



Republic Hydro-Meteorological Service of Serbia

The use and evaluation of medium and extended range forecast

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Outline of the talk

- ECMWF products in use for extended range (monthly & seasonal) forecast
- Combined method of the monthly forecast based on ECMWF products and analogue method of RT500/1000mb anomaly
- Verification of the combined monthly forecast method
- Monthly range forecast - new approach
- Seasonal range forecast – text bulletin based on ECMWF Web products for ministry of energy and Belgrade remote heating system
- First steps in graphical presentation of ECMWF Seasonal forecast products taken by regular dissemination and new text bulletin
- Plans of future using extended range forecast products

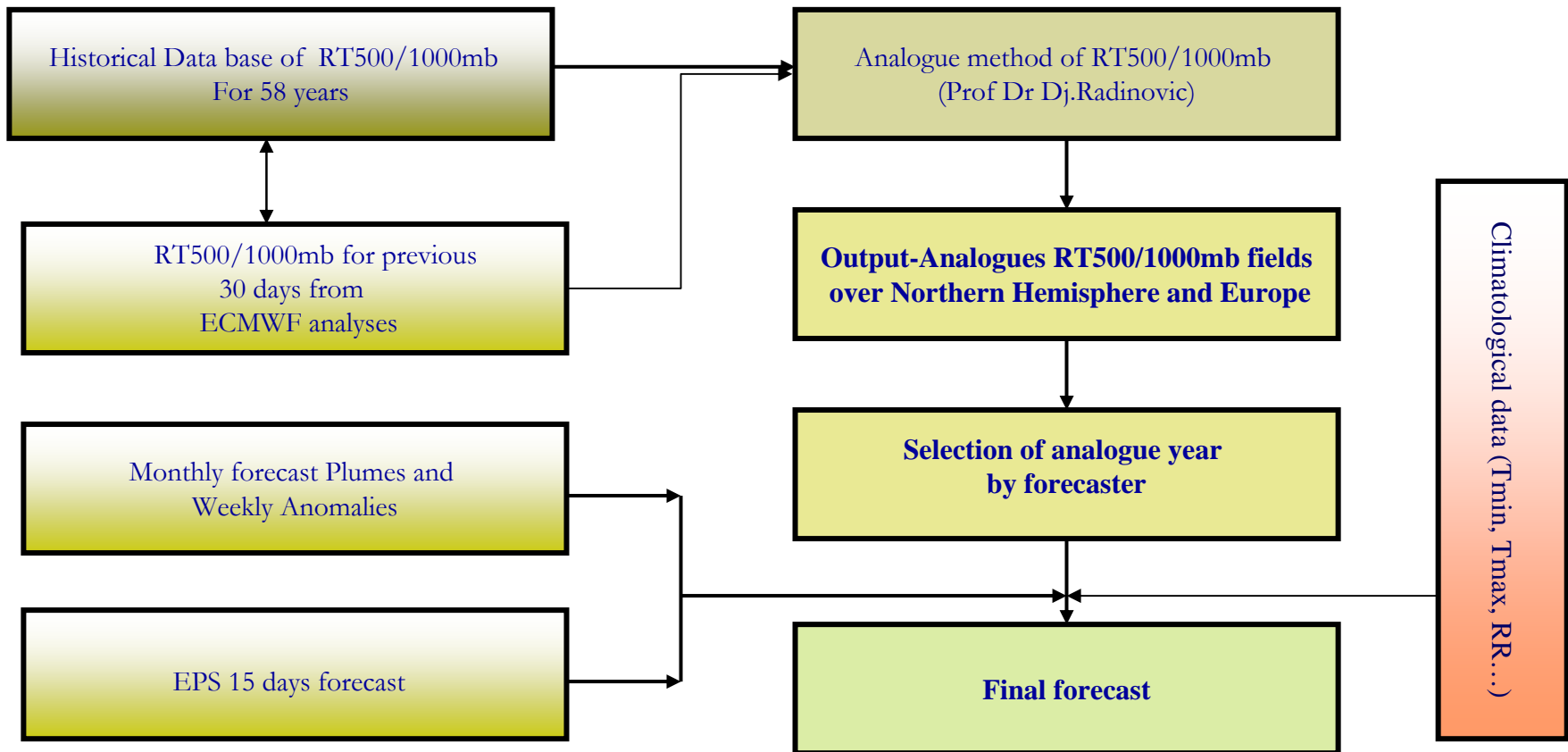


ECMWF products in use

- Monthly range forecast
- Seasonal range forecast



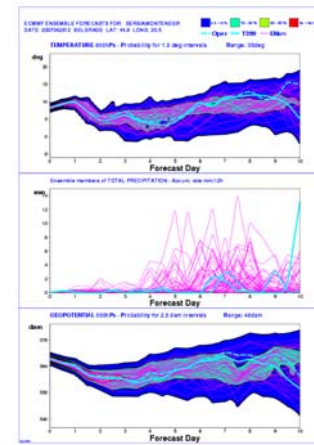
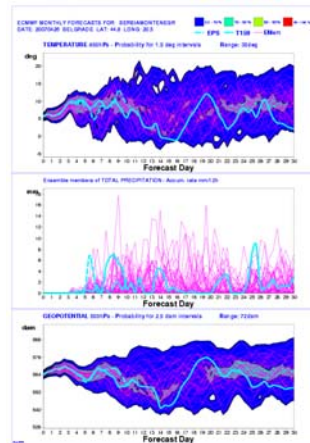
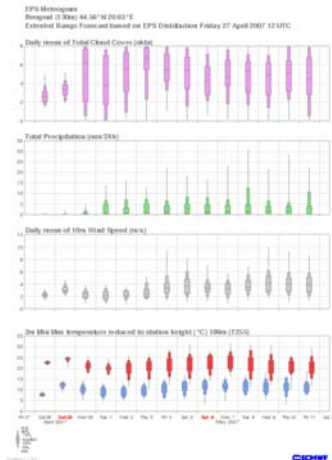
Combined method of the monthly weather forecast based on ECMWF products and analogue method of RT500/1000mb anomaly





ECMWF products in use for monthly forecast by combined ECMWF and analogue method

- Belgrade EPS meteogram from ECMWF for 15 days ahead
- WEB page Belgrade T850 hPa and surface plumes for 10 and 30 days ahead
- Standard synoptic charts
- Web page charts with weekly anomalies of T2m temperature and precipitation for Europe region
- Clusters

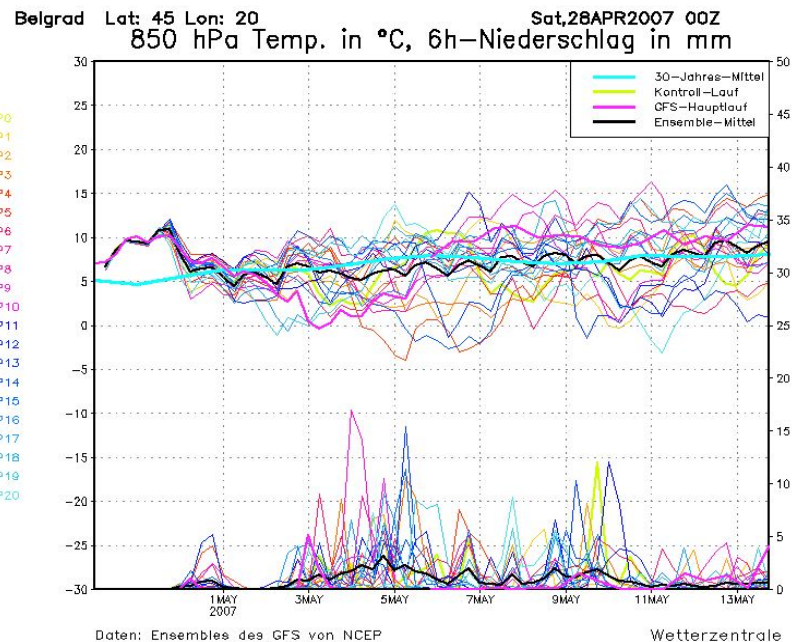
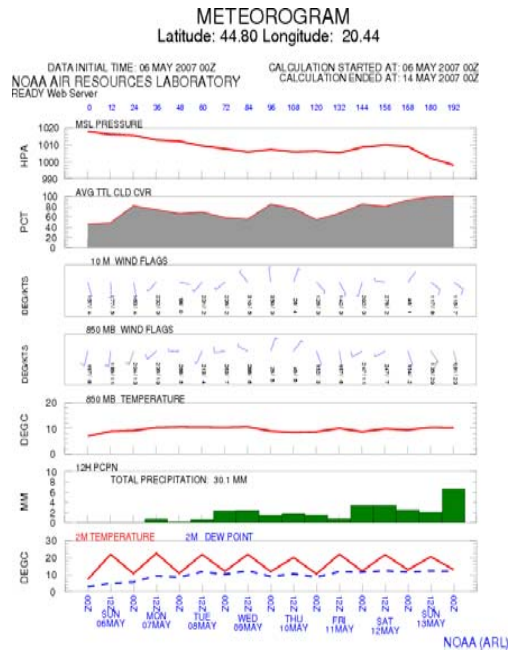




