 -50 50 200 300 [mm]
státní hranice
hranice kraje
Klimatická Změna.cz
MRI
méně teplý
vlhký
CNRM
teplý
vlhký
IPSL
střední
odhad
BNU
méně teplý
sušší
HadGEM2
teplý
suchý
2021-2040
2041-2060
2081-2100
RCP 4.5
RCP 8.5
0
100 km

Dro



Despite uncertainty in climate models Czech water balance is likely to shift in coming decades (no matter how successful we will be with Paris agreement implementation).

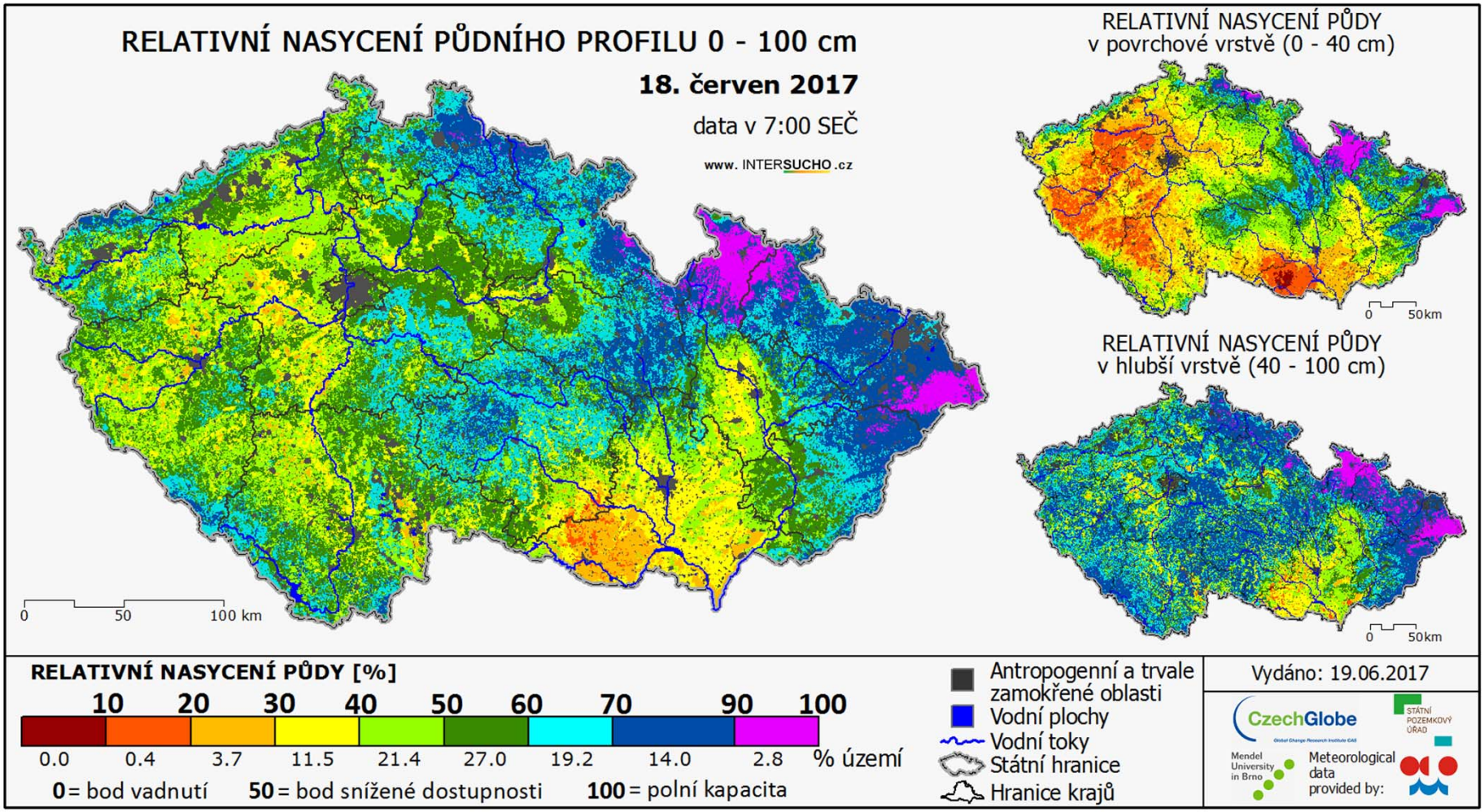
What to do? MONITOR and ACT!



CzechGlobe lead the way in development of drought monitoring and forecasting tool.

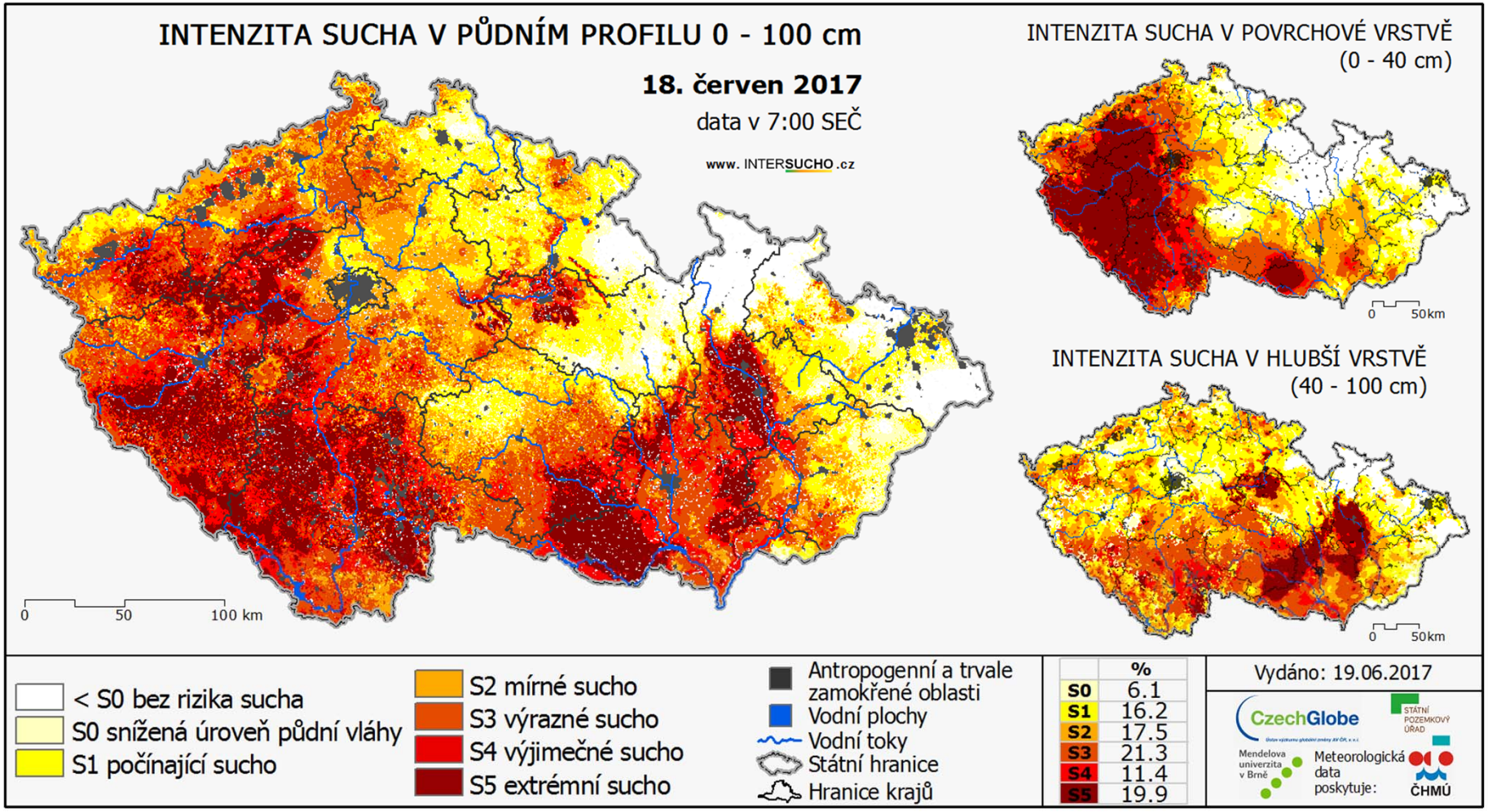
www.intersucho.cz

Pilar I: Soil moisture content



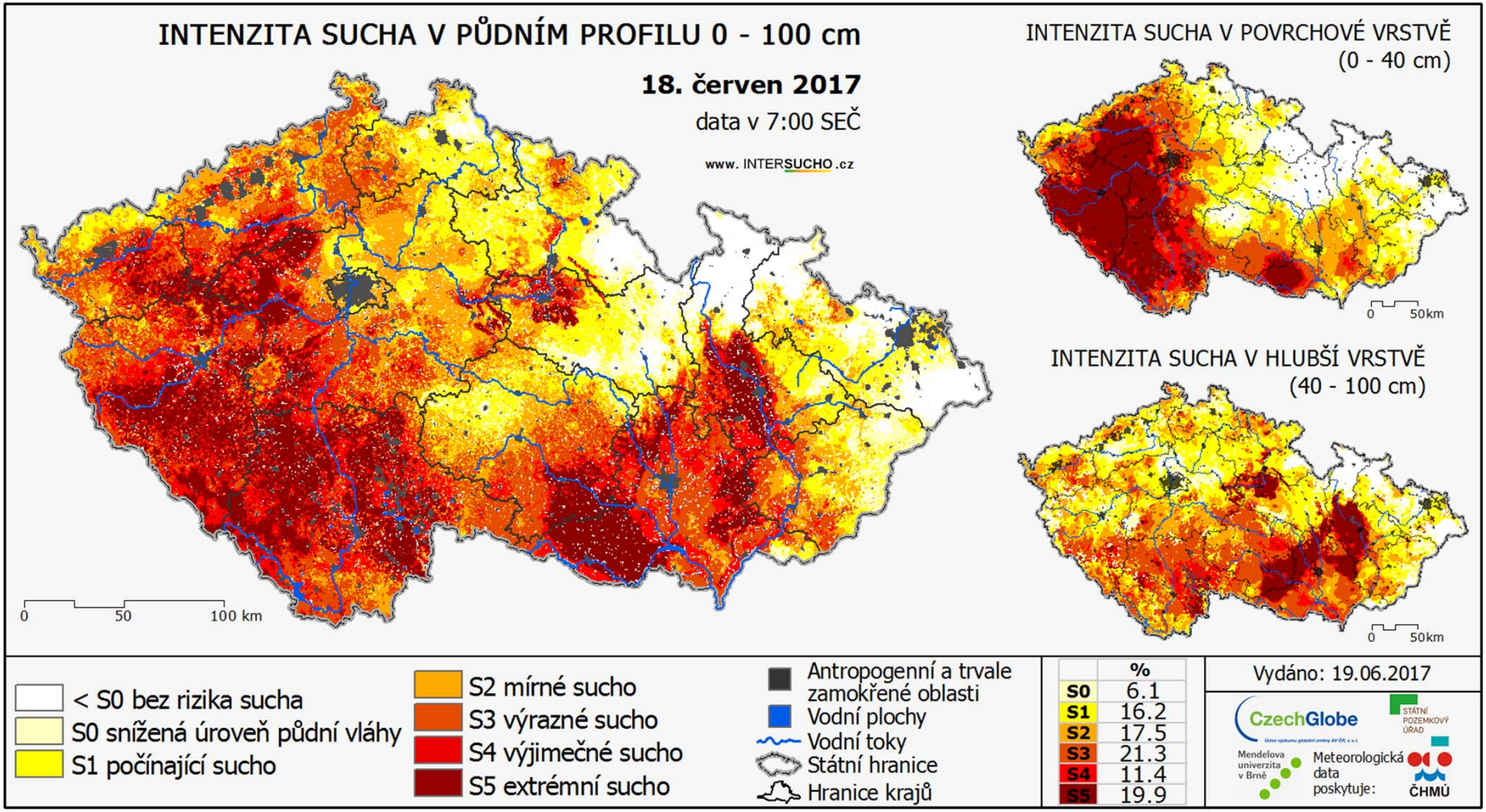
It uses daily soil water balance model in 500m resolution with real soil and terrain, dynamic canopy and high number of weather stations to do the trick! Every week and every day….for free.

