



## HEPEX International workshop on Post-processing and Verification of hydrological ensemble predictions

7-9 June 2011, UNESCO-IHE, Delft, the Netherlands

Co-sponsors:



Hydrological Ensemble Prediction EXperiment workshop on Post-processing and Verification.

The main goal of the June workshop was to analyse in-depth the post-processing methods brought forward by the HEPEX community, to understand their working, end-use potential, and limitations. In doing so, verification methods needed to be discussed as well, undergoing the same scrutiny of discussing the implications of their outcomes. The initial findings of the inter-comparison work on common HEPEX data-sets were presented and it was discussed how to continue these activities.

Please find below the science steering committee, the list of participants, the oral and poster programme.

With best regards,

Jutta Thielen  
John Schaake  
Albrecht Weerts  
Schalk Jan van Andel

| Science steering committee |                                      |
|----------------------------|--------------------------------------|
| Name                       | Affiliation                          |
| Albrecht Weerts            | Deltares                             |
| Andras Szöllösi-Nagy       | UNESCO-IHE                           |
| Andy Wood                  | NOAA/NWS/CBRFC                       |
| D. J. Seo                  | U. Texas at Austin                   |
| Florian Pappenberger       | ECMWF                                |
| Hamid Moradkhani           | Portland State U.                    |
| James Brown                | NOAA/NWS/OHD                         |
| Jay Day                    | Rti                                  |
| John Schaake               | Consultant                           |
| Julie Demargne             | NOAA/NWS/OHD                         |
| Jocelyn Gaudet             | Institut de recherche d'Hydro-Québec |
| Konrad Bogner              | EC/JRC                               |
| Luke Wang                  | Hazen & Sawyer                       |
| Maria-Helena Ramos         | CEMAGREF                             |
| Nathalie Voisin            | PNNL                                 |
| Paolo Reggiani             | Deltares                             |
| Qingyun Duan               | Beijing Normal University            |
| Robert Hartman             | NOAA/NWS/CNRFC                       |
| Roland Price               | UNESCO-IHE                           |
| Schalk Jan van Andel       | UNESCO-IHE                           |
| Stefano Tibaldi            | ARPA SIM                             |
| Thibault Mathevet          | EDF                                  |
| Tom Hopson                 | NCAR                                 |
| Tom Pagano                 | CSIRO                                |
| Vincent Fortin             | CMC                                  |

## Participants

|    | Name                     | Affiliation   |
|----|--------------------------|---|
| 1  | Albert van Dijk          | CSIRO   |
| 2  | Albrecht Weerts          | Deltares  |
| 3  | Allen Bradley            | University of Iowa  |
| 4  | Andras Szöllösi-Nagy     | UNESCO-IHE  |
| 5  | Arnold Lobbrecht         | HydroLogic/UNESCO-IHE   |
| 6  | Cees Diks / Jasper Vrugt | University of Amsterdam   |
| 7  | Dimitri Solomatine       | UNESCO-IHE  |
| 8  | Eric Sprokkereef         | Rijkswaterstaat   |
| 9  | Ezio Todini              | University of Bologna   |
| 10 | Florian Pappenberger     | ECMWF   |
| 11 | Gabriele Coccia          | idrologia&ambiente s.r.l.   |
| 12 | Hua Chen                 | Wuhan University  |
| 13 | Ioanna Zalachori         | CEMAGREF  |
| 14 | James Brown              | NOAA/NWS/OHD  |
| 15 | Jan Verkade              | Deltares  |
| 16 | Jay Day                  | Riverside   |
| 17 | Jeremy Chardon           | EDF   |
| 18 | Jocelyn Gaudet           | Institut de recherche d'Hydro-Québec  |
| 19 | John Schaake             | Consultant/NWS  |
| 20 | Kees Kok                 | KNMI  |
| 21 | Konrad Bogner            | EC/JRC  |
| 22 | Luciano Raso             | TU Delft  |
| 23 | Luke (Lucien) Wang       | NOVA Consulting & Engineering   |
| 24 | Maria-Helena Ramos       | CEMAGREF  |
| 25 | Micha Werner             | Deltares/UNESCO-IHE   |
| 26 | Nathalie Voisin          | Pacific Northwest National Laboratory   |
| 27 | Norbert Demuth           | Hydrologie und Hochwasserschutz, Landesamt für Umwelt, Wasserwirtschaft und Gewerbeaufsicht Rheinland-Pfalz |
| 28 | Norman Crawford          | Hydrocomp   |
| 29 | Paolo Reggiani           | Deltares  |
| 30 | Qingyun Duan             | Beijing Normal University   |
| 31 | Robert Hartman           | NOAA/NWS/CNRFC  |
| 32 | Robert Mureau            | Meteo-Consult   |
| 33 | Roland Price             | UNESCO-IHE  |
| 34 | Sara Liguori             | Bristol University  |
| 35 | Satish Regonda           | NOAA, National Weather Service  |
| 36 | Schalk Jan van Andel     | UNESCO-IHE  |
| 37 | Stefano Tibaldi          | ARPA SIM  |
| 38 | Thibault Mathevet        | EDF   |
| 39 | Tom Hopson               | NCAR  |
| 40 | Tom Pagano               | CSIRO   |

