Workshop on “fine-scale rainfall nowcasting”

31 March 2014, Antwerp
**Block 1:** Radar-based rainfall forecasting by national meteo services (integration with numerical weather prediction)

**Block 2:** Methods for fine-scale rainfall nowcasting (for urban drainage applications)

**Block 3:** Quantification of uncertainties in rainfall nowcasting (statistical methods and stochastic modeling)
Programme

**Block 1:** Radar-based rainfall forecasting by national meteo services (integration with numerical weather prediction)

- Maarten Reyniers, RMI Belgium
- Jean-Luc Cheze, MeteoFrance
- Jarmo Koistinen, FMI Finland
Block 2: Methods for fine-scale rainfall nowcasting (for urban drainage applications)

- UKMO's STEPS system for radar-based rainfall nowcasting and experiences incl. hydrological impact analysis: Clive Pierce, UK Met Office
- Recent experiences with STEPS for Belgium (PLURISK project): Loris Foresti, RMI Belgium
- Radar-based cell tracking and rainfall nowcasting: Lipen Wang, KU Leuven
- Danish experiences with short term nowcasting in urban drainage applications: Søren Thorndahl, Aalborg University
Programme

Block 3: Methods for fine-scale rainfall nowcasting (cont...) + Quantification of uncertainties in rainfall nowcasting (statistical methods and stochastic modeling)

• Probabilistic radar nowcasting for urban runoff nowcasting: Miguel Rico-Ramirez, University of Bristol
• Probabilistic uncertainty estimation in urban runoff nowcasting: David Getreuer Jensen, Aalborg University
• Multifractal predictability and prediction: Daniel Schertzer, ParisTech
• Uncertainty analysis in nowcasting and urban drainage: Patrick Willems, KU Leuven
Uncertainty analysis in nowcasting and urban drainage

Patrick Willems, KU Leuven
• Statistical quantification of total forecast uncertainty
  – Rainfall residuals = $R_{OBS} - R_{FOR} / R_{FOR}$
  – Non-parametric data-based approach (NDA) (empirical frequency distribution of rainfall residuals)
  – As function of rainfall intensity, lead time, ...

• EPS: Ensemble forecasts

Rainfall forecast uncertainty quantification

Statistical non-parametric data-based approach:

Rainfall forecast uncertainty quantification

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Rainfall forecast uncertainty quantification

Statistical non-parametric data-based approach:

Statistical vs. EPS approach:

3 key uncertainty sources:

- Model Uncertainty (MU)
- Rainfall forecast Uncertainty (RU)
- Initial Conditions Uncertainty (ICU)

Quantification of total forecast uncertainty

- NDA
- Residuals = \( \frac{Q_{\text{OBS}} - Q_{\text{FOR}}}{Q_{\text{FOR}}} \)

Quantification of uncertainty on initial conditions

- Resimulation of historical forecasts with optimal initial conditions based on long term simulation with observed input

Quantification of model uncertainty

- Long term historical simulation with observed rainfall

Flood forecast uncertainty quantification

Uncertainty decomposition

\[ s_{E_{Y-Y_0}}^2 = s_{E_{Y_0}}^2 + s_{E_Y|\text{inputs } X}^2 + s_{E_Y|\text{model-str.unc.}}^2 + s_{E_Y|\text{parameters } P}^2 + \ldots \]

Flood forecast uncertainty quantification

Flood probability map:

### Uncertainty quantification

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<th>Deterministic simulation</th>
<th>Probabilistic bias correction</th>
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Nowcasting of fine-scale extreme rainfall

2D fine scale modelling, mapping and nowcasting of urban inundations

Socio-economic risk quantification of urban inundations (incl. cultural heritage)

Risk communication and warning

Risk reduction by new sustainable management strategies (better interfacing urban water management, spatial planning and eco-management)

**WP1**

**WP2**

**WP3**

**WP4**

**WP5**
project
PLURISK

WP1: Nowcasting of fine-scale extreme rainfall

WP2: 2D fine scale modelling, mapping and nowcasting of urban inundations

WP3: Socio-economic risk quantification of urban inundations (incl. cultural heritage)

WP4: Risk communication and warning

WP5: Risk reduction by new sustainable management strategies (better interfacing urban water management, spatial planning and eco-management)

Nation-wide rainfall nowcasting system demonstrated and tested for 3 Belgian cities; applicable to any Belgian urban area.