Pilar I: Soil moisture content deficit



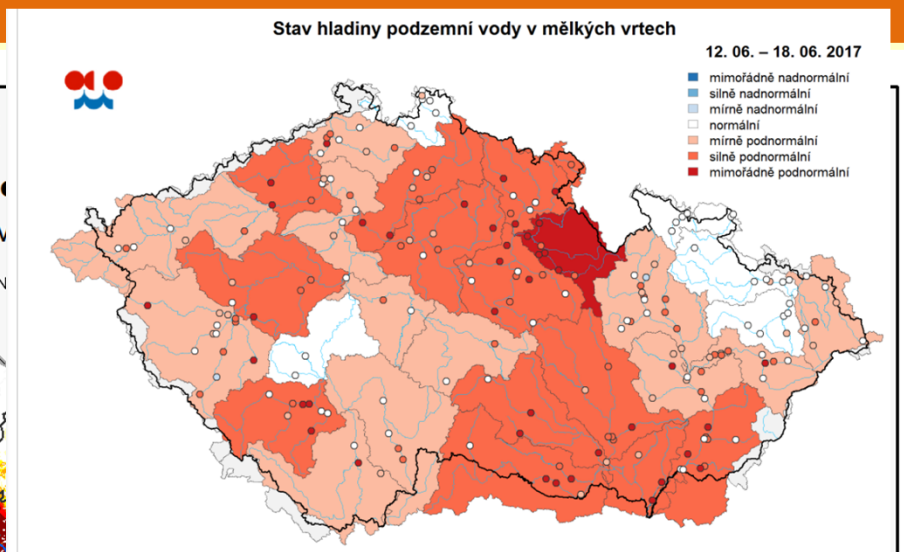
It uses daily soil water balance model in 500m resolution with real soil and terrain, dynamic canopy and high number of weather stations to do the trick! Every week and every day….for free.

Pilar II: Soil moisture content based drought intensity

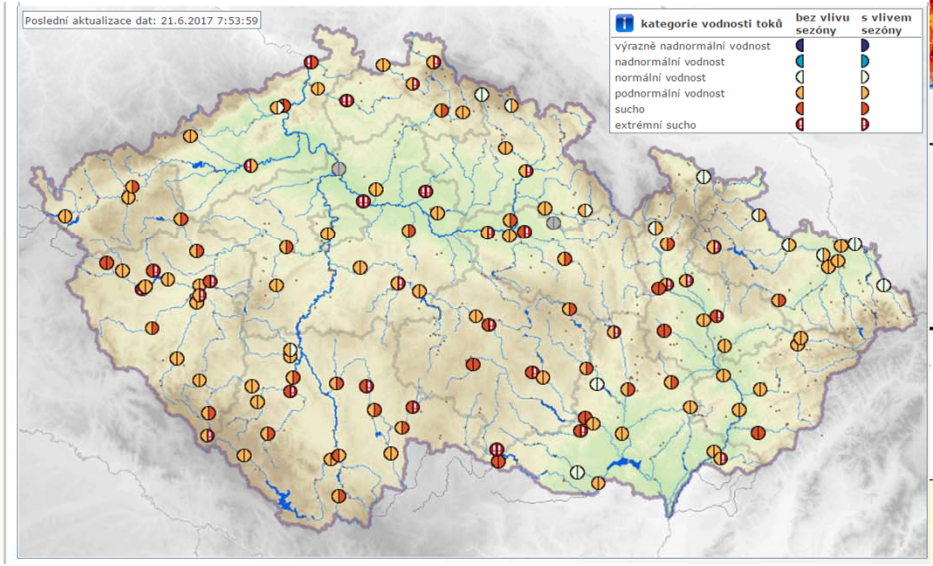


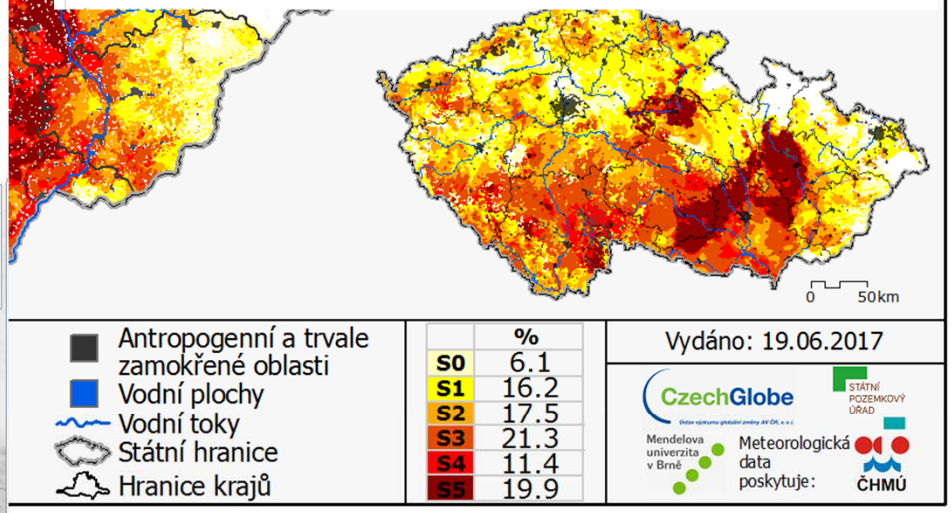
Actual soil moisture is then compared to 1961-2010 soil moisture content database and anomaly is determined…and mapped as drought intensity.

Pilar II: Soil moisture content based drought intensity



1 - velmi vysoká - *very high* (> 90 % AWC)
2 - vysoká - *high* (70-90 % AWC)
3 - dobrá - *good* (50-70 % AWC)
4 - slabá - *weak* (30-50 % AWC)
5 - nízká - *low* (10-30 % AWC)
6 - velmi nízká - *very low* (0-10 % AWC)





to 1961-2010 soil moisture content and mapped as drought intensity.

Pilar II: Drought intensity in high resolution

Stav v nedeli 18.06.2017, 7:00 OKRES ZNOJMO

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RELATIVNÍ NASYCENÍ PŮDY

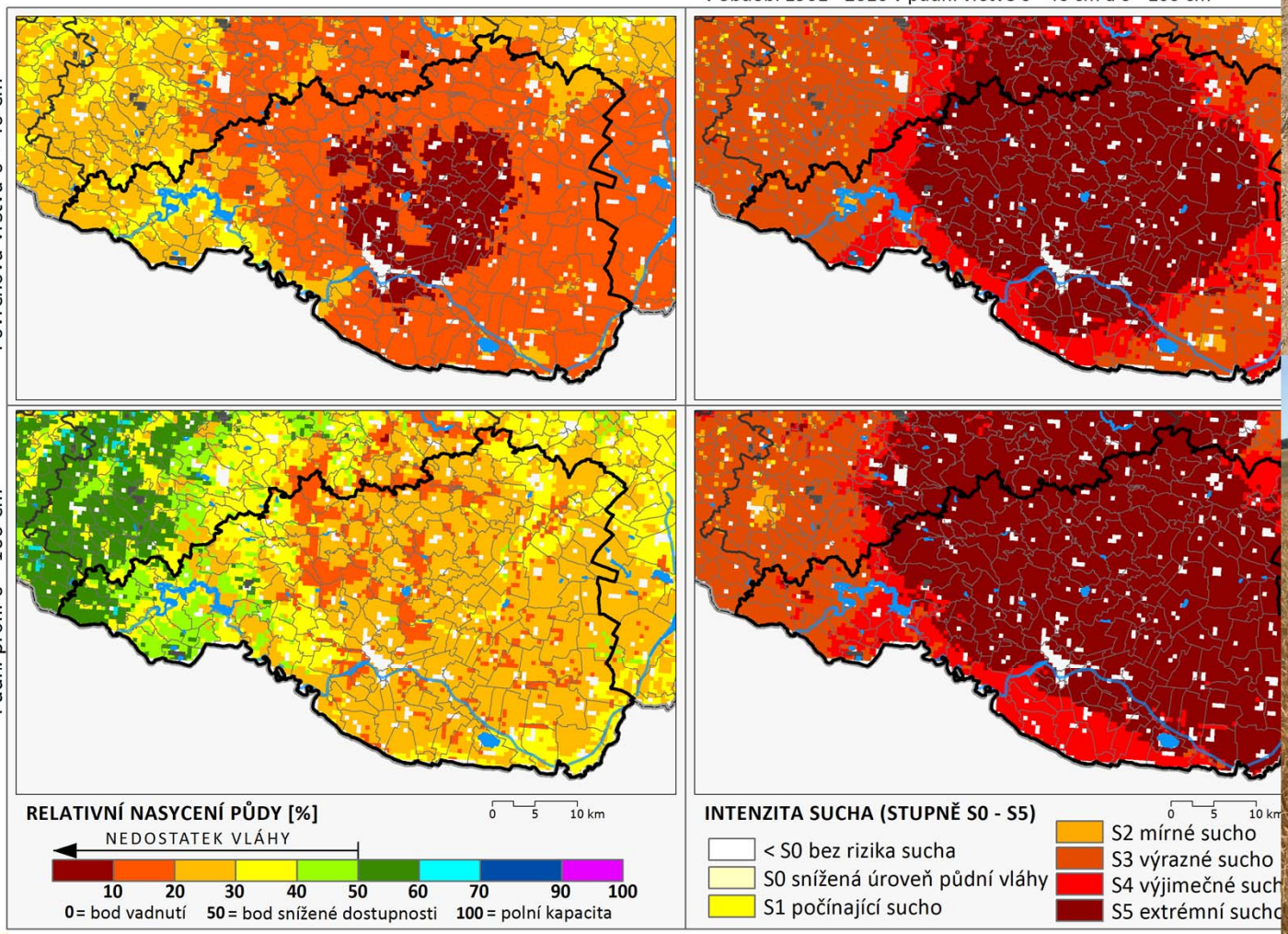
Na kolik procent je nasycena půdní vrstva 0 - 40 cm a 0 - 100 cm

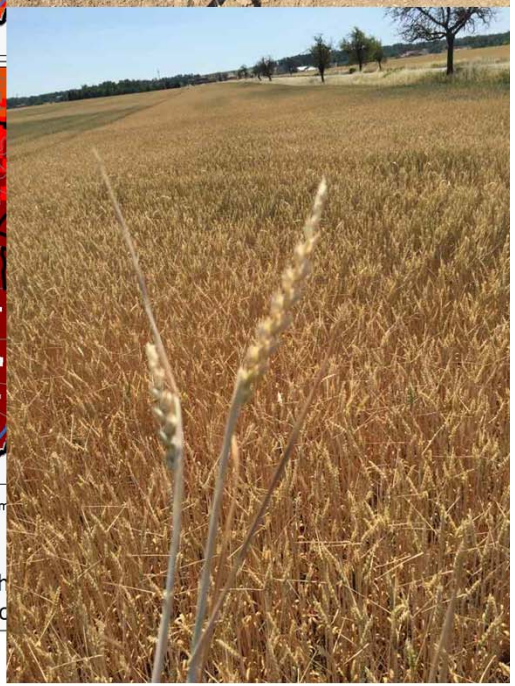
INTENZITA SUCHA

Odchylka půdní vlhkosti (vyjádřená stupněm sucha) od obvyklého v období 1961 - 2010 v půdní vrstvě 0 - 40 cm a 0 - 100 cm

