

Status, experiences and recent activities with ECMWF products at the Croatian Met. Service



Lovro Kalin

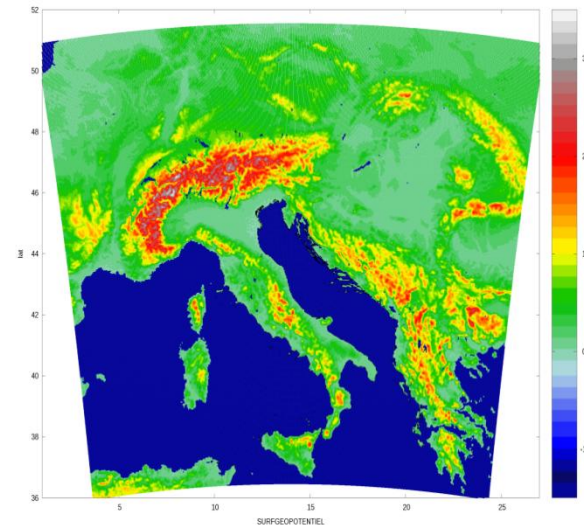
(thanks to Blazenka Matjačić, Tomislav Kozarić, Ivan Guettler, Stjepan Ivatek-Šahdan, Domagoj Mihajlović)

outline

- Croatia as a new member state – supercomputer usage
- usage of new ECMWF products
 - precip. type (freezing rain case 5.1.2016)
- model performance
 - visibility (subjective - survey)
 - persisted upper low
- extended range drought forecast

Supercomputer use - Aladin run

- Aladin model ported and tested on **cca** before upgrade
- speed performance similar to supercomputer at the Service (SGI Altix 5.2 Tflops)
 - 4 km resolution, 73 levels
 - 469x421 (480x432 with extension zone)
 - coupled to IFS
 - OI+3D-Var (not implemented in ECMWF)
 - version: AL38T1, ALAR00-baseline+3MT
 - forecast range 72 hours
- in parallel suite since 02.2015.
- preparation of the scripts for backup solution



Supercomputer use – RegCM4

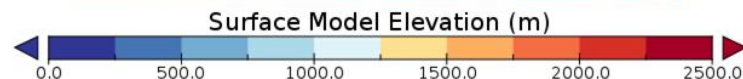
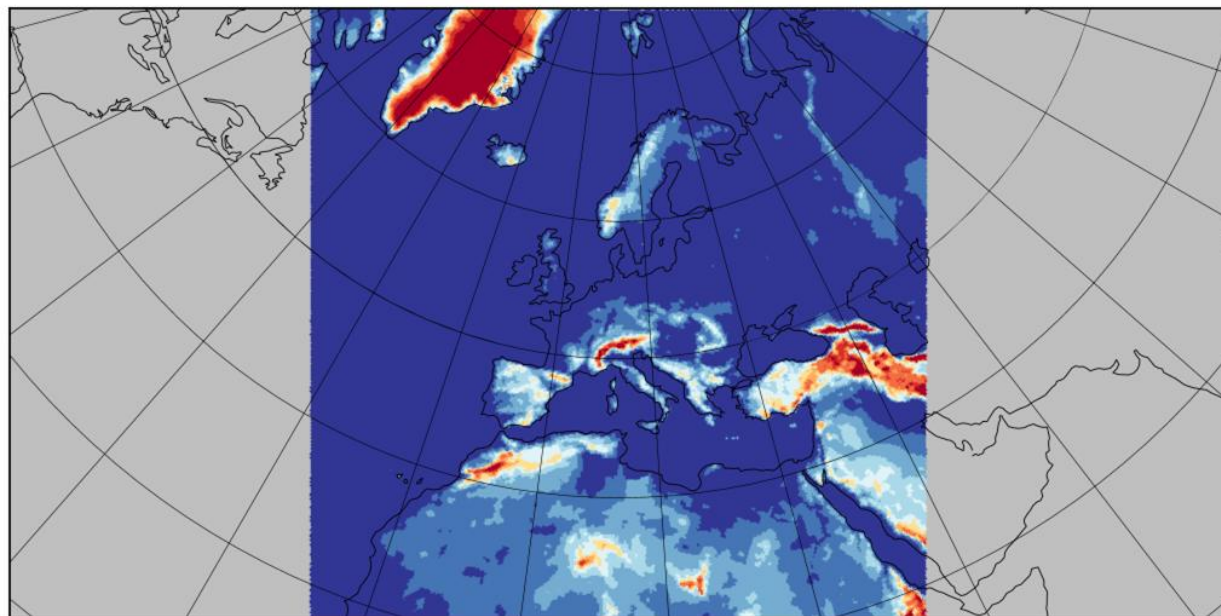
Since Feb. 2016 ECMWF **cca** is used for regional climate model simulations.
Two types of experiments are done using RegCM4 model:

[1] long (climate) simulations:

- e.g. 1989-2008 RegCM4+ERAInterim (12.5 km horizontal resolution; 23 vertical levels)
- 1970-2050 RegCM4+MPI-ESM-MR GCM (same as above; *in progress*)

[2] sensitivity tests

- e.g. several convection schemes, increased number of vertical levels,
- 3 km nonhydrostatic runs (over smaller domain)