Other forecast products in use for monthly forecast

Standard synoptic charts from DWD, NCEP

- Belgrade meteogram for 15 days ahead from NCEP
- EPS plumes for T850 hPa and precipitation from NCEP





Monthly weather forecast by combined ECMWF and analog method prepared for media

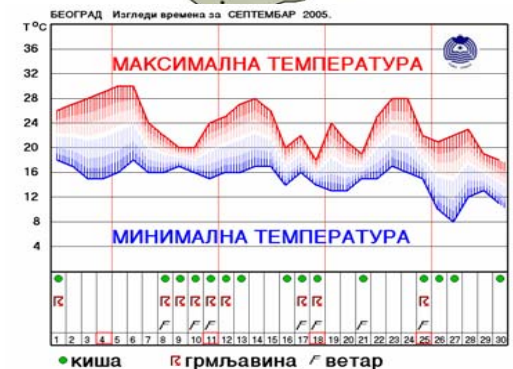
- ❖ Belgrade monthly forecast graph
- ❖ Chart with forecasted amount of precipitation (in mm) for Serbia
- ❖ Text Bulletin

До 13.05, очекује се нестабилно и променљиво време уз чешћу појаву слабе кише, локалних пљускова и грмљавина. Средња дневна температура биће испод вишегодишњег просека (од 14°C до 18°C). Јутарње температуре имаће вредности од 9°C до 13°C, а највише дневне од 19°C до 23°C.

У периоду од 14. до 25.05, одржаваће се углавном стабилно и суво време са средњом дневном температуром испод вишегодишњег просека (од 14°C до 18°C). Јутарња температура биће у интервалу од 11°C до 14°C, а највиша дневна температура од 17°C до 26°C. Локални пљускови са грмљавином се предвиђају око 17, 18, 19, 21. и 23.05. Око 17.05. могућа је појава краткотрајних временских непогода праћених градом и интензивним падавинама.

До краја маја, наставиће се углавном сув период. Средње дневне температуре биће у границама или нешто испод вишегодишњег просека (од 18°C до 22°C). Јутарња температура имаће вредности од 14°C до 17°C, а највиша дневна од 24°C до 29°C. Око 28.05. могућа је појава временских непогода праћених градом и интензивним падавинама.

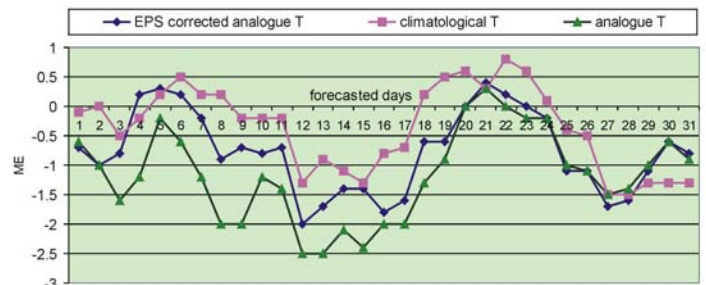
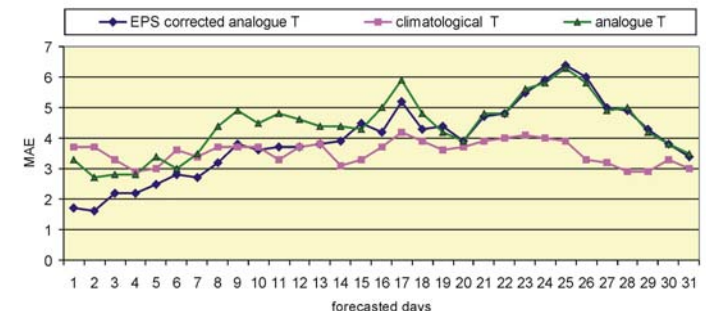
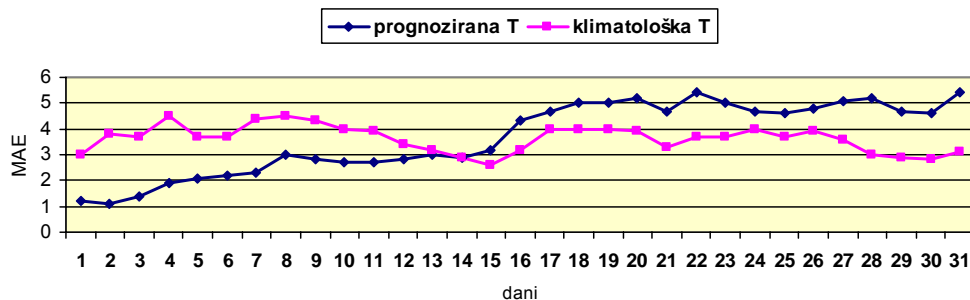
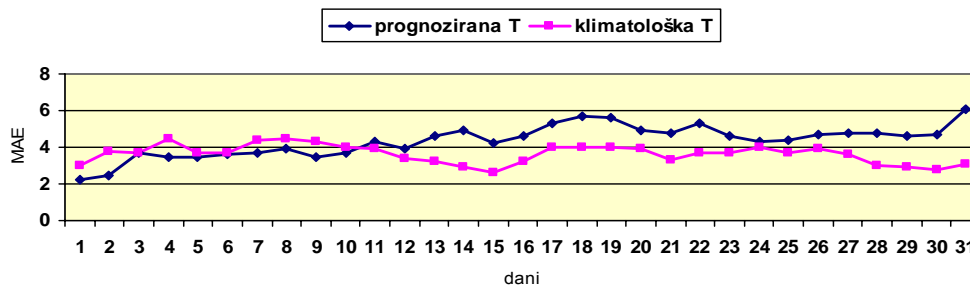
Прогнозирана количина падавина биће нешто изнад вишегодишњег просека за посматрани период и имаће вредност око 80 мм.