Povrchová vrstva 0 - 40 cm

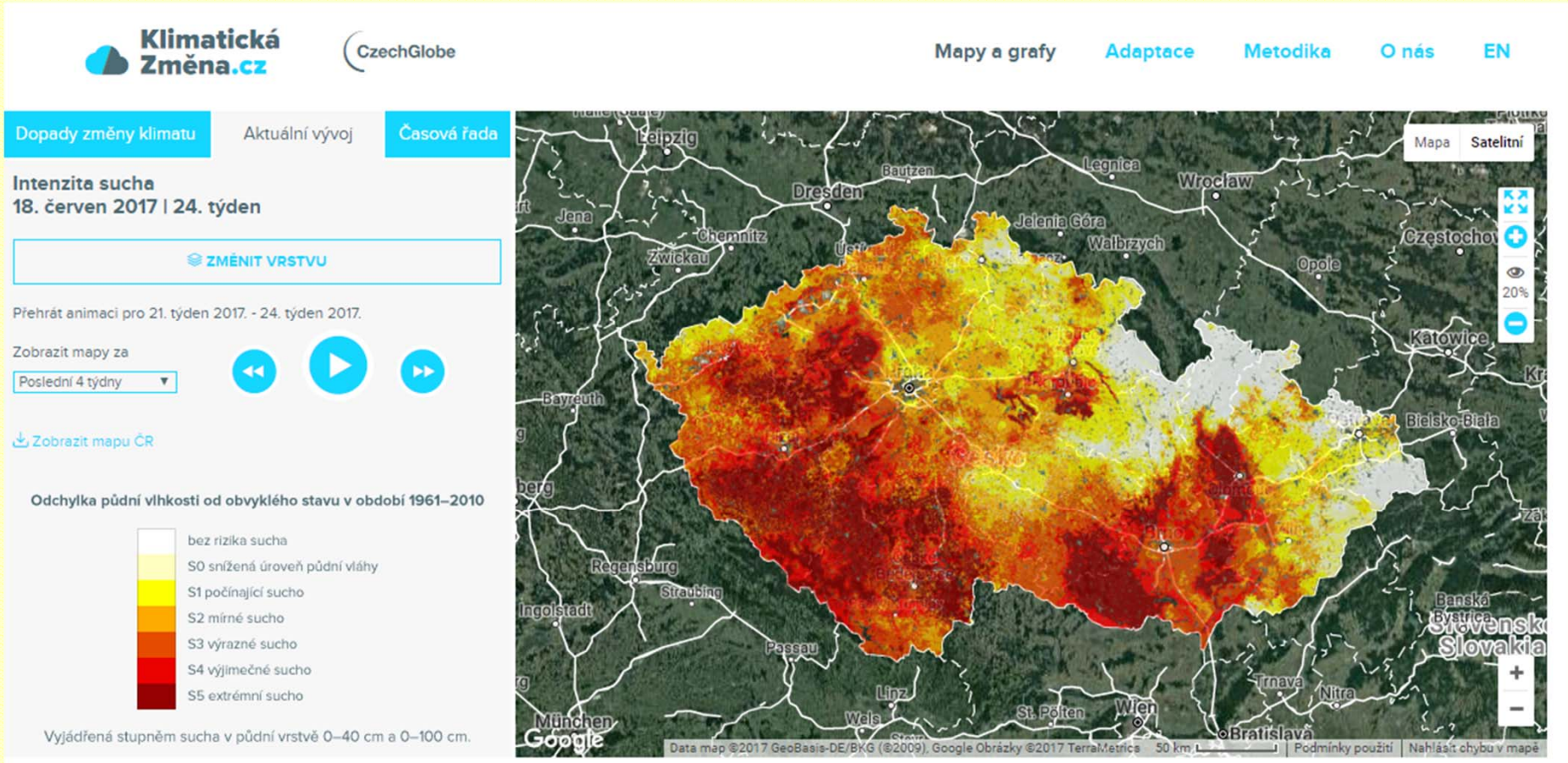
Půdní profil 0 - 100 cm





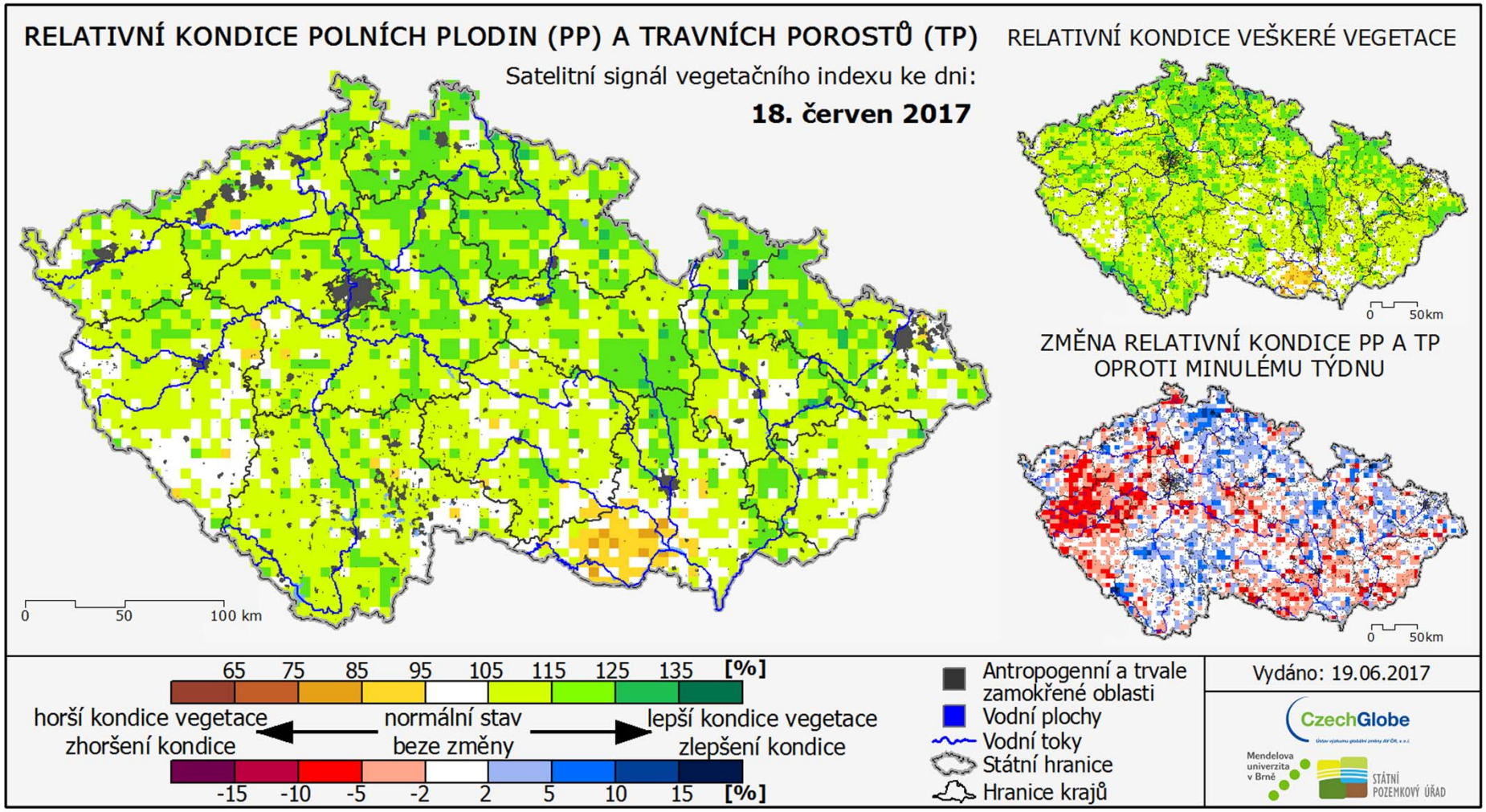
This allows farmers to find their territory in a quick way….

Pilar II: Drought intensity in high resolution



Or google maps could be used as well on the different portal….
CONNECTING WEATHER & CLIMATE WEBSITES

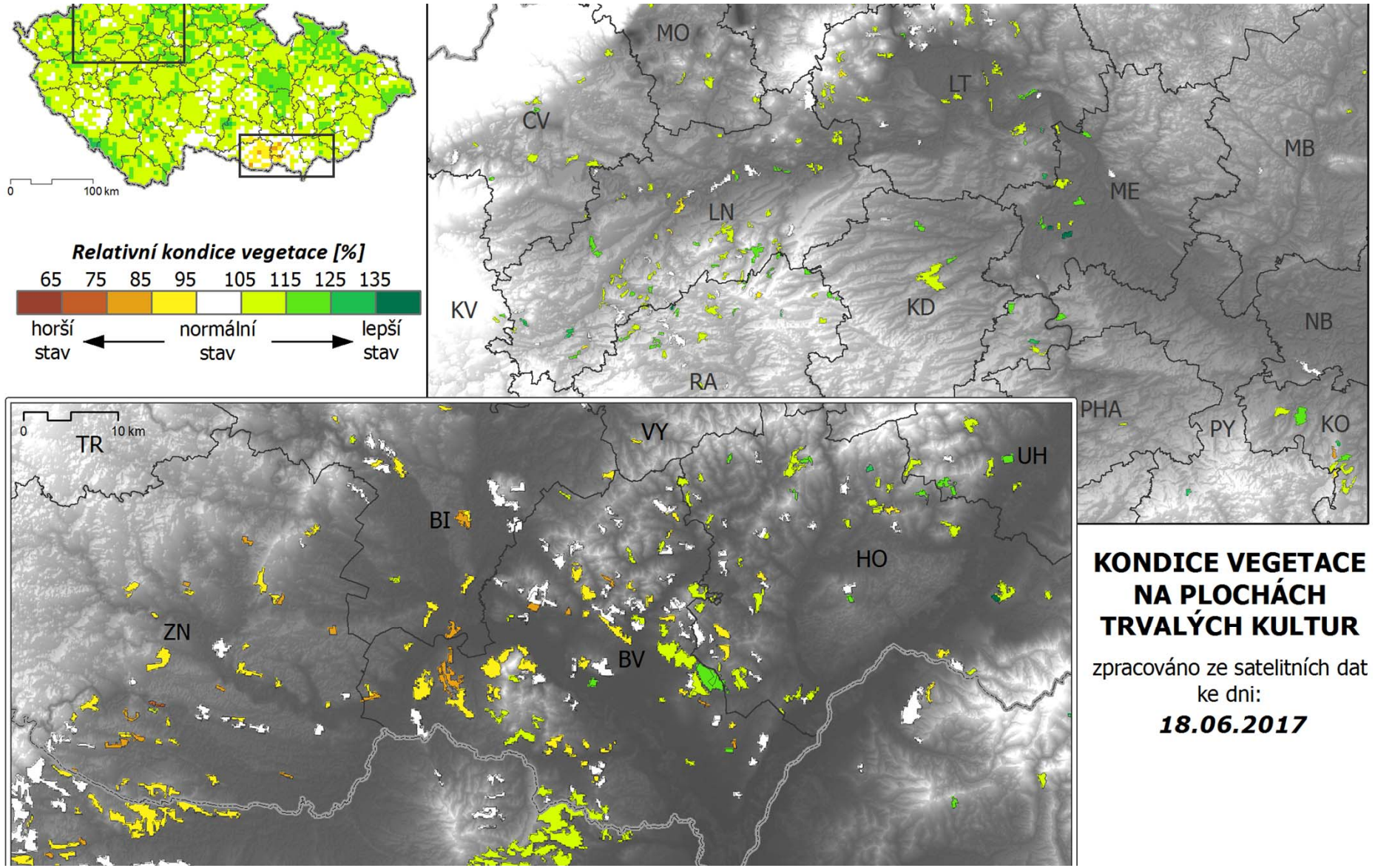
Pilar III: Near real time vegetation status monitoring



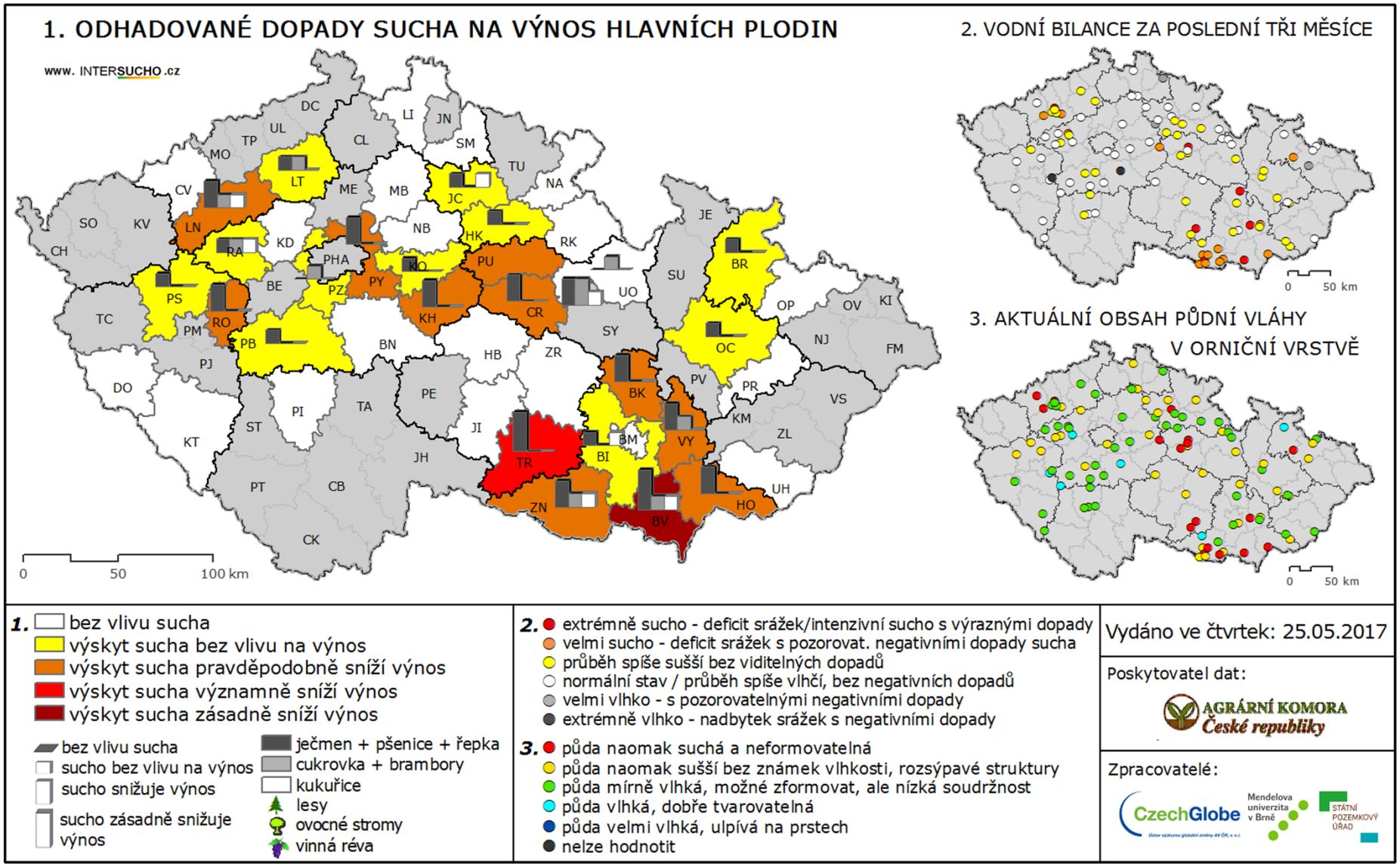
Soil moisture modelling is coupled with EVI index from Terra satelite indicating Status of vegetation on agricultural land and over the country in 5 km resolution to supress noise.