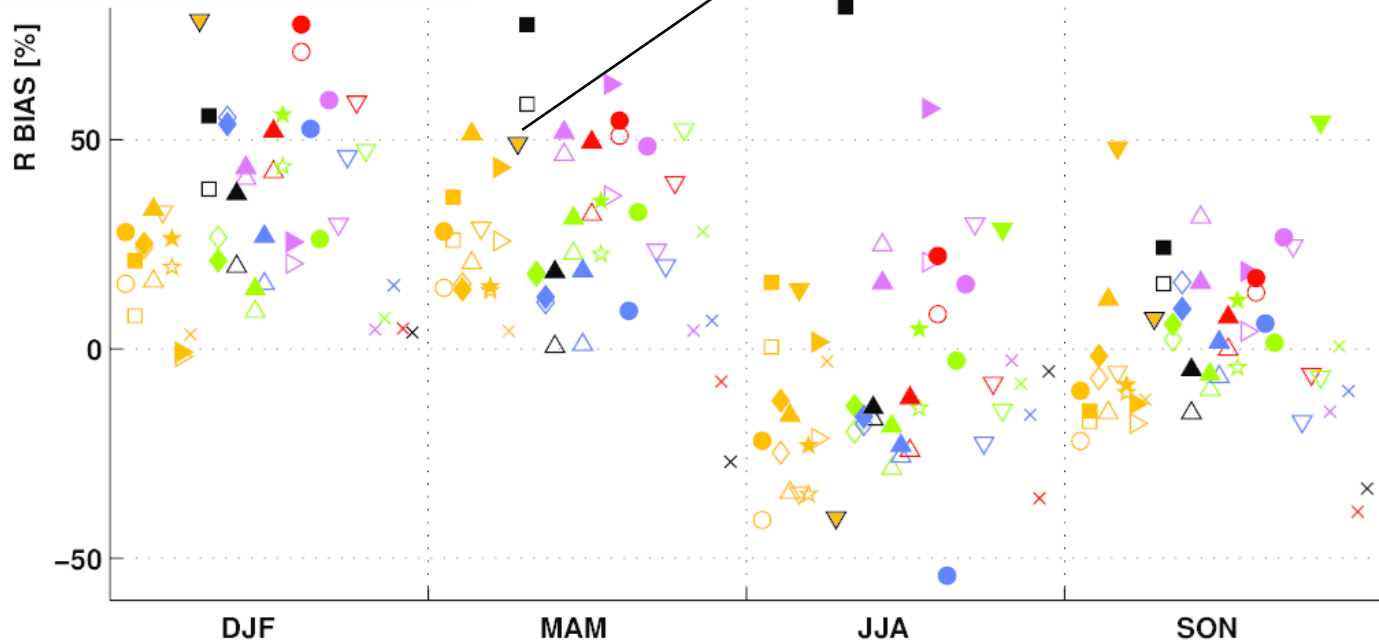
Data Min = -89.3, Max = 3227.3

	RCM	GCM	simbol
CLM-ERA	CLMcom-CCLM4-8-17	ECMWF-ERAINT_evaluation_r11p1	○ / ●
IPSL-ERA	IPSL-INERIS-WRF331F	ECMWF-ERAINT_evaluation_r11p1	○ / ●
KNMI-ERA	KNMI-RACMO22E	ECMWF-ERAINT_evaluation_r11p1	○ / ●
SMHI-ERA	SMHI-RCA4	ECMWF-ERAINT_evaluation_r11p1	○ / ●
DHMZ-ERA	DHMZ-RegCM4-2	ECMWF-ERAINT_evaluation_r11p1	○ / ●
DMI-ERA	DMI-HIRHAM5	ECMWF-ERAINT_evaluation_r11p1	○ / ●
CNRM-ERA	CNRM-ALADIN53	ECMWF-ERAINT_evaluation_r11p1	○ / ●
IPSL-CM5A	IPSL-INERIS-WRF331F	IPSL-IPSL-CM5A-MR_historical_r11p1	□ / ■
KNMI-ECEARTH	KNMI-RACMO22E	ICHEC-EC-EARTH_historical_r11p1	◇ / ◆
KNMI-HadGEM	KNMI-RACMO22E	MOHC-HadGEM2-ES_historical_r11p1	◇ / ◆
DMI-ECEARTH	DMI-HIRHAM5	ICHEC-EC-EARTH_historical_r31p1	◇ / ◆
SMHI-Cm5	SMHI-RCA4	CNRM-CERFACS-CNRM-CM5_historical_r11p1	◇ / ◆
SMHI-ECEARTH	SMHI-RCA4	ICHEC-EC-EARTH_historical_r121p1	◇ / ◆
SMHI-HadGEM	SMHI-RCA4	MOHC-HadGEM2-ES_historical_r11p1	◇ / ◆
SMHI-ESM	SMHI-RCA4	MPI-M-MPI-ESM-LR_historical_r11p1	◇ / ◆
SMHI-CM5A	SMHI-RCA4	IPSL-IPSL-CM5A-MR_historical_r11p1	◇ / ◆
CNRM-Cm5	CNRM-ALADIN53	CNRM-CERFACS-CNRM-CM5_historical_r11p1	◇ / ◆
CLM-ESM	CLMcom-CCLM4-8-17	MPI-M-MPI-ESM-LR_historical_r11p1	◇ / ◆
CLM-HadGEM	CLMcom-CCLM4-8-17	MOHC-HadGEM2-ES_historical_r11p1	◇ / ◆
CLM-ECEARTH	CLMcom-CCLM4-8-17	ICHEC-EC-EARTH_historical_r121p1	◇ / ◆
CLM-Cm5	CLMcom-CCLM4-8-17	CNRM-CERFACS-CNRM-CM5_historical_r11p1	◇ / ◆
DHMZ-ECEARTH	DHMZ-RegCM4-2	ICHEC-EC-EARTH_historical_r11p1	◇ / ◆
DHMZ-Cm5	DHMZ-RegCM4-2	CNRM-CERFACS-CNRM-CM5_historical_r11p1	◇ / ◆
DHMZ-HadGEM	DHMZ-RegCM4-2	MOHC-HadGEM2-ES_historical_r11p1	◇ / ◆
DHMZ-ESM	DHMZ-RegCM4-2	MPI-M-MPI-ESM-LR_historical_r11p1	◇ / ◆