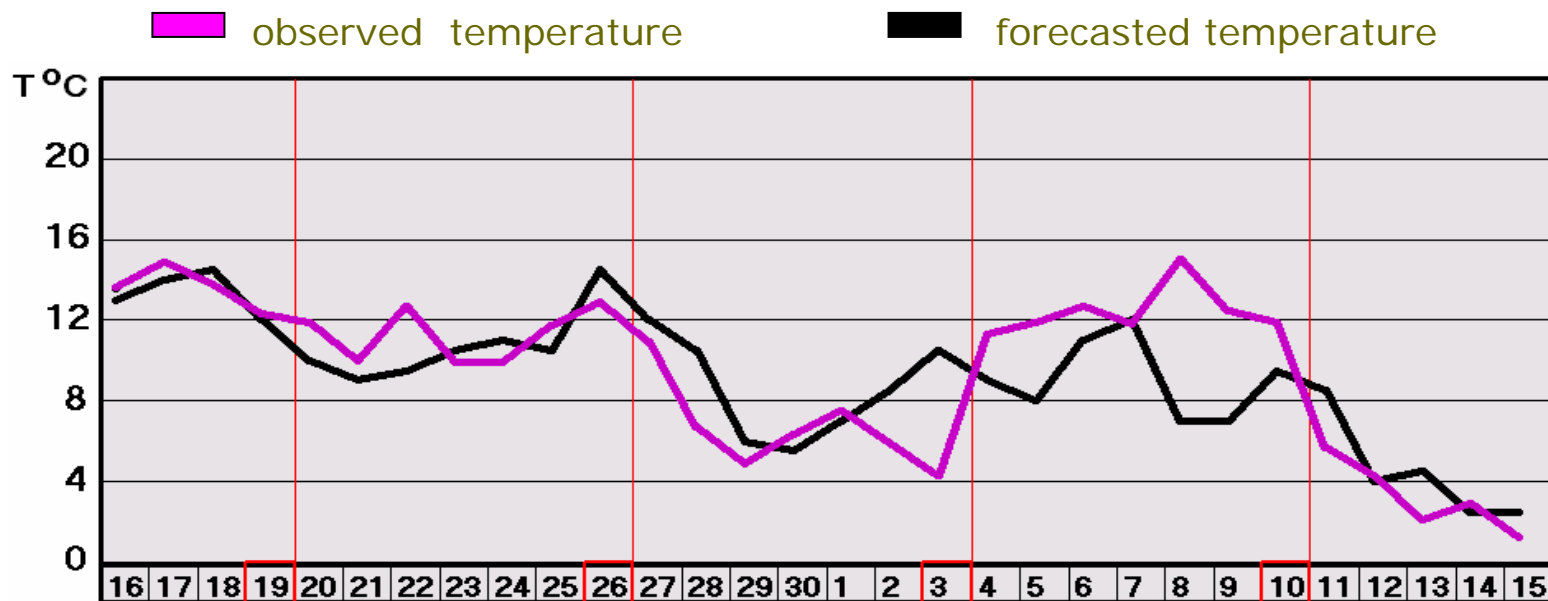
Verification

Method by analogy is used for monthly forecast. During 2005/2006 some corrections were made in using Web available EPS and monthly plumes and anomaly products. Plots of ME and MAE of mean daily temperature for Belgrade shows noticeable improvement in reliability of monthly forecast especially in the first 16 days.