Pilar III: Near real time vegetation status monitoring

And in 250 m resolution for orchards and vineyards….for farmers and decision makers to see how the sector is doing.

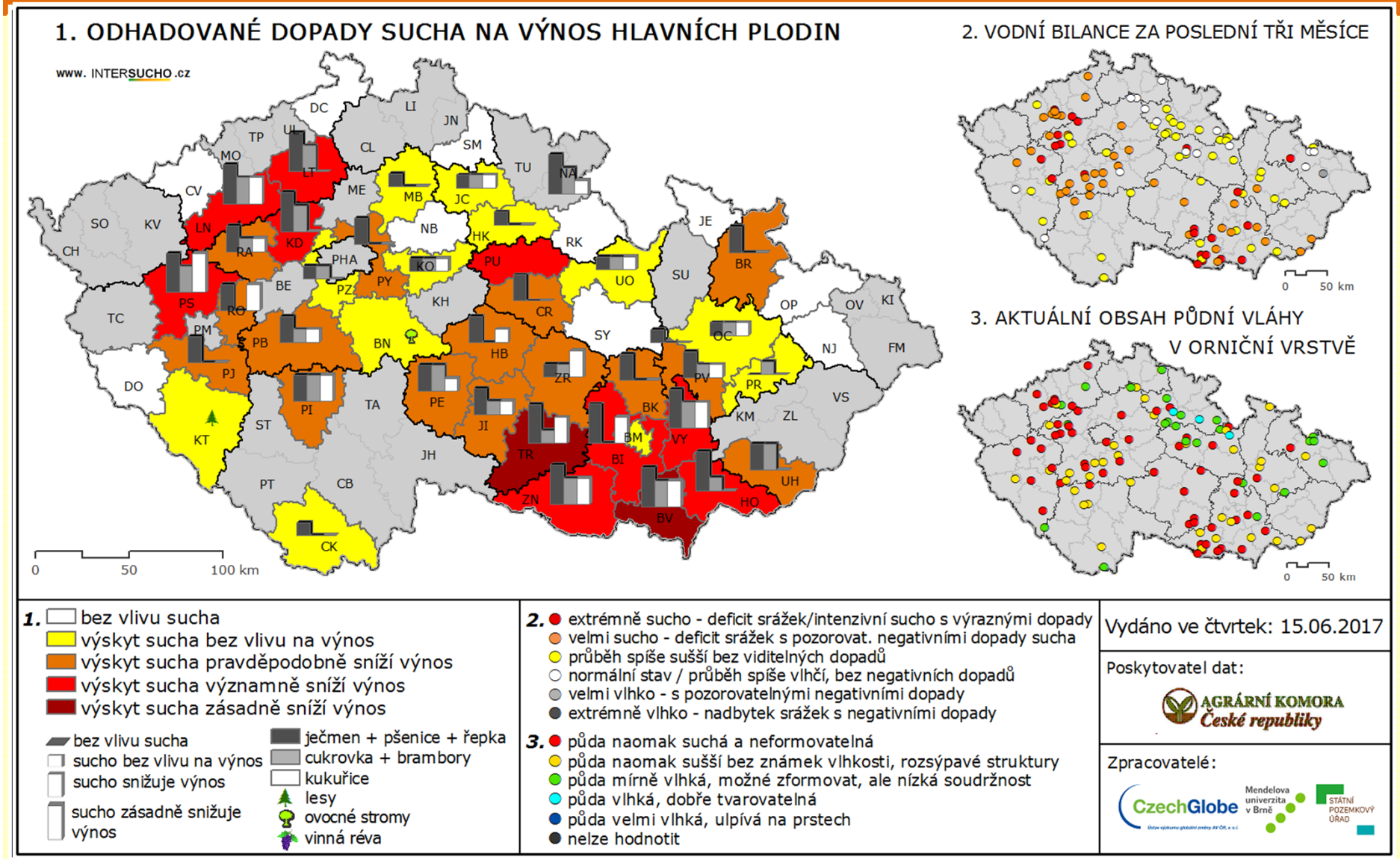


Pilar IV: Reported drought impacts



Every week over 110-130+ farmers are reporting back the moisture and crop status – aim is to have network of 300+ educated farmers and colleagues.

Pilar IV: Reported drought impacts



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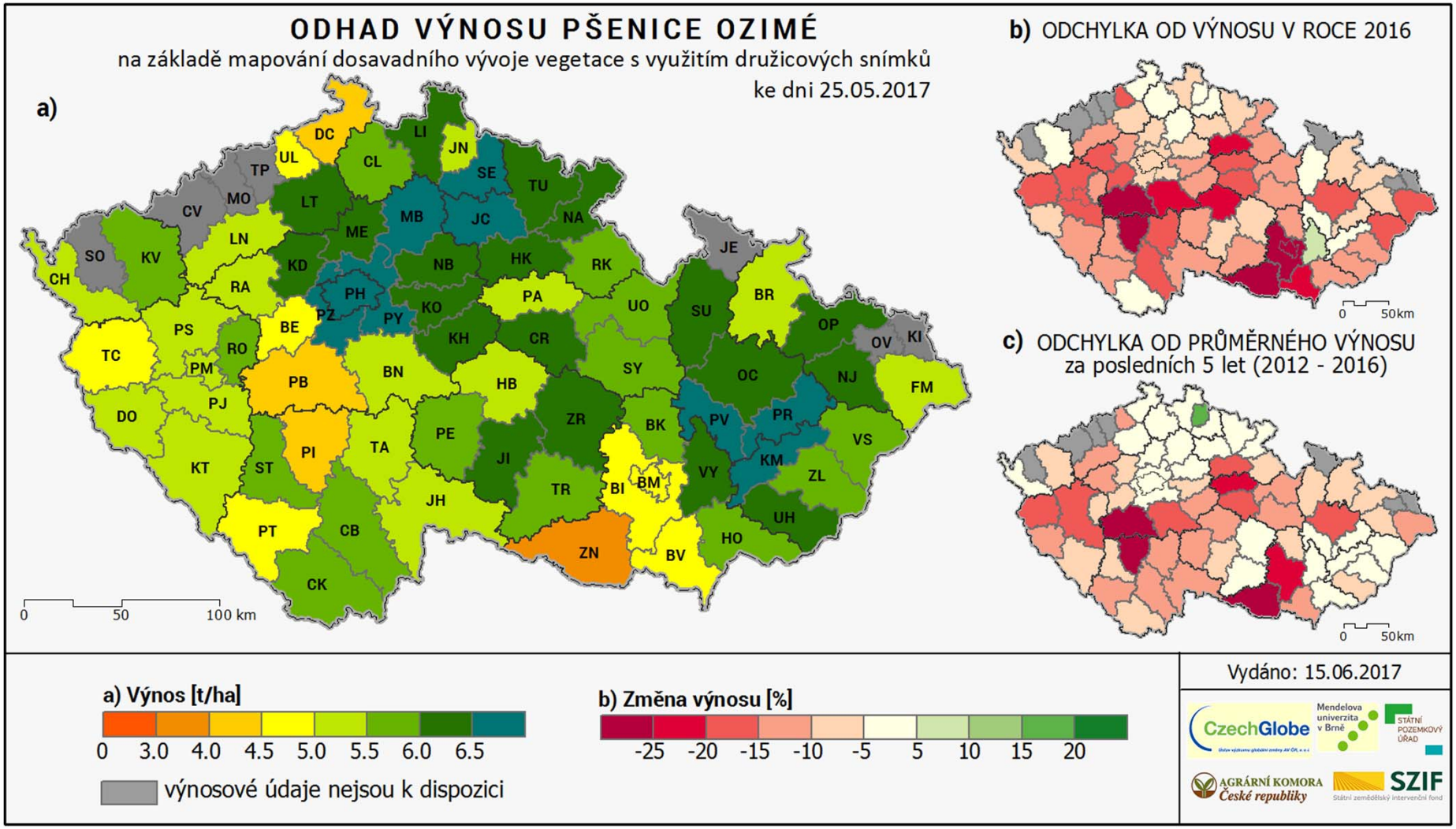
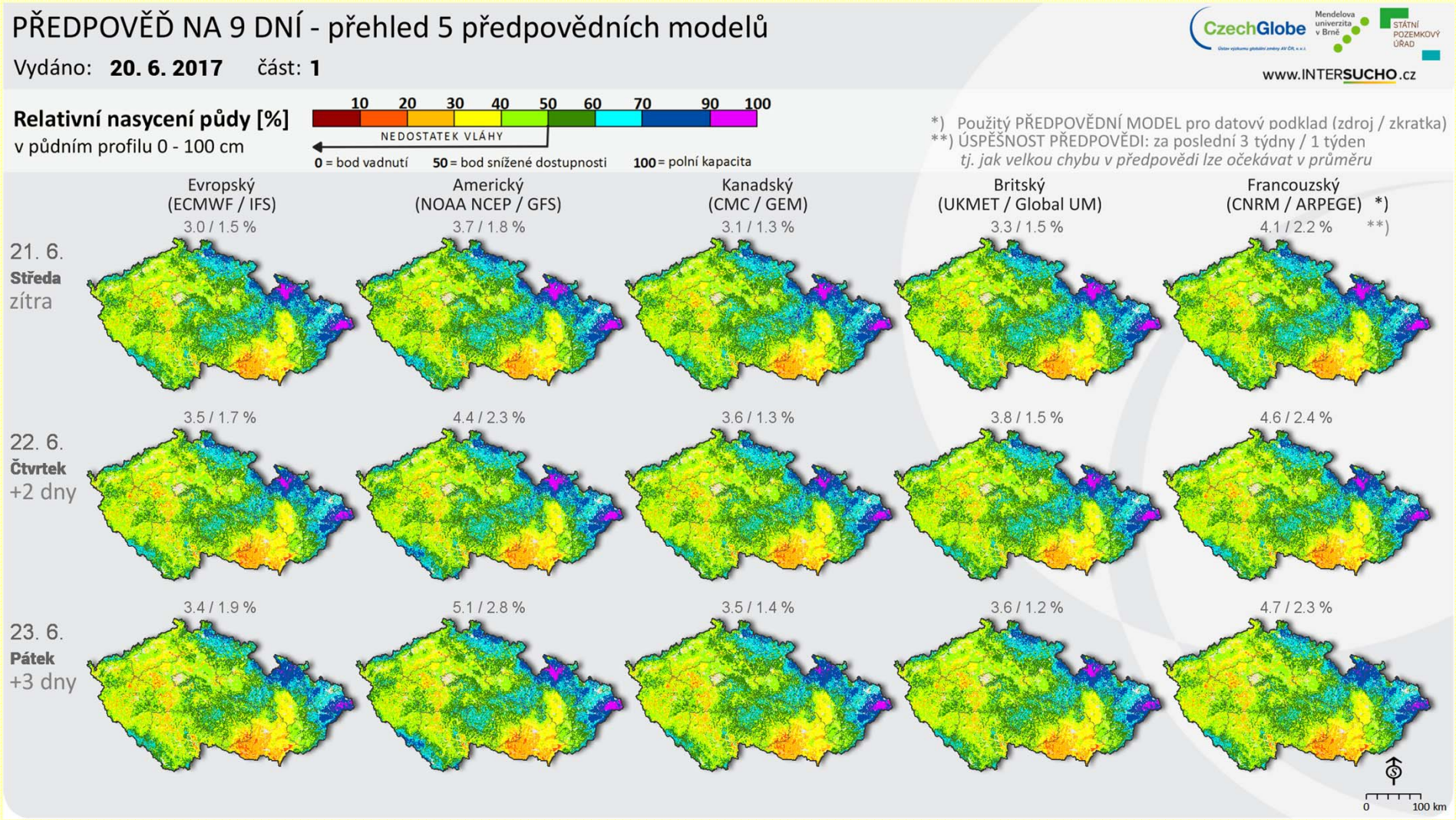
Pilar IV: Estimated Yield Impacts



Yield impact estimates for wheat, barely and oil-seed rape based on ensemble of statistical models.