R BIAS for CRO region

DHMZ-ERA-11 MIT convection

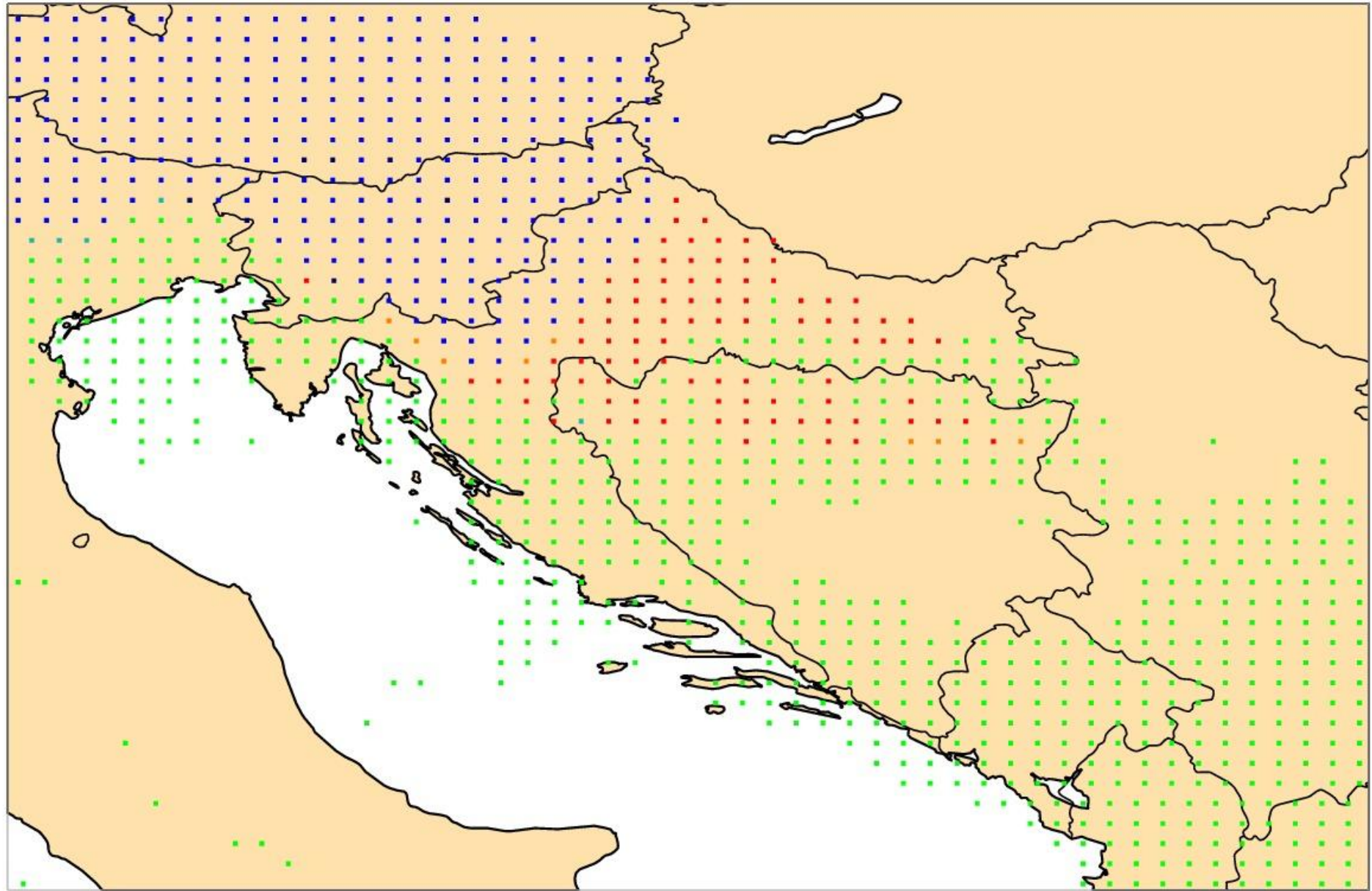
DHMZ-ERA-11 Grell convection
(simulation performed on cca)

