

# 2016 HEPEX Workshop, Quebec, Canada

## *Ensemble for better hydrological forecasts*

**Day 1: 6 June 2016**

<b>8.30 - 9.00: Registration and coffee</b>		
<b>9.00-9.10</b>	Welcome note from local organizers and HEPEX co-chairs	François Anctil, Antoine Thiboult, MH Ramos, Fredrik Wetterhall, QJ Wang, Andy Wood
<b>9.10-9.20</b>	Welcome note from FloodNet: an NSERC Canadian Strategic Network	FloodNet representative
<b>Session 1 - Producing ensemble predictions and communicating uncertainty in hydrologic forecasting</b> Chair: Maria-Helena Ramos		
<b>09.20-09.40</b>	Do we (still) need ensemble predictions?	Pappenberger (ECMWF, UK)
<b>09.40-10.00</b>	Progress toward ensemble flood and 7-day streamflow forecasting services for Australia	Robertson (CSIRO, Australia)
<b>10.00-10.20</b>	Forecasting at Quebec provincial government for flood prediction and dam management – an overview of the current operational methods and challenges producing forecast uncertainties	Roussel (MDDELCC, Canada)
<b>10.20-10.40</b>	Assessing the potential of over-the-loop short-to-medium range ensemble forecasts using SHERPA	Wood (NCAR, USA)
<b>10.40 - 11.10: Coffee break</b>		
<b>Session 2 - Keynote talk and discussions</b> Chairs: Vincent Fortin and Andy Wood		
<b>11.10-11.40</b>	<b>Keynote talk:</b> Hydrological forecasting from a Great Lakes perspective	Andrew Gronewold (NOAA, Great Lakes Environmental Research Laboratory)
<b>11.40-12.30</b>	<b>Plenary discussion</b>	
<b>12:30 - 14:00: Lunch (sponsored by Rio Tinto)</b>		
<b>Session 3 - Advances in data assimilation schemes for operational forecasting systems</b> Chair: Antoine Thiboult		
<b>14.00-14.20</b>	Improving hydrologic prediction through state updating	Weerts (Deltares, Wageningen University, the Netherlands)
<b>14.20-14.40</b>	Accounting for combined effect of initial condition and model uncertainty in seasonal forecasting through data assimilation	Moradkhani (Portland State University, USA)
<b>14.40-15.00</b>	How much can we improve the hydrological forecasting skill in snow dominated regions via snow data assimilation?	Pechlivanidis (SMHI, Sweden)
<b>15.00-15.20</b>	A comparison of two approaches for state updating with the particle filter in a Nordic watershed	Chimi (INRS) & Boucher (UQAC), Canada
<b>15.20-15.40</b>	Comparison of Kalman filter type and variational data assimilation approaches for operational hydrology	Schwanenberg (University of Duisburg-Essen, Deltares, the Netherlands)
<b>15.40 - 16.00: Coffee break</b>		
<b>Poster session (sponsored by MDDELCC)</b>		
<b>16.00-17.00</b>	See list of posters below	
<b>17.00 - 18.00: Ice Breaker (sponsored by FloodNet)</b>		