Verification

Example of monthly forecast of daily mean temperature for Belgrade by combined method for period 15.11.2006 and observed mean daily temperature for the same period





Extended Range Forecast (ERF) – new approach

Users of new probabilistic ERF bulletins

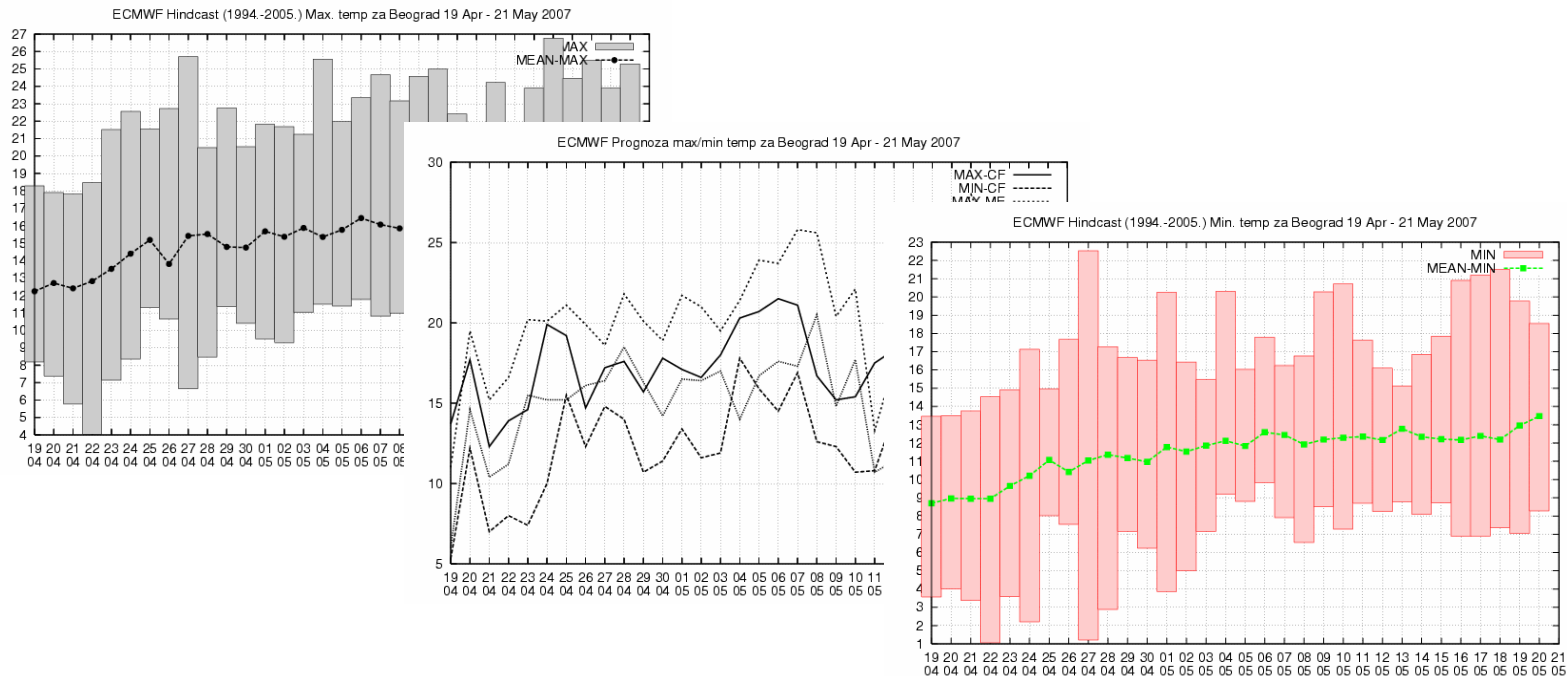
From October 2006 we started to prepare new extended range forecast bulletins (30 days ahead, till 7 months ahead) based on ECMWF EPS products for:

- ❖ Ministry of energy
- ❖ Belgrade remote heating system
- ❖ Hydrology and Agriculture departments of RHMS of Serbia



Monthly Range Forecast - new approach

- Monthly forecast-raw data in GRIB form (51 Ensemble member of Tmin, Tmax and precipitation amount),
- Hindcast data, GRIB form,
- Statistical analyses of Ensemble members, both Hindcast and forecast