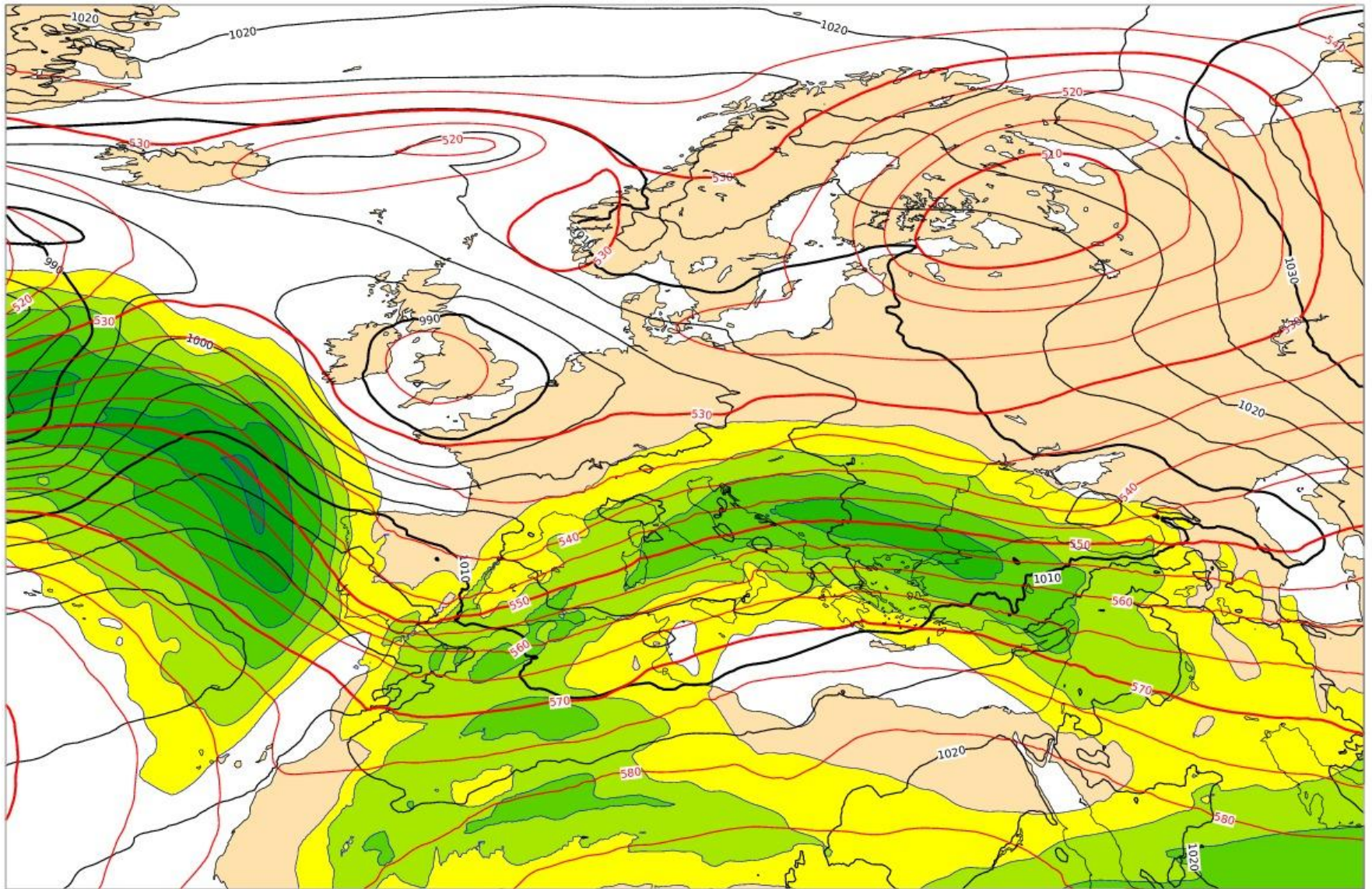


EURO-CORDEX simulations (empty 50km, filled 12.5km). Total precipitation relative errors with respect to E-OBS v11 observations, averaged over Croatia. Both ERA-Interim (1998-2008 period) and CMIP5 (1971-2000 period) RCM simulations are shown.

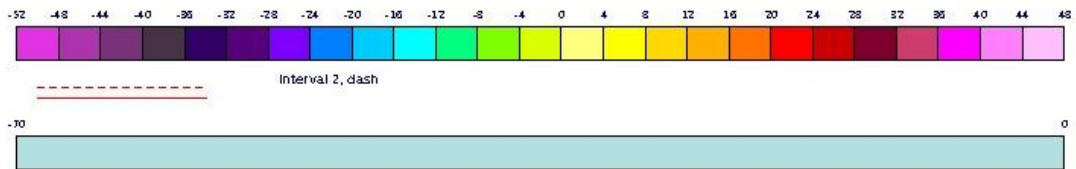
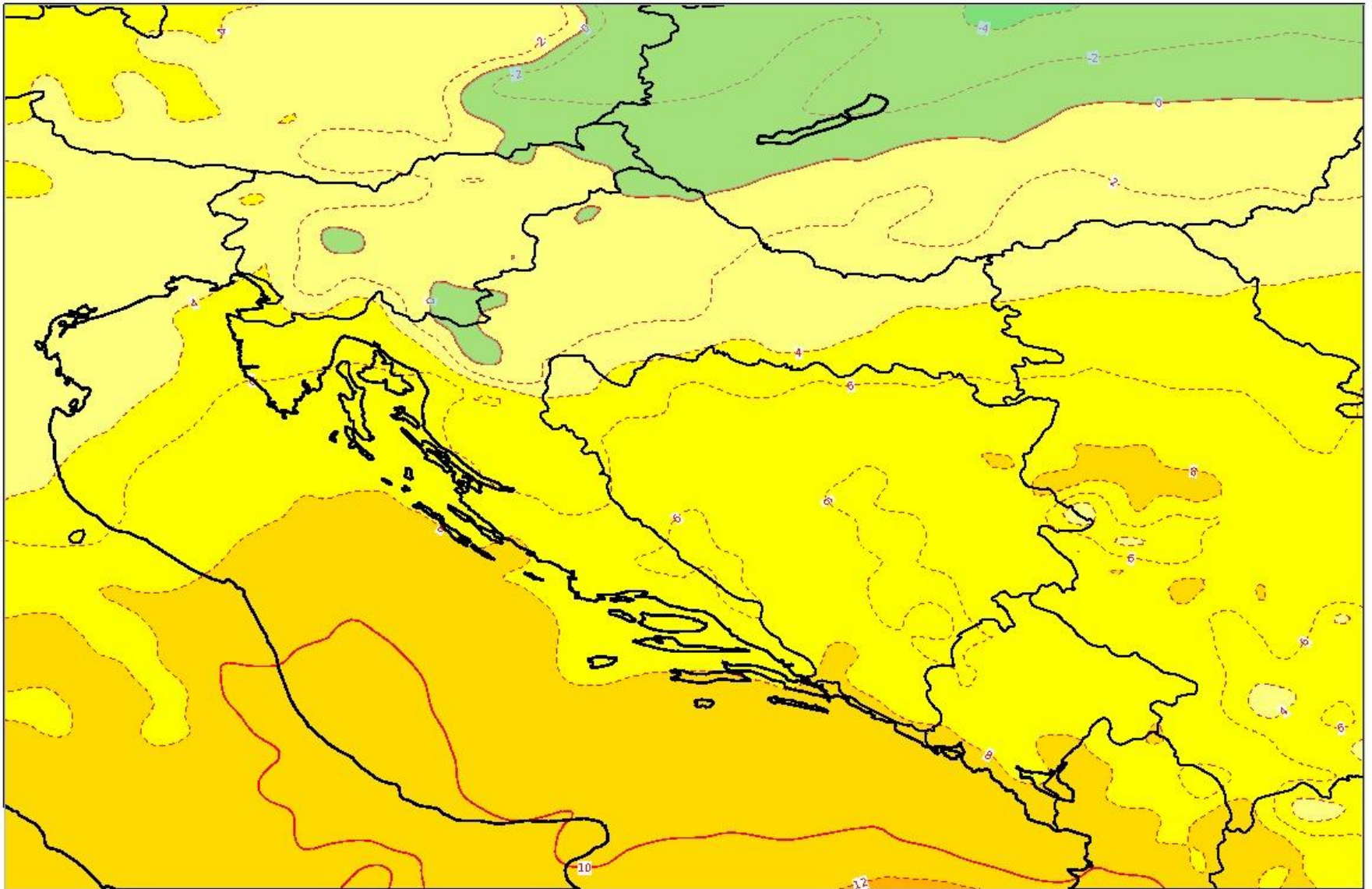
Case: Freezing rain

- first (and only) significant case since ECMWF precip. type product started
- Jan 5 2016 (12 UTC – 21 UTC)
- very successful fc. (even in the medium range)
- low impact (precip. amounts – new product!)