## Day 2: 7 June 2016

<b>Session 4 - Enhancing science, applications and operations in hydrologic ensemble prediction systems</b>		
Chair: QJ Wang		
09.00-09.20	Processing outputs from a land-data assimilation system in order to get ensemble streamflow predictions for free: do we get more than what we paid for?	Fortin (ECCA, Canada)
09.20-09.40	"Upgraded" meteorological forcing for operational hydrological ensemble predictions: challenges, risks and chances	Zappa (WSL, Switzerland)
09.40-10.00	Ensemble flow forecasting for hydropower operations	Voisin (PNNL, USA)
10.00-10.10	Operational Hydrologic-hydraulic Ensemble Prediction System in Urban Watersheds: Runoff and Combined Sewer Overflow (CSO) Forecasts in the City of Hoboken, NJ	Saleh (Stevens Institute of Technology, USA)
10.10-10.40	Opportunities and challenges of transitioning to an inflow forecast system of higher complexity at BC HYDRO	Gobena (BC HYDRO, Canada)
<b>10.40 - 11.10: Coffee break</b>		
<b>Session 5 - Making decisions based on uncertain forecasts and economic value</b>		
Chair: Nathalie Voisin		
11.10-11.40	The game of making decisions under uncertainty: How sure must one be?	Werner & Ramos
11.40-12.10	<b>Plenary discussion:</b> How HEPEX can contribute to decision-making in hydrologic forecasting and operations?	
<b>12:10 - 12:30: Group photo</b>		
<b>12:30 - 14:00: Lunch (sponsored by Deltares)</b>		
<b>Session 6 - Value of (imperfect) hydrologic predictions in decision-making and management of water systems</b>		
Chair: Luc Perreault		
14.00-14.20	Investigating quality and value of dissimilar streamflow forecasting systems	Thiboult (Université Laval, Canada)
14.20-14.40	Assessing the economic value of an ensemble hydrological forecast: case of the Montmorency river	Matte (UQAC, Canada)
14.40-15.00	Impact of better forecasts on a decision model for hydropower	Cassagnole & Ramos (IRSTEA, France)
15.00-15.20	Understanding the statistical structure of GCM ensemble forecasts	QJ Wang (CSIRO)
15.20-15.40	Development and implementation of a probabilistic medium-range forecasting service for waterway transport on the River Rhine	Klein (Federal Institute of Hydrology, Germany)
<b>15.40 - 16.00: Coffee break</b>		
<b>Round table: Towards a socio-hydrology framework for hydrologic forecasting and water-related disaster management</b>		
Chairs: François Anctil and Richard Turcotte		
16.00-16.30	<b>Keynote talk:</b> How forecasts can trigger humanitarian action	Andrew Kruczkiewicz (Red Cross Red Crescent Climate Centre, USA)
16.30-17.00	<b>Keynote talk:</b> Lessons learnt from the 2011 Lake Champlain and Richelieu River floods	Jean-François Cantin (Government of Canada)
17.00-17.30	<b>Plenary discussion</b>	

### Day 3: 8 June 2016 (Wednesday)

<b>Session 7 - Quality of (imperfect) hydro-meteorological predictions for hydrologic applications</b>		
Chair: Marie-Amélie Boucher		
09.00-09.20	Evaluating the U.S. National Weather Service Hydrologic Ensemble Forecast Service (HEFS) in the Middle Atlantic Region for flood and drought applications	Reed (National Weather Service, NOAA, USA)
09.20-09.40	Meteorological ensemble forecast verification study at the catchment scale over Quebec, Canada	Arandia Martinez (Hydro-Québec, Canada)
09.40-10.00	An exchangeable construction for ensemble forecasts post-processing	Courbariaux (AgroParisTech-INRA, France)
10.00-10.20	Multivariate Statistical Postprocessing of ensemble forecasts of precipitation and temperature over four river basins in California	Scheuerer (University of Colorado/NOAA, USA)
10.20-10.40	Preserving the space-time dependence structure in hydro-meteorological forecasts: a case study with analogue derived PQPF	Bellier (Université Grenoble Alpes, France)
<b>10.40 - 11.10: Coffee break</b>		
<b>Session 8 - Extended-range predictions</b>		
Chair: Ilias Pechlivanidis		
11.10-11.30	Towards timelier, sub-seasonal to seasonal streamflow forecasts in Australia to better meet user needs	Schepen (CSIRO, Australia)
11.30-11.50	From seasonal forecasts to scenarios of climatic variability	Werner (UNESCO-IHE, Deltares, the Netherlands)
11.50-12.10	Benchmarking different approaches for harnessing predictability in climate and hydrologic initial conditions for seasonal streamflow forecasting	Mendoza (NCAR, USA)
<b>12.10- 12.30: Update on the HEPEX seasonal forecasting inter-comparison experiment, by Andy Wood &amp; Andrew Schepen</b>		
<b>12:30 - 14:00: Lunch (sponsored by Université Laval)</b>		
<b>Session 9 - Practical solutions for uncertainty assessment in operational hydrologic forecasting systems</b>		
Chair: Florian Pappenberger		
14.00-14.20	Towards improved error modelling for short-term streamflow forecasting in Australia	Li (CSIRO, Australia)
14.20-14.40	Towards probabilistic flood forecasting in France	Marty (DREAL, France)
14.40-15.00	The hydrological ensemble prediction in Feilaixia basin	Aizhong Ye (BNC, China)
15.00-15.20	An operational hydrological ensemble prediction system in the Winnipeg River Basin	Bomhof (Lake of the Woods Secretariat, Canada)
15.20-15.40	Efficient uncertainty analysis in streamflow prediction for reservoir operation	Arsenault (Rio Tinto, Canada)
15.40-16.00	<b>Closing note</b>	HEPEX co-chairs and local organizers