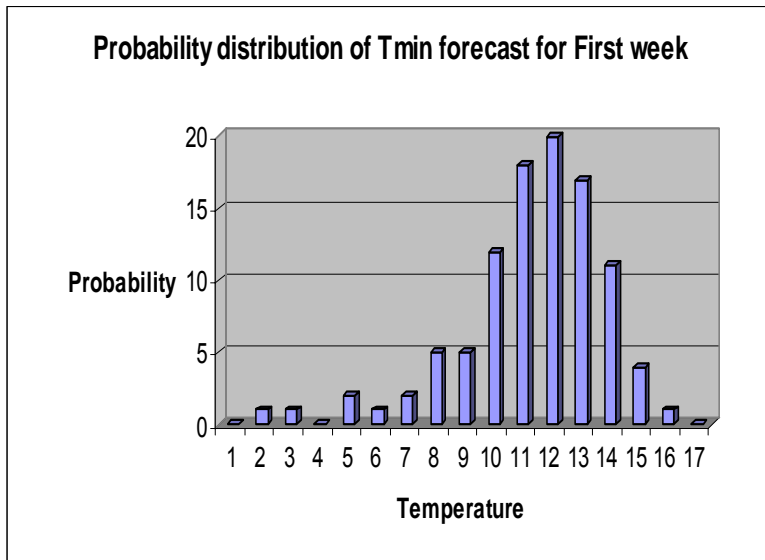




Monthly range forecast - new approach

Probabilistic bulletin for Belgrade remote heating system

Threshold of tercile and percentile for Tmin



GRANICE TERCILA I PERCENTILA za 1 nedelju

Proc.	15%	25%	33%	50%	66%	75%	85%
Temp.	10	11	12	13	13	14	15

GRANICE TERCILA I PERCENTILA za 2 nedelju

Proc.	15%	25%	33%	50%	66%	75%	85%
Temp.	10	11	12	13	14	15	15

GRANICE TERCILA I PERCENTILA za 3 nedelju

Proc.	15%	25%	33%	50%	66%	75%	85%
Temp.	9	10	11	12	14	15	17

GRANICE TERCILA I PERCENTILA za 4 nedelju

Proc.	15%	25%	33%	50%	66%	75%	85%
Temp.	8	9	10	12	14	15	16

In the bulletin thresholds are given for weekly Tmin, Tmax, Tdaily mean, also and probabilities for Tmin less than 0°C and Tmax higher than 13°C.



Seasonal range forecast

- Big mass media interest
 - Sometimes too enthusiastic expectations from them

- Textual material for newspaper, TV and Web
 - Use of all available ECMWF forecast material