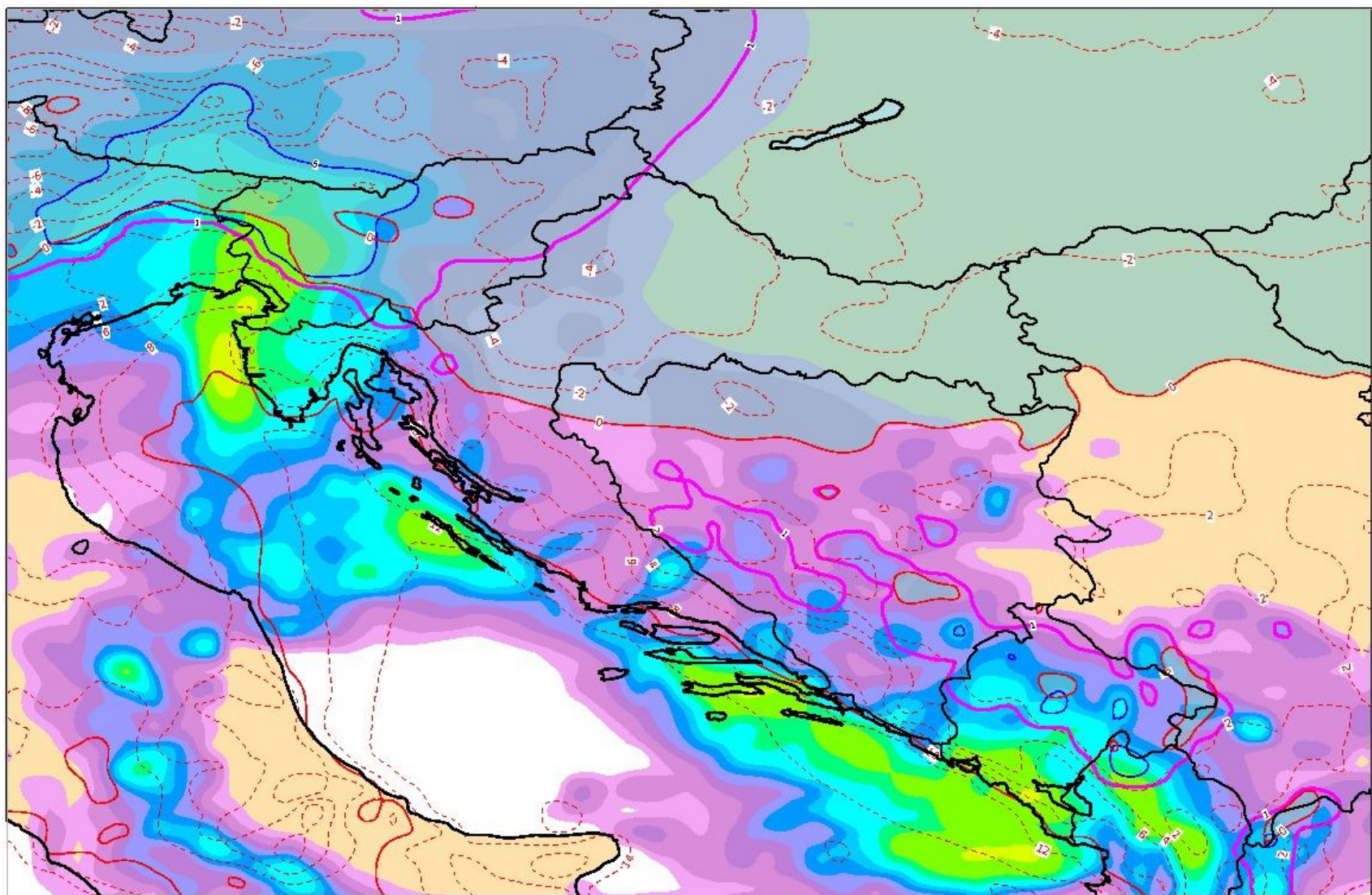
200 hPa wind speed
Mean sea level pressure
500 hPa geopotential