Pilar V – drought forecast

To increase usefulness the forecast of soil moisture is issued daily….5 forecast models (IFS, GFS, GEM, GLOBAL UM, ALADIN) RUN AS ENSEMBLE



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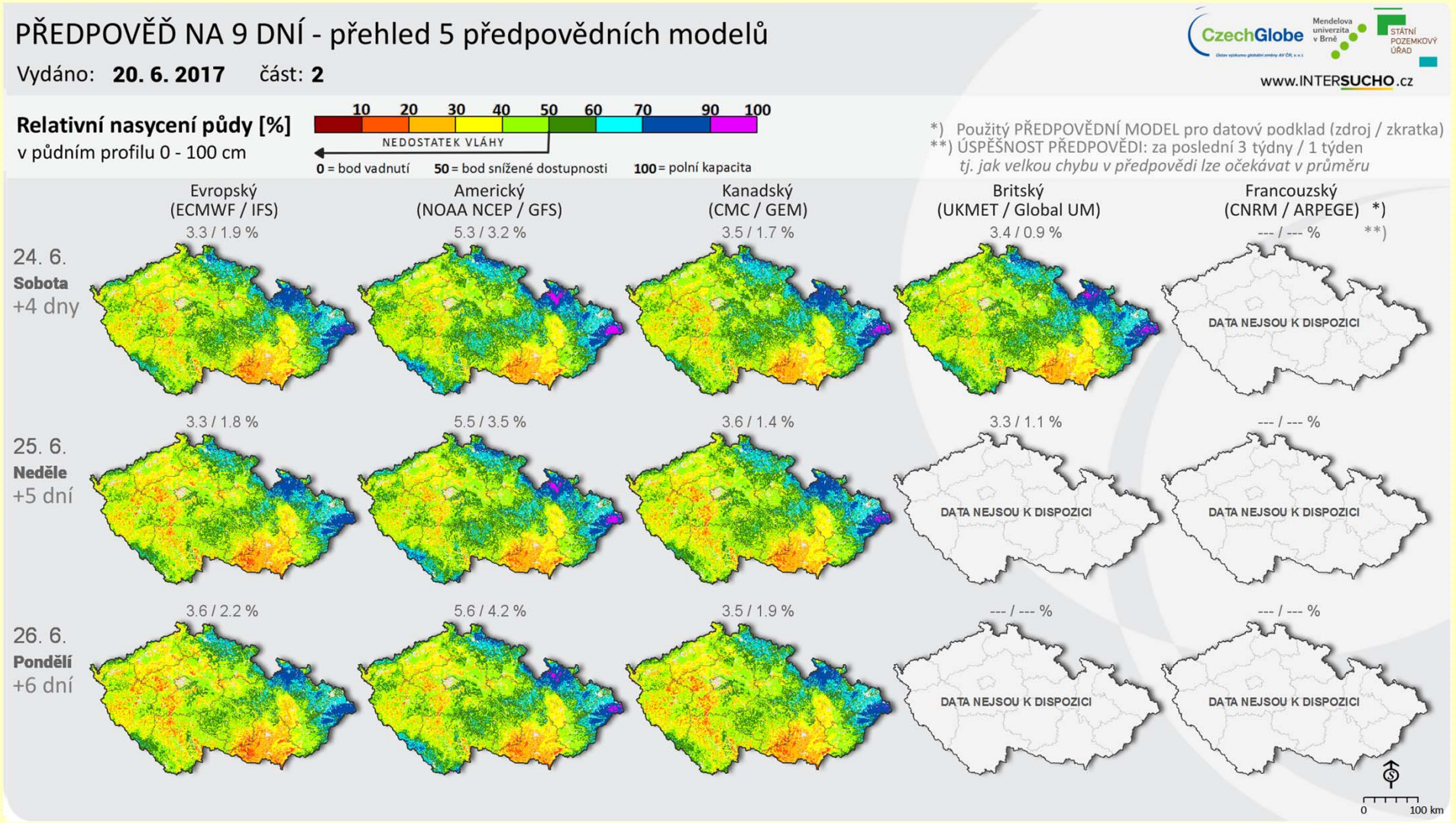

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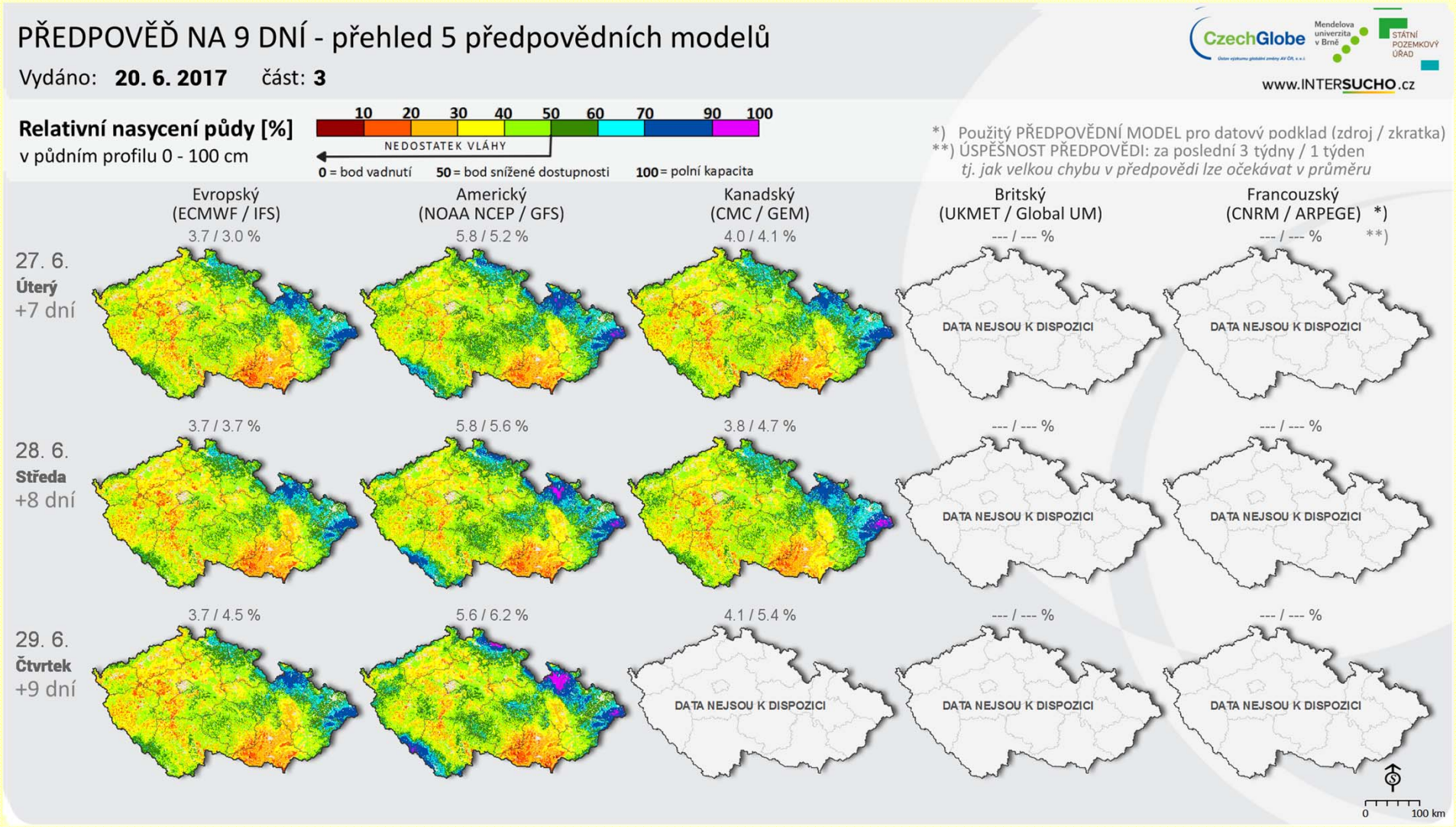

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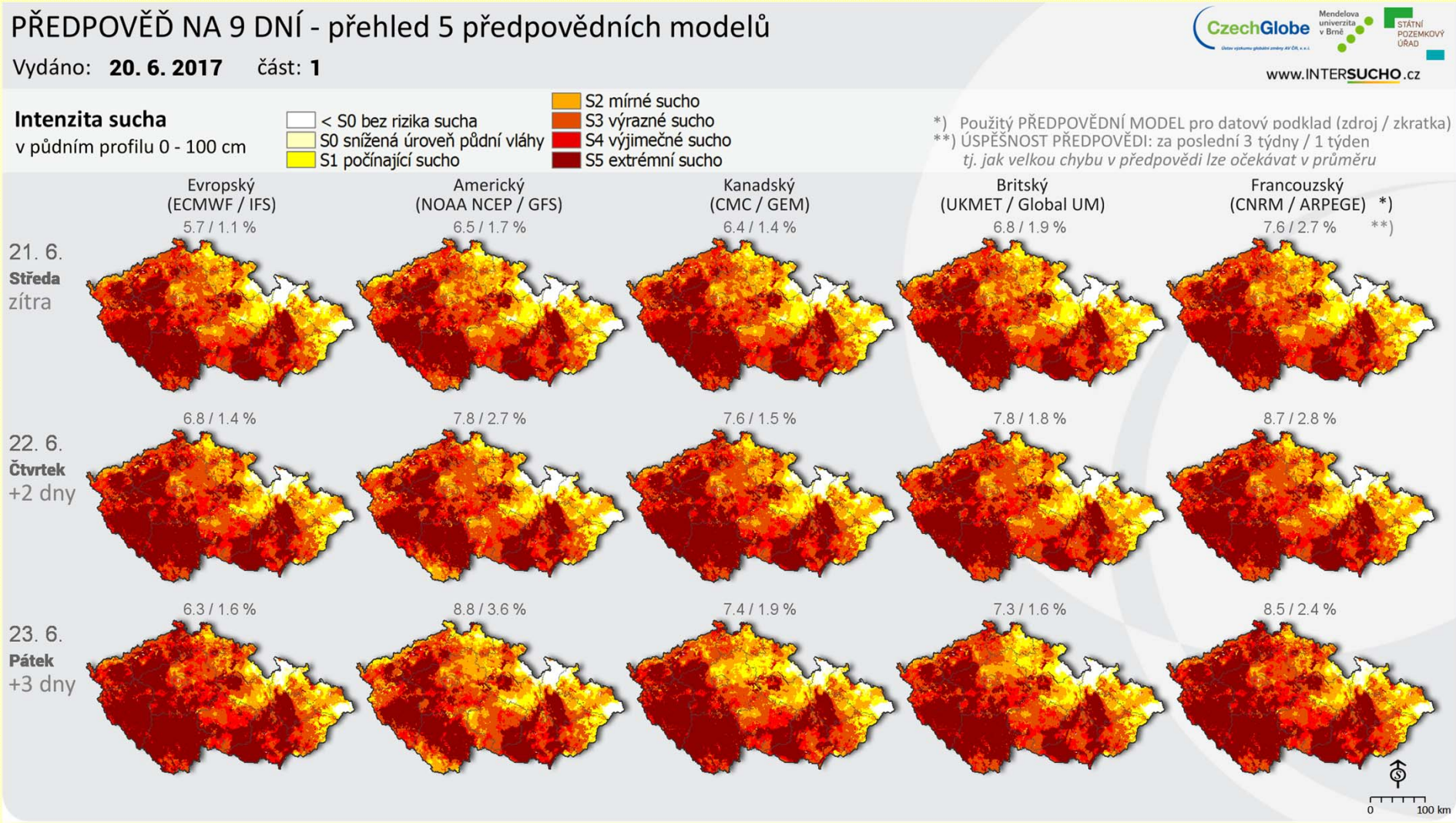

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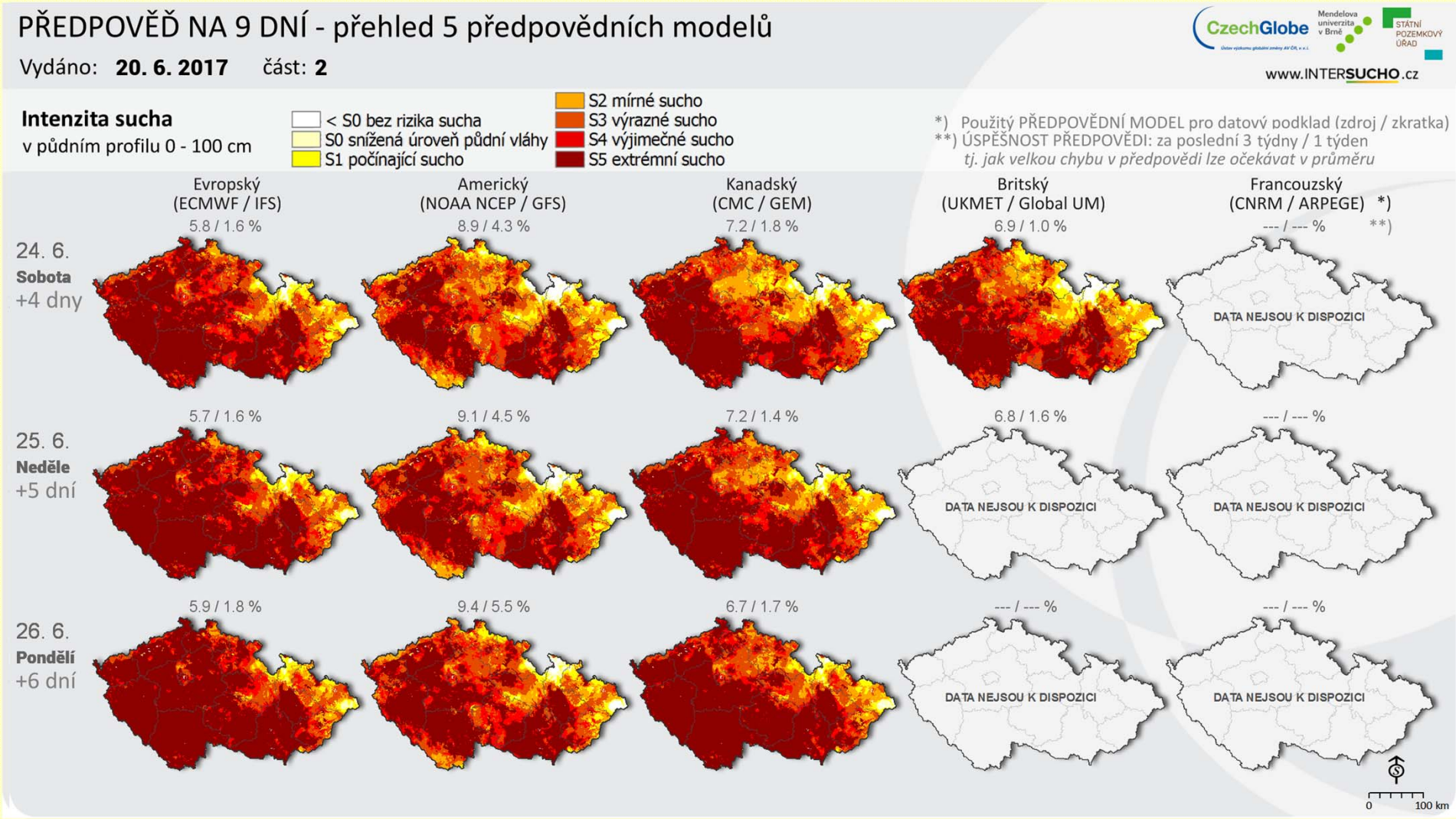