## LIST OF POSTERS

- Hydrologic ensemble prediction: enhancing science, operation and application through HEPEX, *HEPEX co-chairs*.
- The peak box game – two years and 250 participants later, *Liechti et al.*
- Ensemble streamflow forecasting activities with WRF-Hydro, *McCreight et al.*
- Variational data assimilation by moving horizon estimation and a probabilistic pool of Conceptual Hydrological Models, *Alvarado Montero et al.*
- Investigating the relationship between precipitation input and model parameter distribution during calibration: initial results from 72 Canadian basins, *Kornelsen and Coulibaly*.
- Evaluating the impact of biased precipitation on multivariate data assimilation for streamflow predictions, *Bergeron et al.*
- Flood forecasting for rivers over cold regions using GRACE satellite observations, *Wang*.
- Comparison of ensemble verification metrics on daily mean flows and monthly peak flows, *Seid Awol, et al.*
- How do I know if I've improved my continental scale flood early warning system? *Cloke et al.*
- Verification of multi-model precipitation forecasts for optimal decision making in water management, *Van den Bergh et al.*
- Verification and comparison of seasonal meteorological ensemble forecasts for long-term hydropower plant management in Nordic watersheds, *Bazile et al.*
- Impact of dynamical downscaling on land surface model forcings, *Roundy et al.*
- Development of a gridded meteorological ensemble forecast processor at US National Water Center, *Wu et al.*
- From meteorological to hydrological post-processing: the question for an effective approach, *Moradkhani et al.*
- Post-processing and verification of monthly hydrological forecasts in Switzerland, *Monhart et al.*
- Post-processing ensemble precipitation forecasts using geometric model combination, *Robertson et al.*
- Can post-processed meteorological ensemble forecasts outperform a sophisticated analog model for operational streamflow forecasting? *Boucher et al.*
- Exploiting the novel Canadian Meteorological ensemble reforecasts for the post processing of their ensemble forecasts, *Abaza et al.*
- Systematic pairing of ensemble initial conditions and ensemble forecasts in an automated hydrologic forecast system, *Clark et al.*
- Seasonal hydrological predictability and the NMME-based forecasting over the Yellow River basin in China, *Yuan et al.*
- Seasonal forecasting of river discharge in the upper Yellow River based on the distributed grid and physical process based VIP model and beyond, *Mo et al.*
- A comparison between streamflow ensemble forecasts of an extreme hydrological event using inputs from the ECMWF and GFS ensemble weather models, *Saleh et al.*
- Critical flood event prediction based on multiple meteorological scenarios from TIGGE propagated into different hydrological conceptual models and neural networks configurations - Study case: La Mojana, Colombia, *Brochero et al.*
- Ensemble water temperature forecasting: accounting for uncertainty associated with meteorological inputs, *Ouellet-Proulx et al.*
- SWIFT2: Software for continuous ensemble short-term streamflow forecasting, *Perraud et al.*