925 hPa temperature

925 hPa temperature

925 hPa temperature

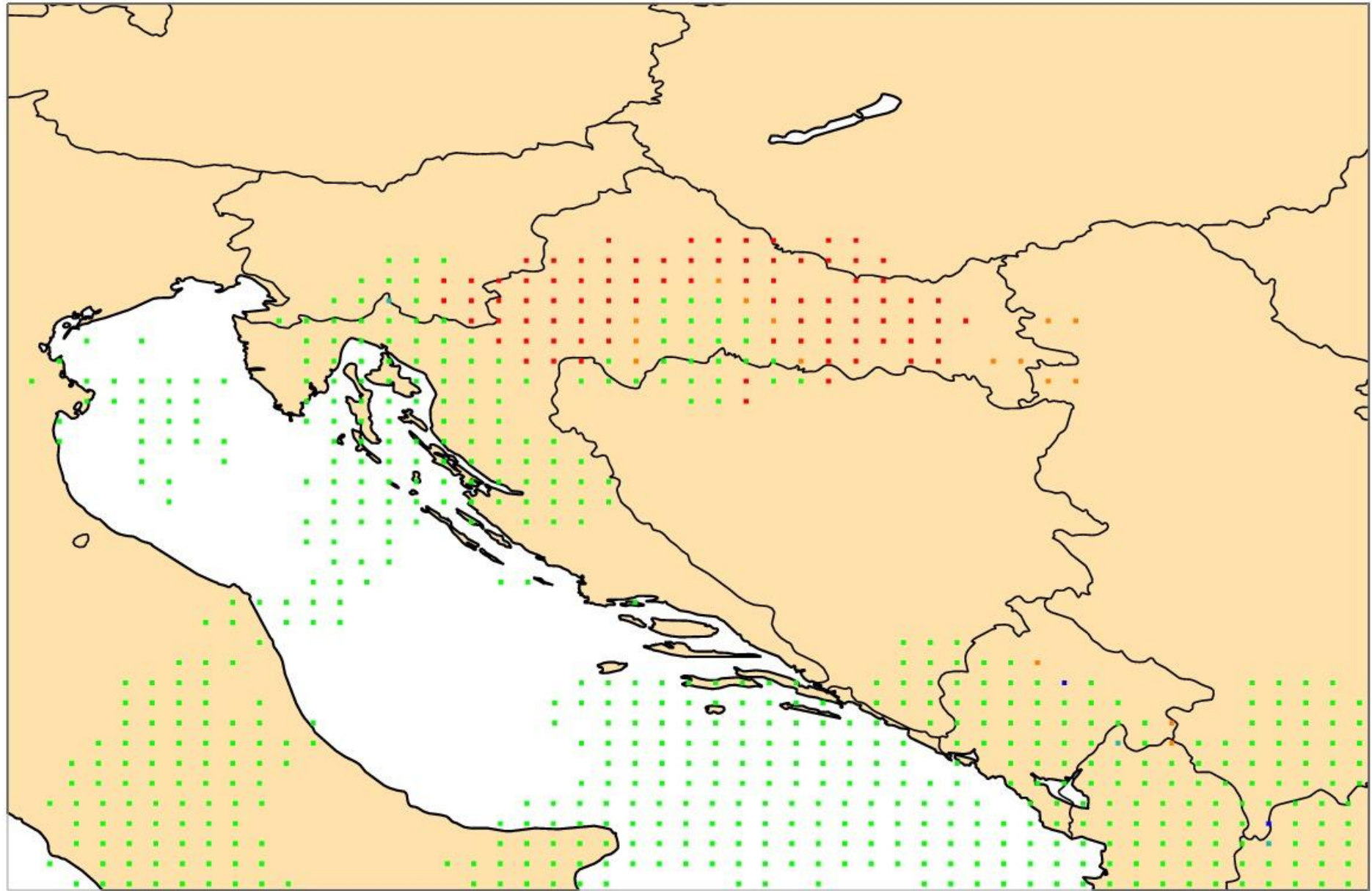


Total precipitation per 6 hour

2m temperature

Total snowfall over 6 hour(s)

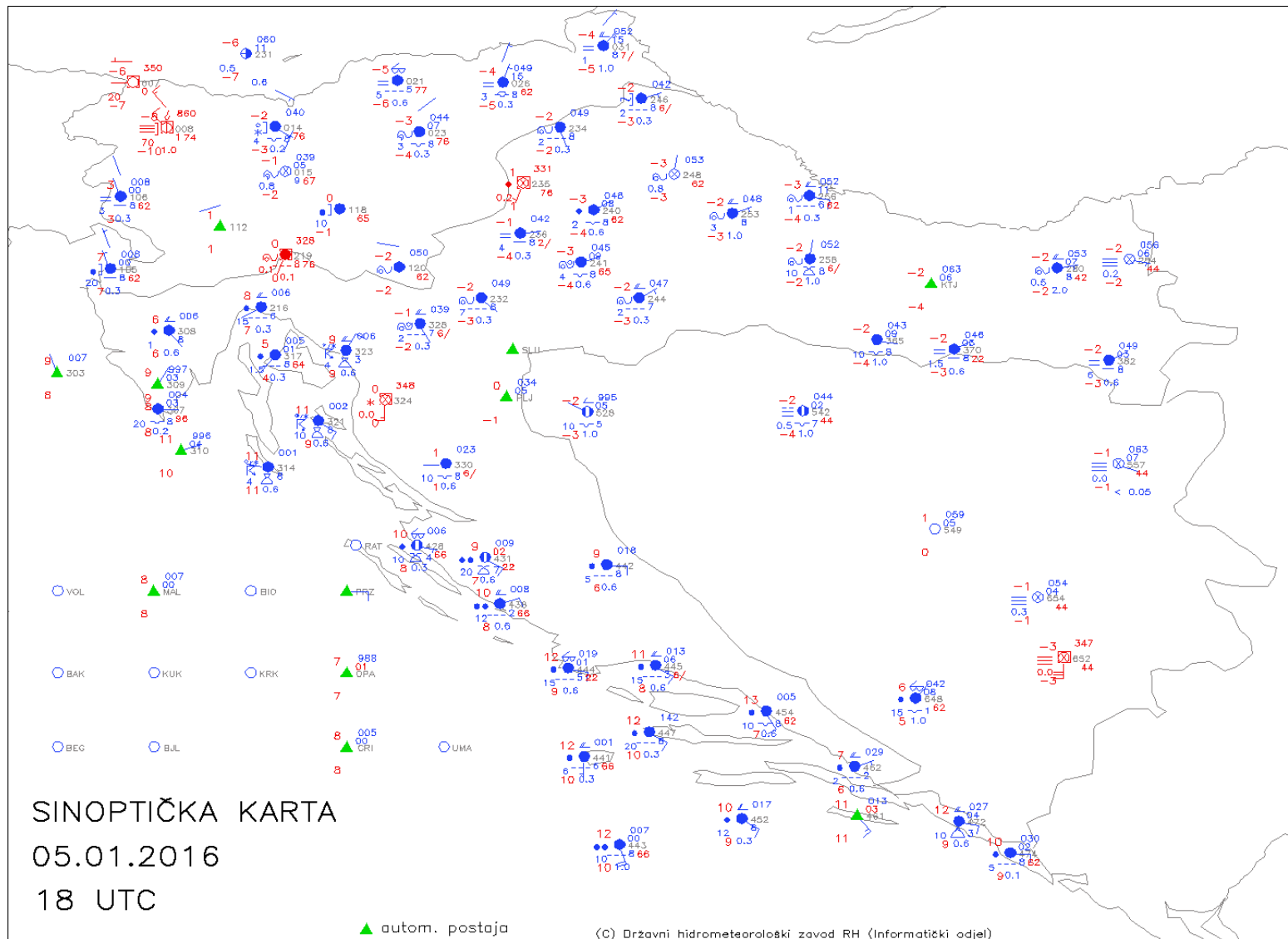
2m temperature



Precipitation type for precipitation rate more than 0.1 mm



Case: Freezing rain



Case: Freezing rain



Case: Freezing rain - summary

- only case since ECMWF precip. type product started
- very successful (even in the medium range)
- low impact (precip. amounts – new product!)