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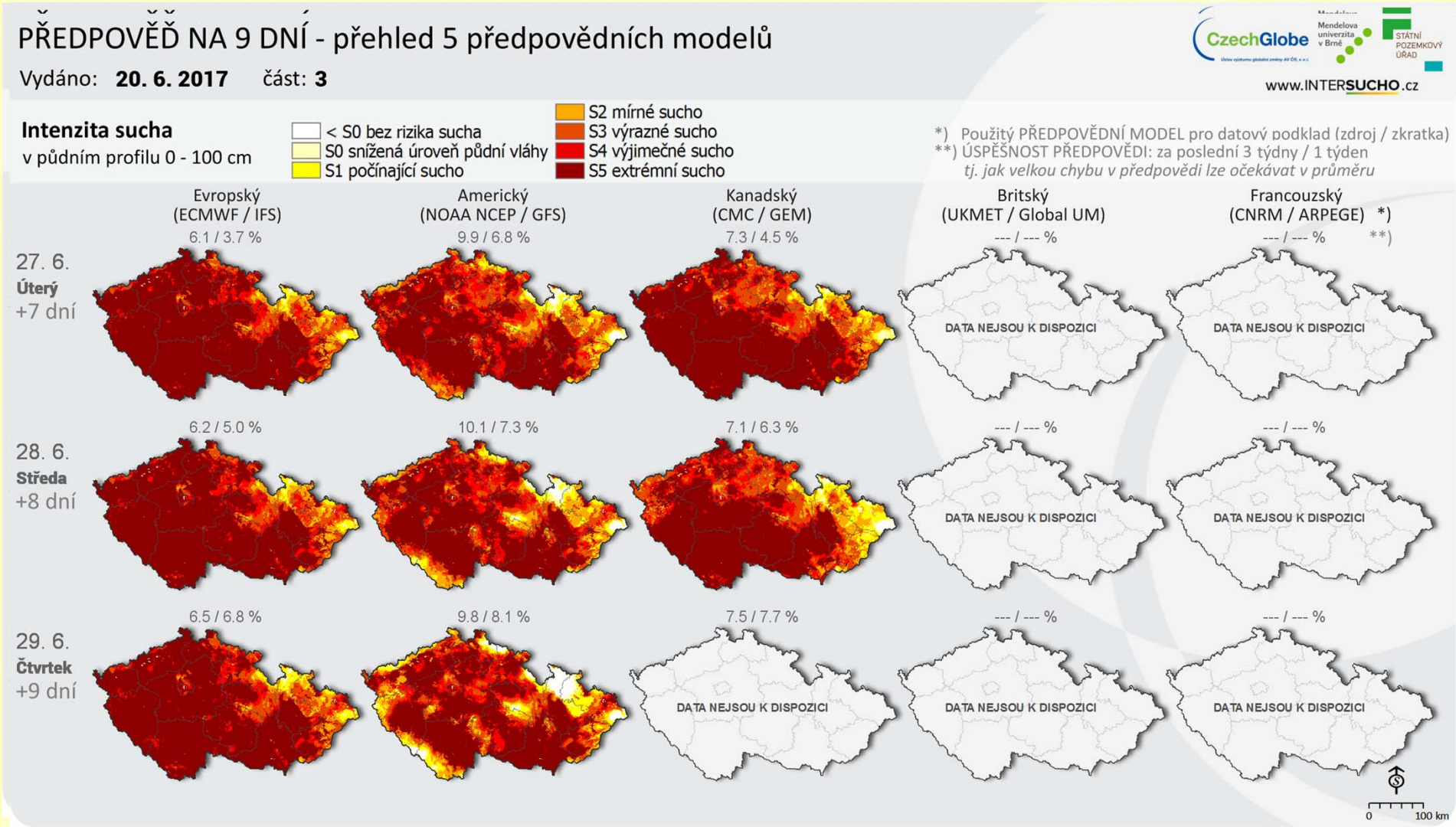
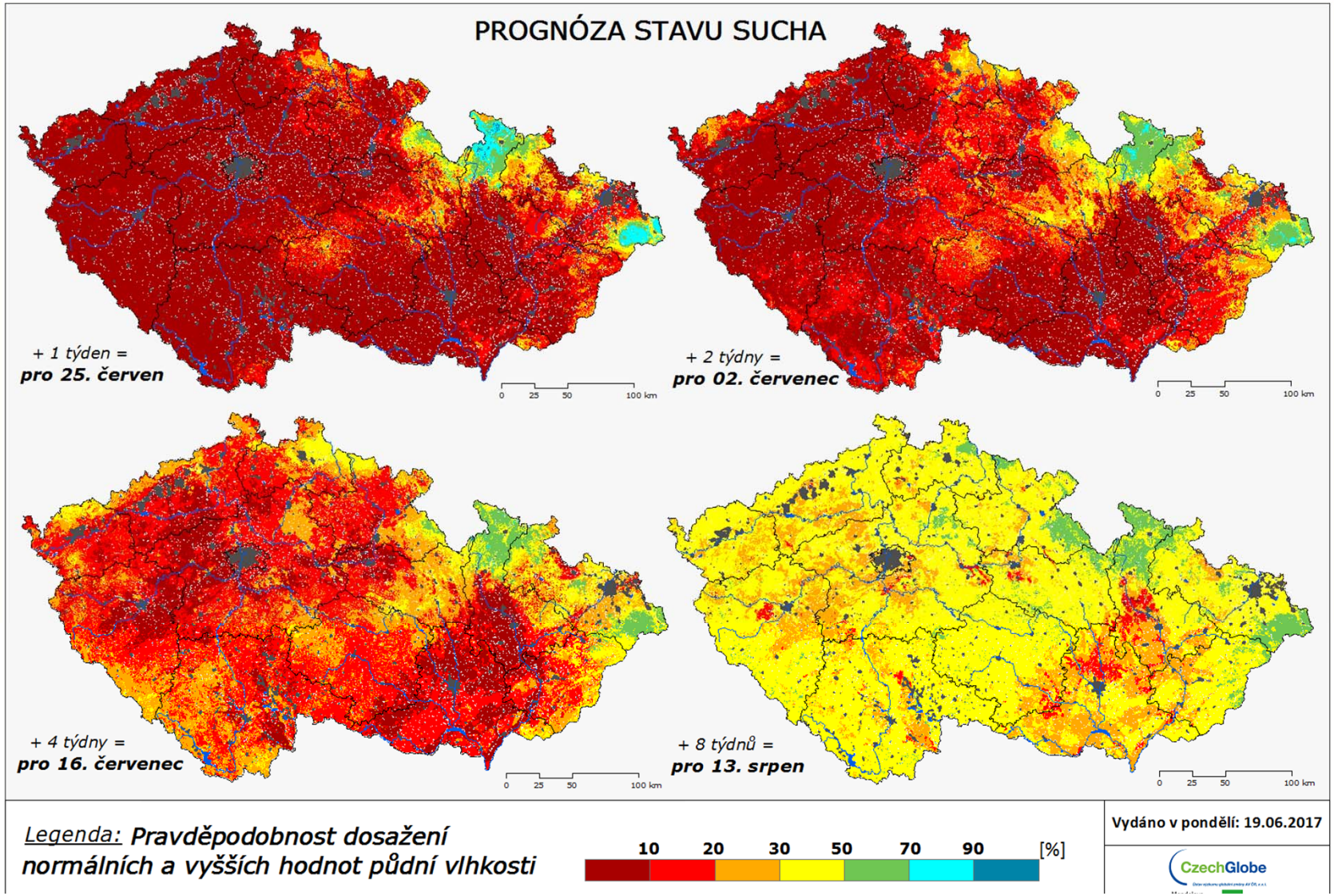
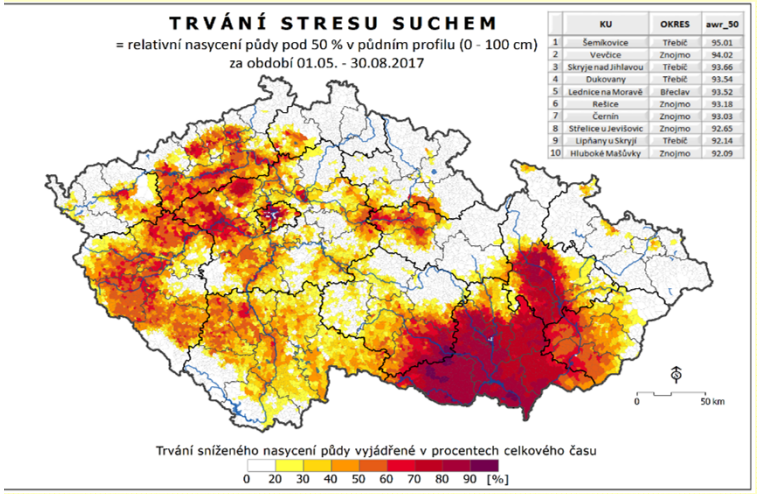


Pilar V – long term statistical prognosis

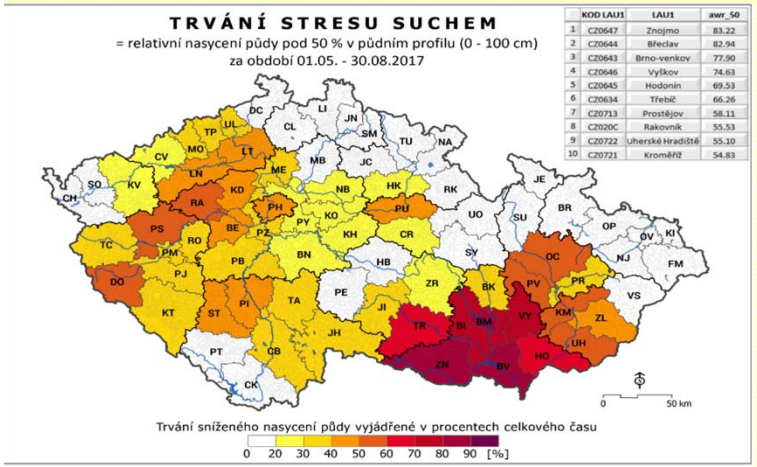


And outlook for 1, 2, 4 and 8 weeks is issued every week …showing the likelihood of conditions being normal or better (not a good chance for next weeks in the western part of Czechia it seems).

