The new system of flash flood forecasting in the Czech Republic

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Operational hydrology in CHMI

- Flood forecasting service
  - 48h discharge forecast calculated daily for more than one hundred profiles
  - **89 profiles** published on website [http://hydro.chmi.cz](http://hydro.chmi.cz)
  - Flash floods – hardly predictable, not standard part of operational service so far
Flood forecasting (hydrological modelling) - comparison

Large-scale floods

- Uncertainty is "relatively small"
- Results presented by hydrogram
- Accuracy of forecasts "in cm"
- Input data in 1 hour step
- Forecast updated in several hour step

Flash floods

- Great uncertainty
- Single hydrogram is not relevant
- Accuracy of forecast
  - Danger of flood exists
  - Danger of flood does not exist
- Input data in 5-10 minute step
- Forecast updated in 5-10 minute step
- Observed/unobserved catchments
Precipitation scheme

- actual time
- measured precipitation
- 3h nowcasting
- Zero precipitation

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Uncertainties...

- Measured precipitation
- Radar measurement
- Raingauges errors
- Adjustment methods
- Merge methods

3h nowcasting

Extrapolation

Adjustment methods

Actual time

Time
Variant discharge forecast

Discharge forecast in river profile 33 - 02.07.2009 13:30

Legend:
- Limit
- CELLTRACK
- CELLTRACK (history)
- INCA cz
- Persistence (1h)
- Zero precipitation forecast (ext)
- COTREC
- COTREC (ext)
- CELLTRACK (history)
- INCA ext
- Persistence (1h)
- Zero precipitation forecast (ext)
Peak discharge exceedance curve
Probability of limit discharge exceedance – Husí potok
Discharge time serie – Husí potok

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Probability of limit discharge exceedance – Husí potok
What was done…

- **Simulation of the operation** – 20 June to 20 July 2009
- 4 small catchments tested so far:
  - Husí potok
  - Jičínka
  - Luha
  - Romže
- **Measured precipitation:**
  - Radar raingauge merge algorithm (Šálek) used in operation in CHMI
  - INCA precipitation analysis
  - CZ radar network only, EXTended radar network (neighbouring countries)
  - 3 variants of measured precipitation
What was done…

- **4 precipitation nowcasting methods**
  - COTREC (Novák)
  - CELLTRACK, CELLTRACK-history (Kyznarová)
  - INCA
  - PERSISTANCE (1h)
  - CZ radar network only, EXTended radar network (neighbouring countries)
  - 8 variants of precipitation forecasts

- **Zero precipitation forecast**
  - For estimation of the influence of the measured precipitation („bottom limit estimation“)
  - CZ radar network only, EXTended radar network (neighbouring countries)

- **10 precipitation scenarios together**
### Simulation of the operation – first results

<table>
<thead>
<tr>
<th>CATCHMENT</th>
<th>NUMBER OF FLOODS</th>
<th>NUMBER OF NON-ZERO EXCEEDANCE PROBABILITIES</th>
<th>NUMBER OF HIGHER THAN 25% EXCEEDANCE PROBABILITIES</th>
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<tbody>
<tr>
<td>Husí potok</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Jičínka</td>
<td>1</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Luha</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Romže</td>
<td>0</td>
<td>10</td>
<td>7</td>
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</tbody>
</table>
Example: Various limit discharges - Jičínka
Example: Various limit discharges - Luha
Conclusion and other works

- Continue in testing operation (operative run in 2012 season)
- It is well known that flash floods can be predicted only several tenths of minutes in advance…
- Various precipitation nowcasting methods…
  - evaluate their benefit
  - calculate their flash flood detection probability
- Each catchments has different behaviour – necessary to set up different values for warning probabilities of exceedance of the limit discharge
- The improved calibration of the hydrological model can decrease the number of false alarms
- Discussion with the end users
  - Trainings necessary
  - feedback necessary (overwarning?)
Acknowledgement

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