model performance – visibility

- survey within the Maritime Branch and Air Traffic Control Service
 - 7 from 10 forecasters responded
 - almost all don't use the product regularly
 - unreliable in fog situations
 - influenced by precipitation
- further (objective) studies to be carried out

model performance

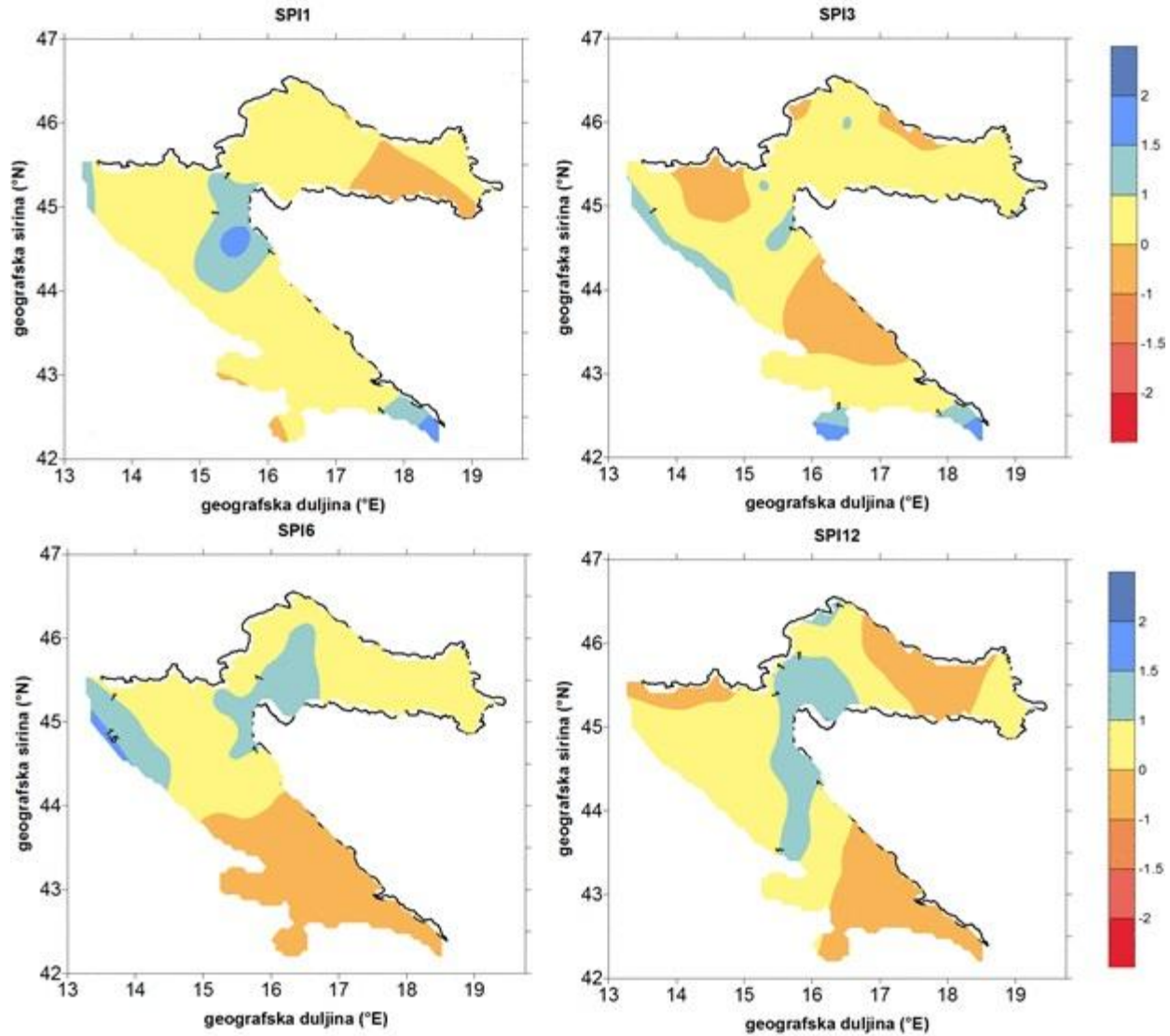
- mid February 2016 - a week with (un)expected sustained rainy weather associated with upper low over Central Europe
- each consecutive ECMWF run delayed the lifetime (death) of the upper low
- model was correct (but not consistent?)
- several such cases reported before

drought

- highest economic losses (39%) among all hydro-meteorological events in Croatia
- SPI - Standardized Precipitation Index (McKee et al. 1993)
- measure of meteorological drought, based on precipitation amount only
- gamma dist. to normal -2,-1,0,1,2
- used by insurance companies

drought

05-2016.