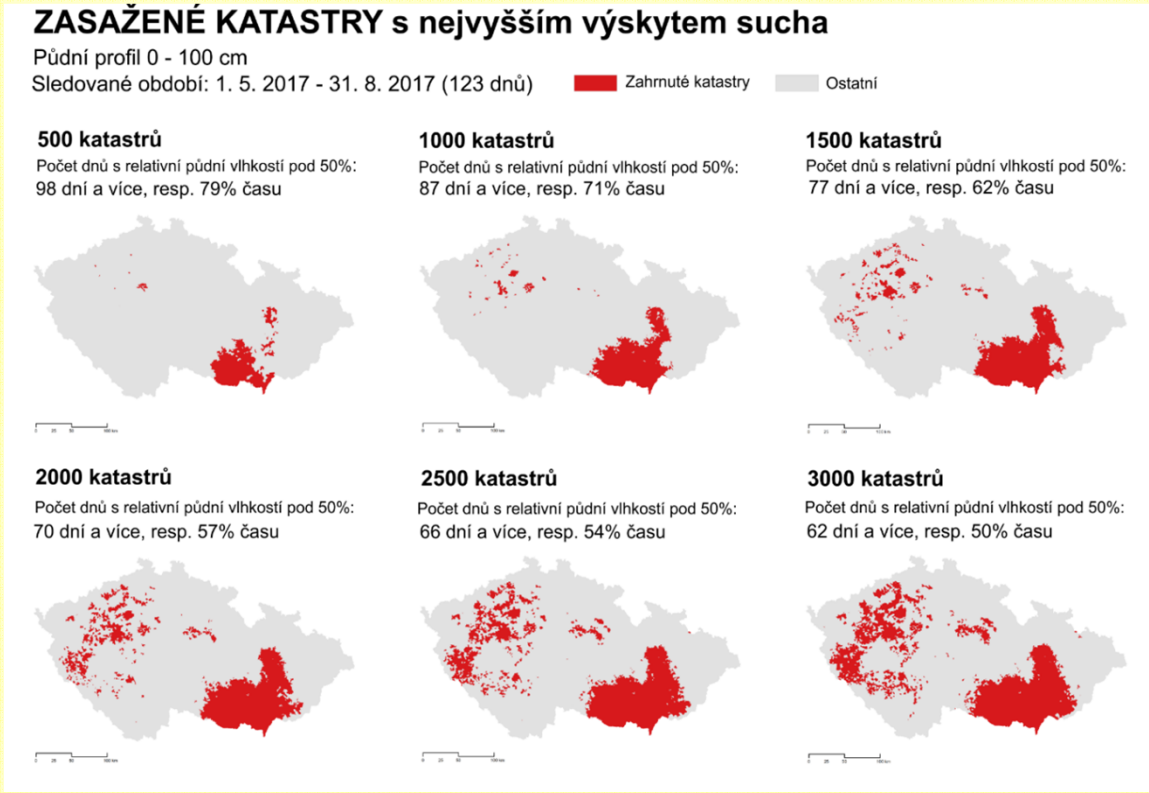
Current use of the system – drought relief for farmers



	KU	OKRES	awr_50
1	Šemíkovice	Třebíč	95.01
2	Vevčice	Znojmo	94.02
3	Skryje nad Jihlavou	Třebíč	93.66
4	Dukovany	Třebíč	93.54
5	Lednice na Moravě	Břeclav	93.52
6	Řeřice	Znojmo	93.18
7	Černín	Znojmo	93.03
8	Střelice u Jevišovic	Znojmo	92.65
9	Lipňany u Skryjí	Třebíč	92.14
10	Hlubokě Mašůvky	Znojmo	92.09

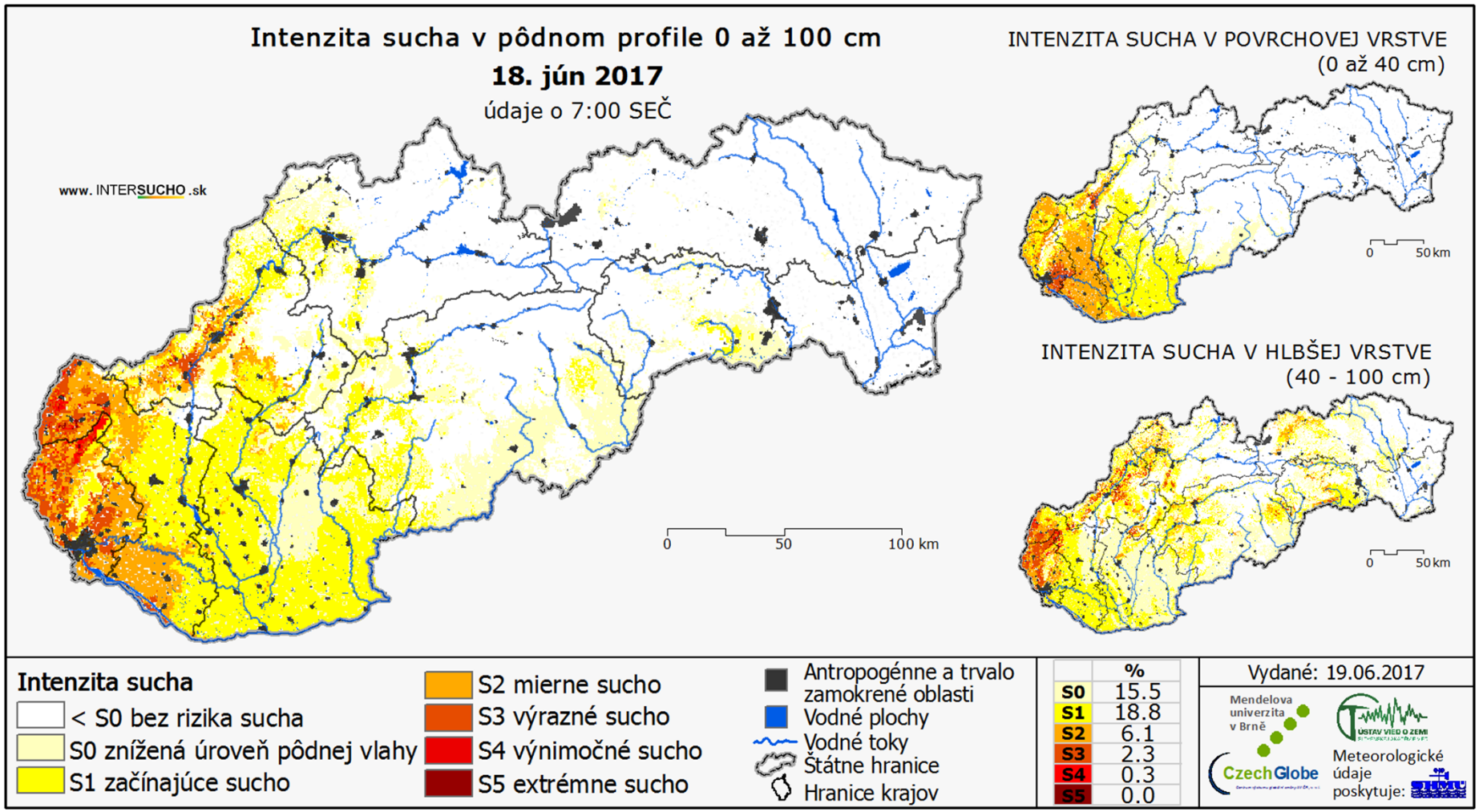


	KOD LAU1	LAU1	awr_50
1	CZ0647	Znojmo	83.22
2	CZ0644	Břeclav	82.94
3	CZ0643	Brno-venkov	77.90
4	CZ0646	Vyškov	74.63
5	CZ0645	Hodonín	69.53
6	CZ0634	Třebíč	66.26
7	CZ0713	Prostějov	58.11
8	CZ020C	Rakovník	55.53
9	CZ0722	Uherské Hradiště	55.10
10	CZ0721	Kroměříž	54.83



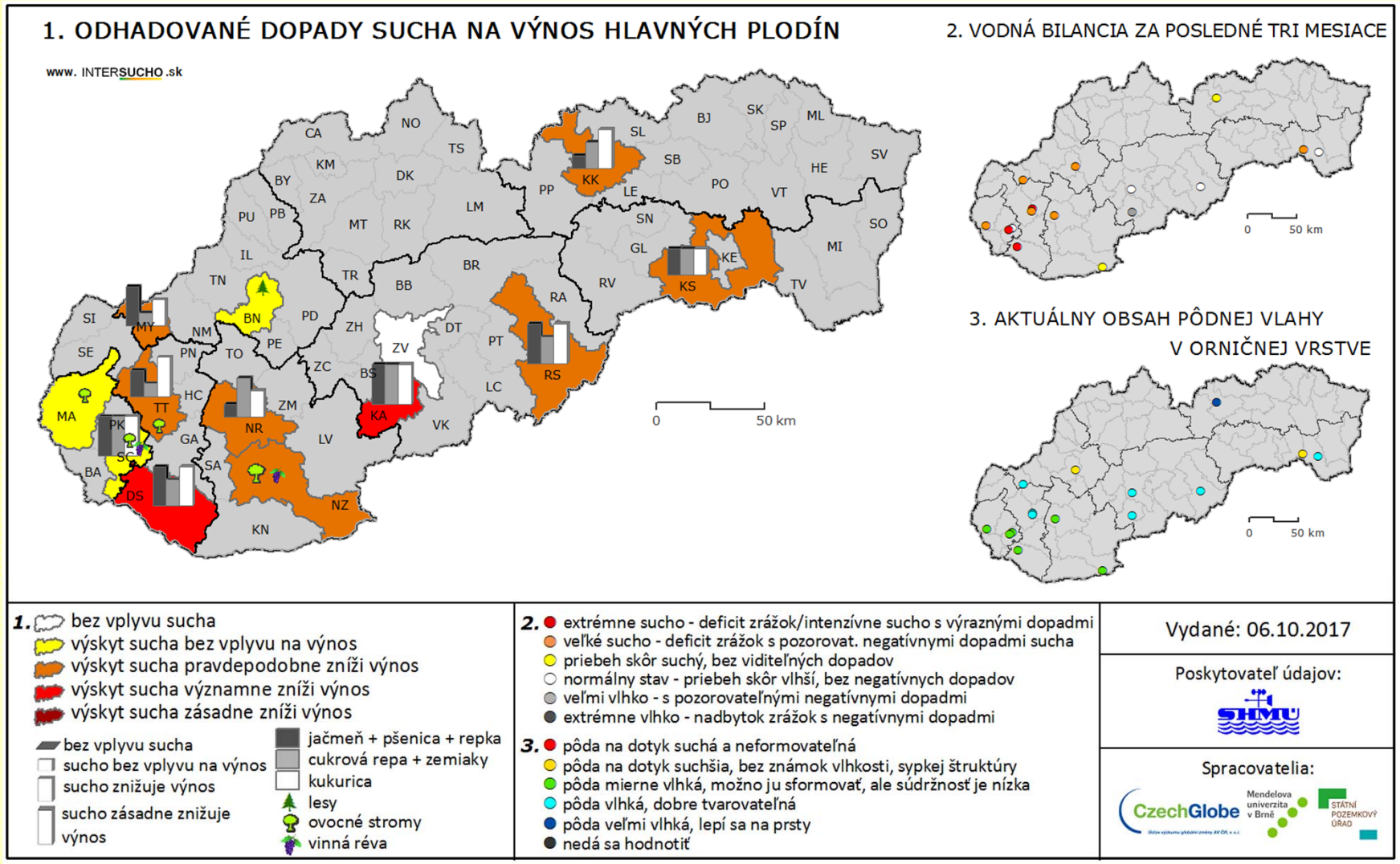
Examples - Central European monitoring platform - SLOVAKIA

Operational since October 2015

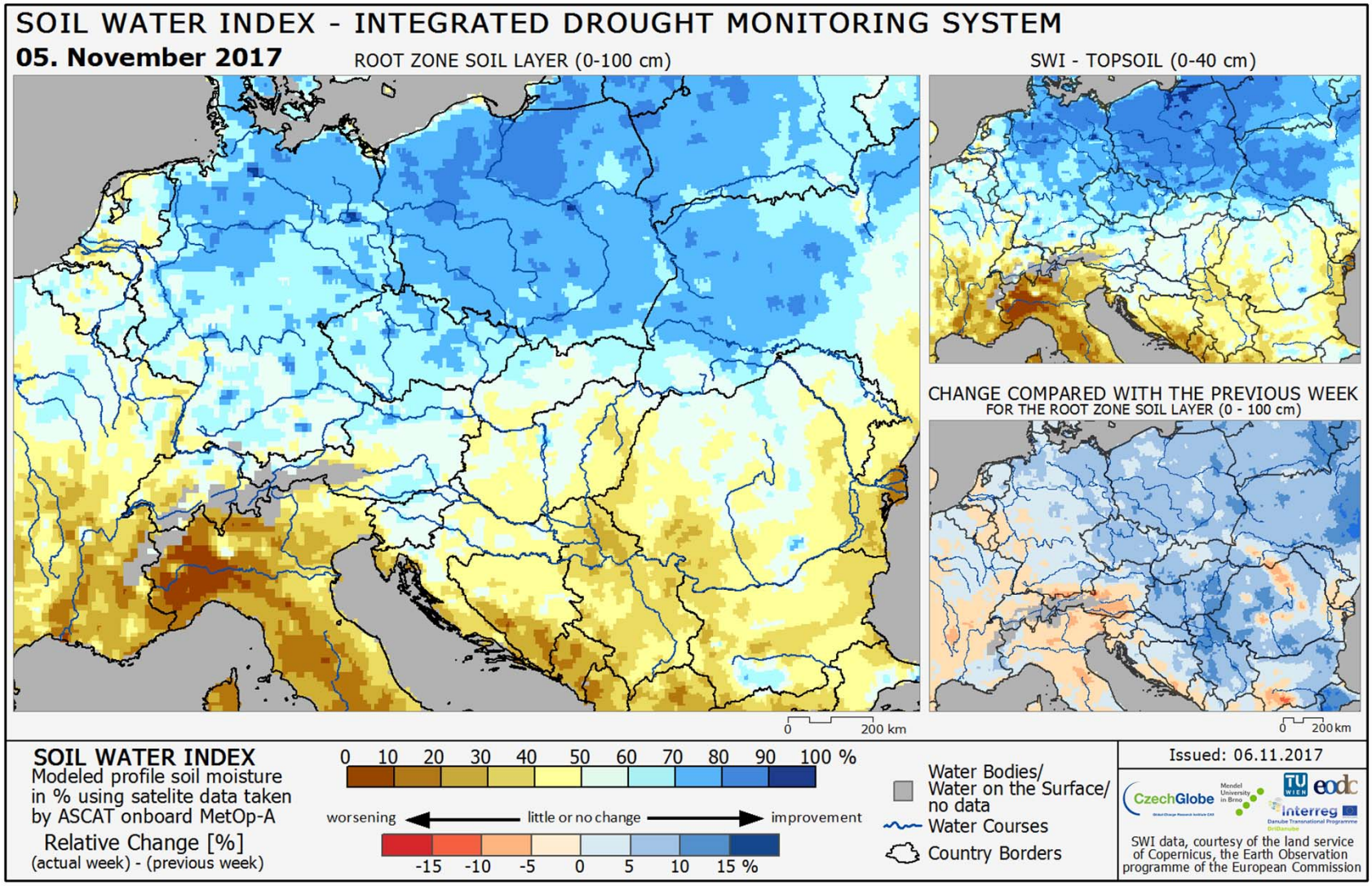


We are open and we run „no-cost“ monitoring scheme with our Slovak partners….