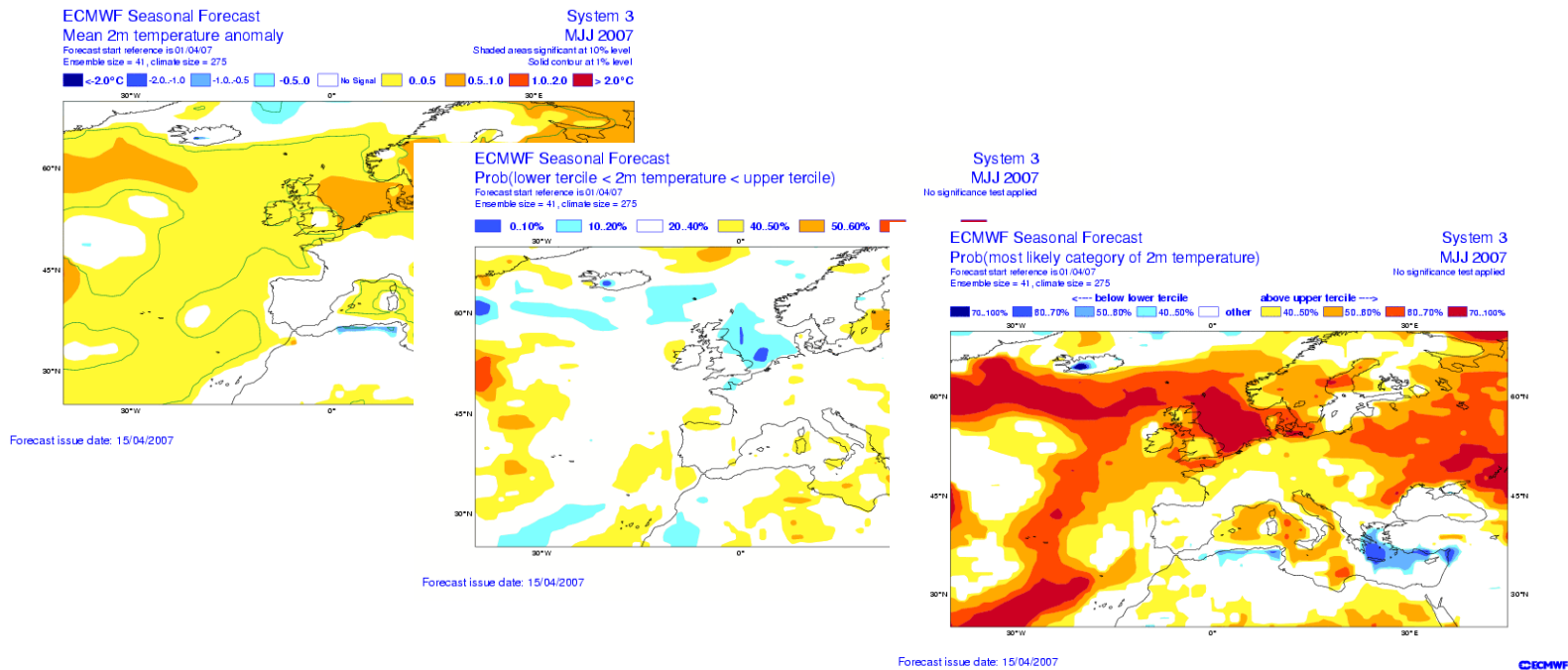
- No really experience jet



Seasonal range forecast

ECMWF Web products in use

Spatial maps of model probabilities stratified by terciles for T2m temperature and precipitation





Seasonal range forecast

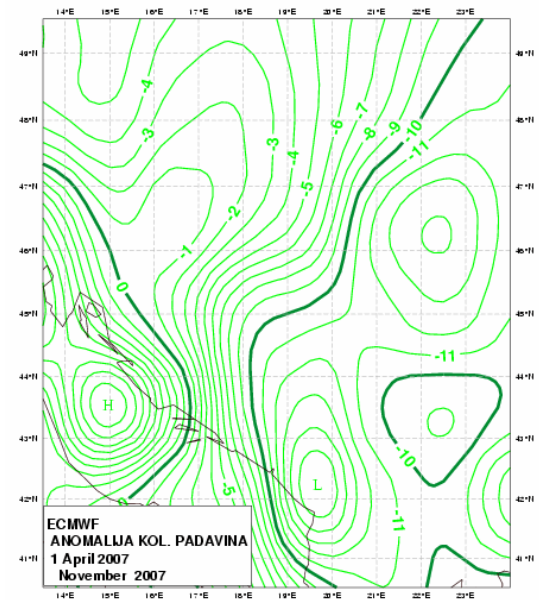
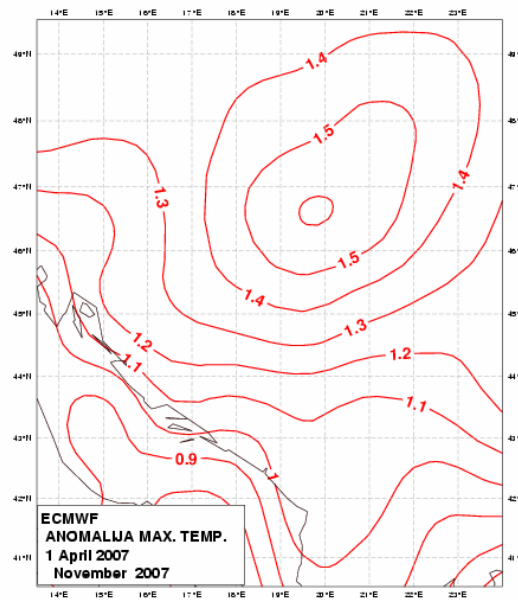
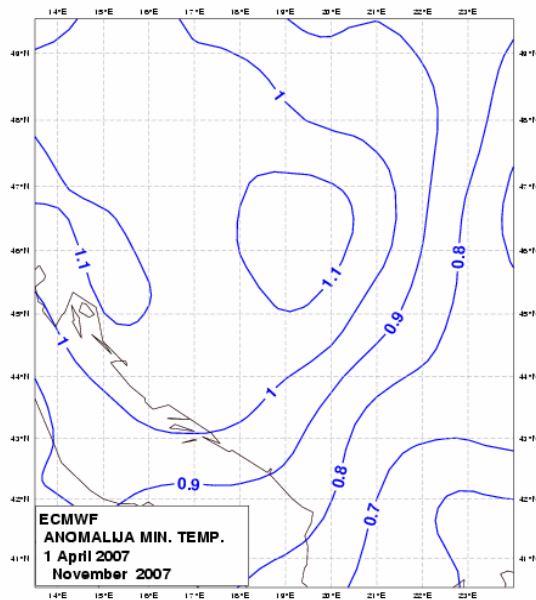
Probabilistic bulletin for Belgrade remote heating sistem