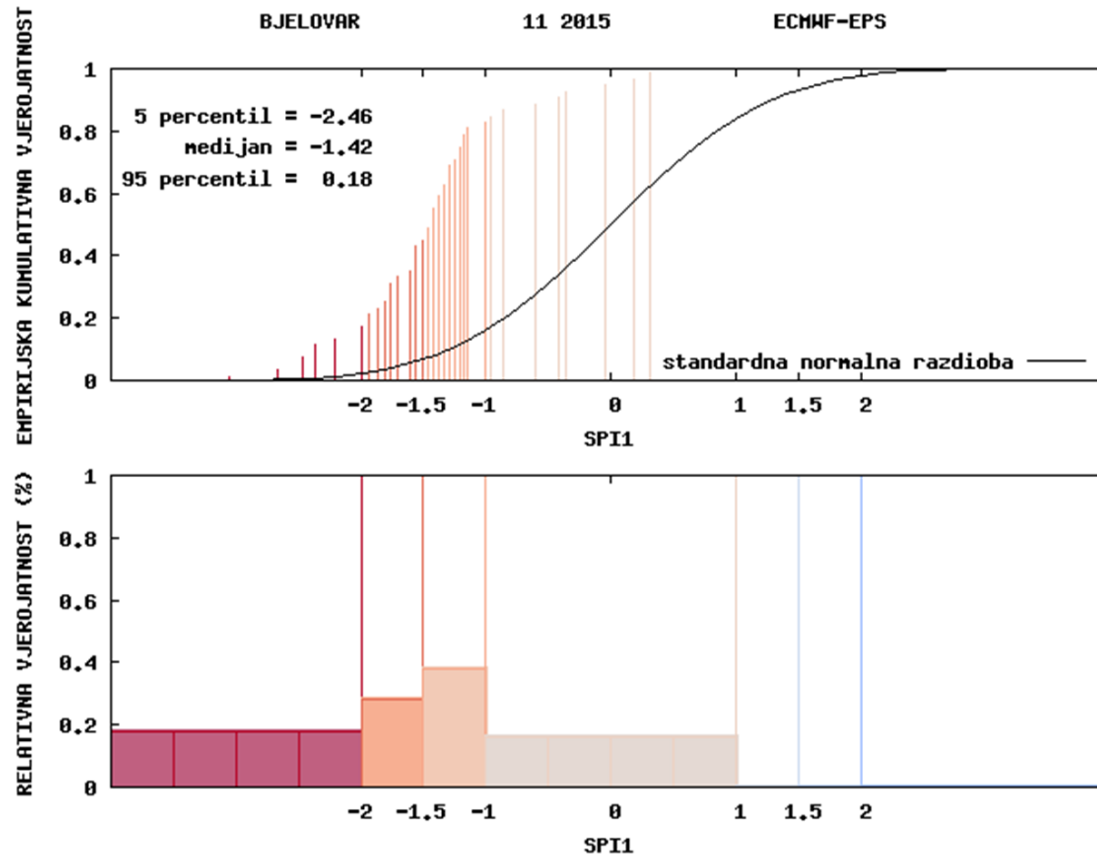
drought prediction

- ECMWF seasonal forecast (monthly anom.)
- different combinations of observed and forecasted data

- SPI 1
- SPI3comb=2 months obs. +1 month forec.
- SPI 3

- SPI 3+3, SPI 6+6...

drought prediction

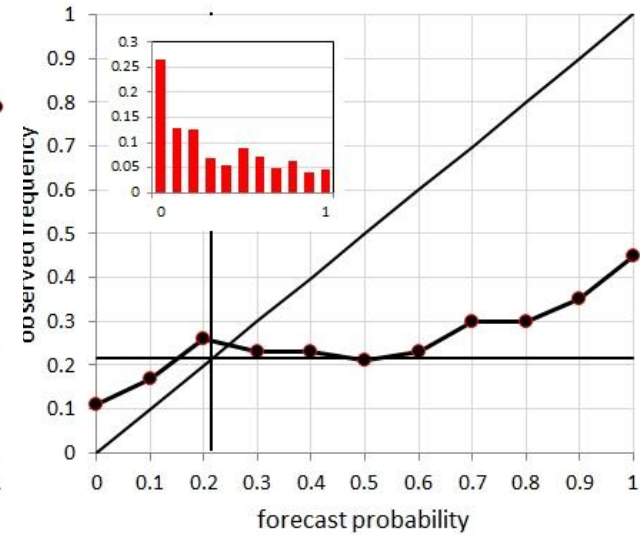
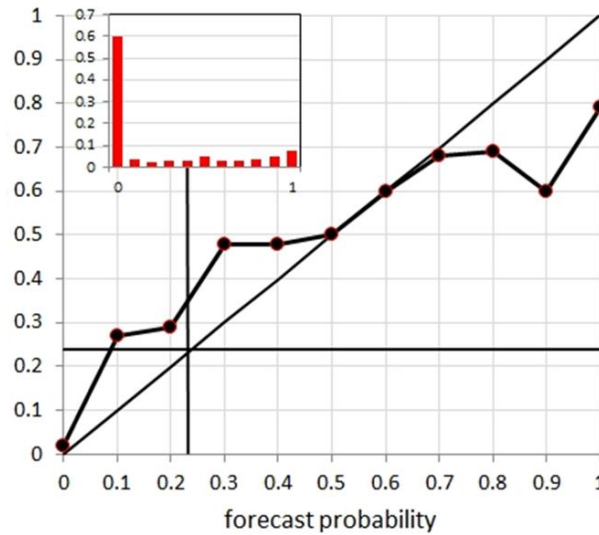
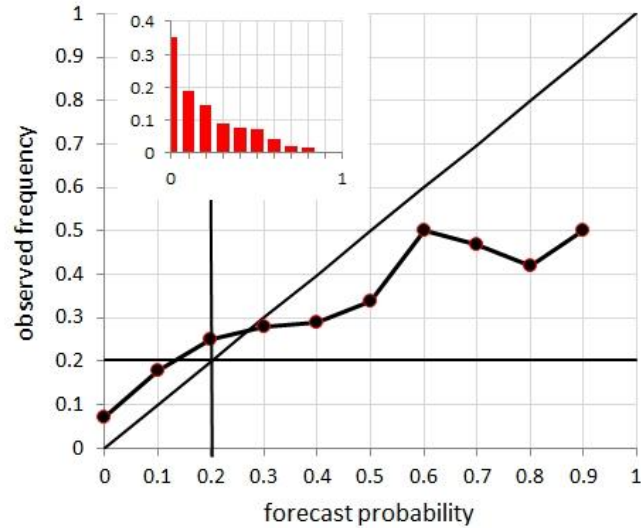


- fraction of ens. members giving $SPI < \text{treshold}$

SPI1 < -1

SPI3comb < -1

SPI3 < -1



BS=.151	BS=.11	BS=.22
BSS=.265	BSS=.52	BSS=-.006
Good reliability	Almost perfect reliab.	Low reliability
Some overconfidence	Slightly overconfident	Overconfident
Decent sharpness	Less sharpness	Poor resolution

Final

- benefits of full membership – supercomputer usage (Aladin and RegCM4)
- good experience with new products (precipitation type + precip. amount)
- visibility - to be verified
- spurious behaviour with upper low reported
- seasonal drought forecast (SPI) – decent skill – introducing other indices (SPEI)

Thank you!