Operational since September 2017

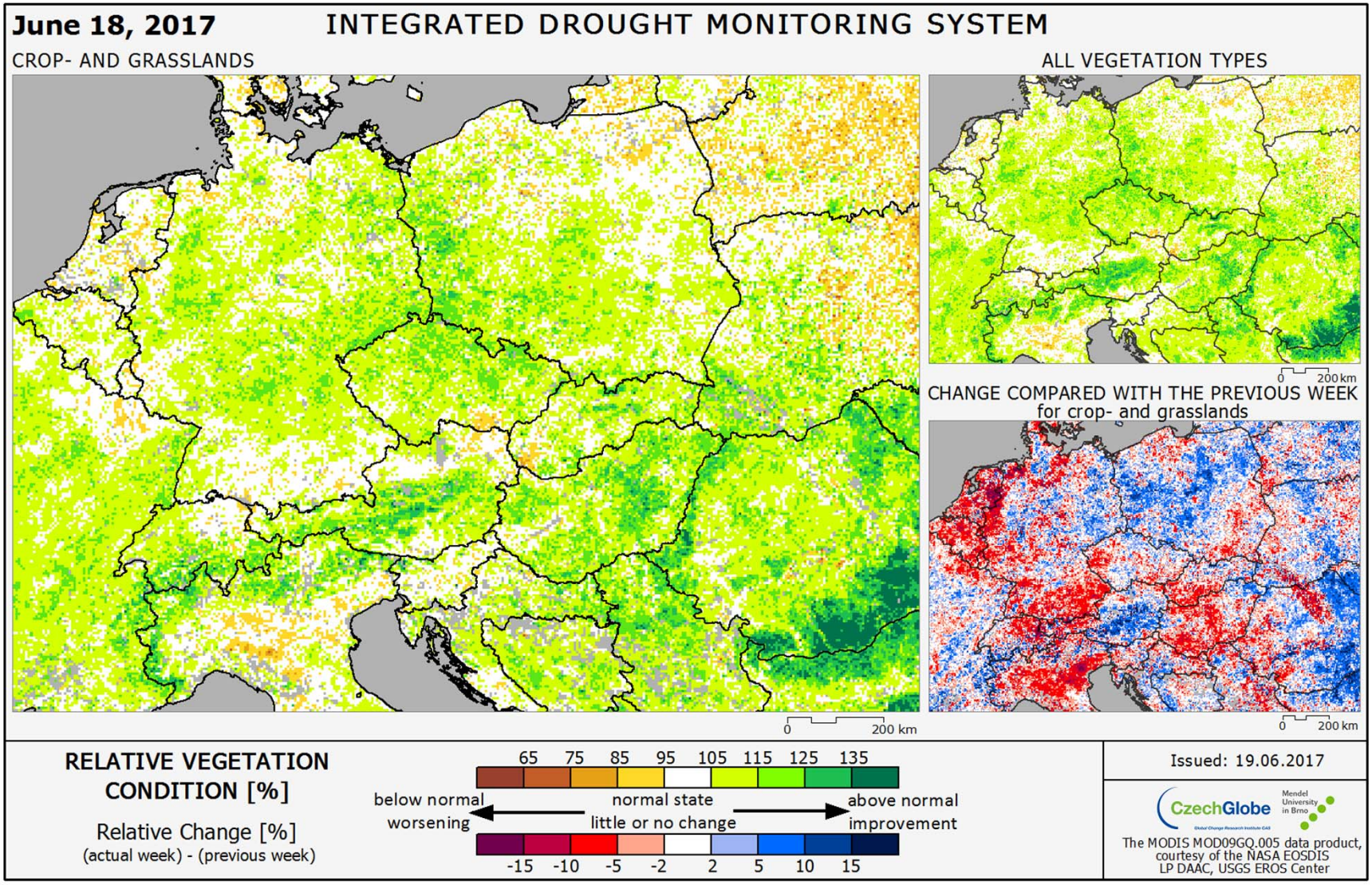


Examples – Central European monitoring platform – Central Europe



And we hope to initiate networking for presented domain…..including – regional monitoring would be valuable….

Examples – Central European monitoring platform – Central Europe



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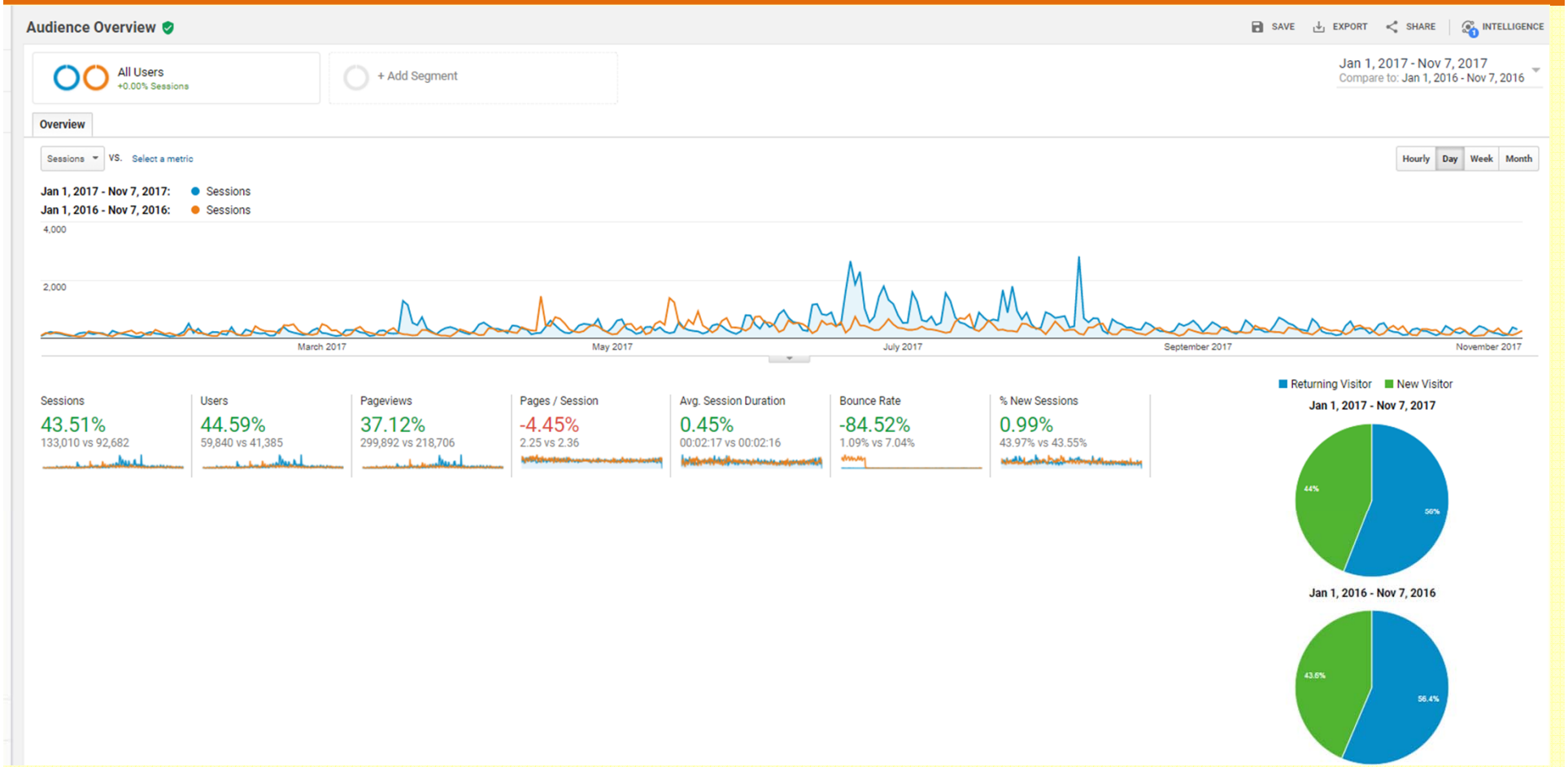
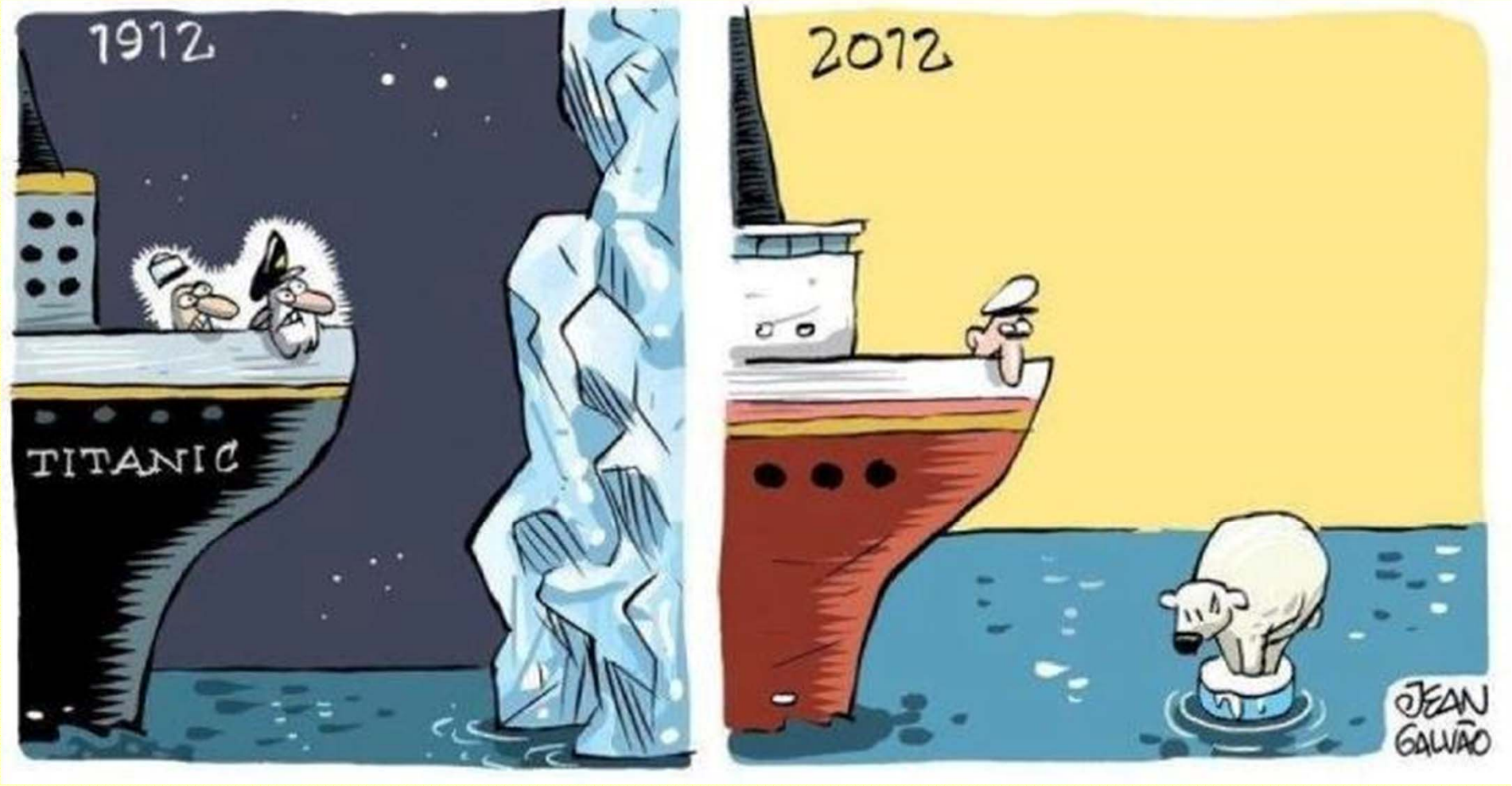
WHEN THE PROBLEM IS LOOMING…. Drought.cz



www.drought.cz

Drought monitoring and forecasting has shown to be important and in high demand when drought strikes….now heat, lack of snow or forest fires are integrated….

Thank You for Your attention…



Questions….if not answered at the spot to mirek_trnka@yahoo.com