BELGRADE three month period forecast *	Daily mean air temperature in °C in 3-month climatology period	Anomaly of daily mean air temperature in °C	Releasing probability in %	Categorization of forecasted mean daily air temperature**	Categorization of thermic condition**
FMA	8.9	Below 1.4	1	Extremely below normal	Extreme cold
		From 1.4 to 5.2	4	Below normal	Cold
		From 5.3 to 11.0	15	Normal	Normal
		From 11.1 to 14.6	45	Over normal	Hot
		Over 14.6	35	Extremely over normal	Very hot
		Mean seasonal temperatures for period Februar - April will have values over or extremely over climatology values for the same period - in other words considering period will be hot or very hot concerning 3-month climatology period.			
MAM	13.8	Below 6.2	10	Extremely below normal	Extreme cold
		From 6.2 to 10.3	10	Below normal	Cold
		From 10.4 to 15.6	25	Normal	Normal
		From 15.7 to 19.2	25	Over normal	Hot
		Over 19.2	30	Extremely over normal	Very hot
		Mean seasonal temperatures for period Mart - May will have values over or extremely over climatology values for the same period - in other words considering period will be hot or very hot concerning 3-month climatology period.			
AMJ	17.8	Below 11.6	2	Extremely below normal	Extreme cold
		From 11.6 to 14.9	8	Below normal	Cold
		From 15.0 to 19.5	30	Normal	Normal
		From 19.6 to 22.3	25	Over normal	Hot
		Over 22.3	35	Extremely over normal	Very hot
		Mean seasonal temperatures for period April - June will have values over climatology values for the same period - in other words considering period will be hot concerning 3-month climatology period.			



Seasonal range forecast

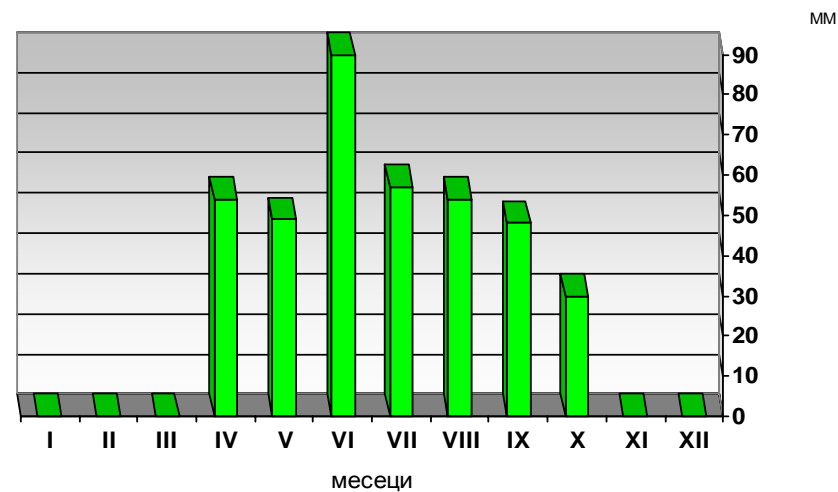
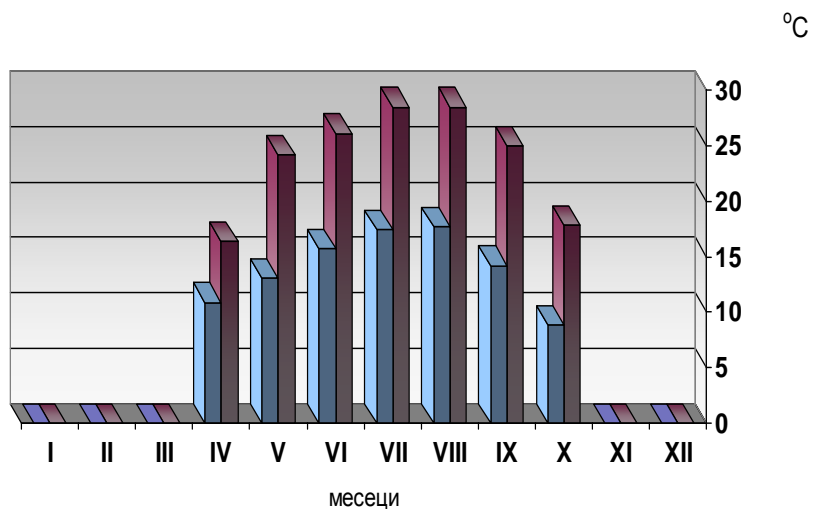
Mean monthly anomaly charts for maximum, minimum temperature and precipitation





Seasonal range forecast

Web page Mean Monthly Tmin, Tmax & Precipitation amount
forecast for Belgrade





Future challenges

- Further improvement of the analogue method combined with ECMWF products for monthly weather forecast
- Improving and developing of applications of extended range forecast for targeted users (Belgrade Remote heating system; very soon Remote heating system of the bigger towns in Serbia)
- Spreading use of the ECMWF extended range forecast, specially monthly probabilistic products for normal activities in economy
- Downscale of extended range forecast



Republic Hydro-Meteorological Service of Serbia

Thanks for your attention