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|----|-------------------|---|
| 41 | Tommaso Diomede   | ARPA SIMC   |
| 42 | Zheng Ziyan       | Institute of Atmospheric Physics,<br>Chinese Academy of Science |
| 43 | Steven Weijs      | TU Delft, NL, and EPFL, Switzerland                             |
| 44 | Fabrizio Tonelli  | ARPA SIMC   |
| 45 | Martin Ebel       | Deltares  |
| 46 | Bruce Davison     | McGill University - Environnement<br>Canada                     |
| 47 | Marco Latraverse  | Rio Tinto Alcan   |
| 48 | Stefan Uhlenbrook | UNESCO-IHE  |

# Programme

| Posters  |                                    | Poster |
|--|------------------------------------|--------|
| <i>Title</i>   |                                    |        |
| Comparison of two hydrological ensemble postprocessing methods   | Qingyun Duan                       | 1      |
| An evaluation of the performance of downscaling methods in driving hydrological models                                     | Hua Chen                           | 2      |
| Comparison of rainfall-runoff model post-processing approaches in the context of an operational ensemble forecasting chain | Thibault Mathevet / Jeremy Chardon | 3      |
| Information-theoretical evaluation of probabilistic forecasts  | Steven Weijs                       | 4      |
| Valuing information from high resolution forecasts   | Kees Kok                           | 5      |

| <b>Tuesday, June 7</b> |   |   | Pre-sen-tation |
|------------------------|---|---|----------------|
| 12:00                  | <b>Registration and Ice-breaker lunch</b>   |   |                |
| <b>Session 1</b>       | <b>Presentations HEPEX</b>  | <i>Chair: Schalk Jan van Andel</i>                    |                |
| 13:30                  | Opening   | Rectorate UNESCO-IHE represented by Stefan Uhlenbrook | Intro          |
| 13:45 – 14:15          | Introduction: HEPEX, set-up of the current workshop and data sets; overview of the experimental design document | John Schaake  | 6              |
| 14:20 – 14:40          | Innovative Tools for Water Quality/Quantity Management: New York City's Operations Support Tool                 | Luke Wang   | 7              |
| 14:40 – 15:00          | An Ensemble Post-Processor for the New York City Operations Support Tool  | Jay Day   | 8              |
| 15:00 – 15:30          | <i>Poster announcements/session - Coffee-break</i>  |   |                |
| 15:30 – 15:50          | Probabilistic Forecasts Within a Time Horizon and Exact Flooding Probability                                    | Gabriele Coccia / Ezio Todini                         | 9              |
| 15:50 – 16:10          | Estimating the benefits of probability forecasting for flood warning  | Jan Verkade   | 10             |
| 16:10 – 16:30          | NWS Requirements for Operational Hydrologic Post-Processing   | Robert Hartman  | 11             |

|                          |   |                                       |    |
|--------------------------|---|---------------------------------------|----|
|                          | <i>Short break</i>  |                                       |    |
| 16:40 – 17:00            | HEPEX data sets   | Qingyun Duan                          | 12 |
| 17:00 – 17:30            | Discussion / Comments on the experimental set-up  |                                       |    |
|                          |   |                                       |    |
|                          |   |                                       |    |
| <b>Wednesday, June 8</b> |   |                                       |    |
|                          |   |                                       |    |
| <b>Session 2</b>         | <b>Presentations Verification</b>   | <i>Chair: Albrecht Weerts</i>         |    |
| 9:00 – 9:20              | Using Forecast Verification to Evaluate Forecast System Enhancements for Long-Range Hydrologic Ensemble Predictions   | Allen Bradley                         | 13 |
| 9:20 – 9:40              | Impact of sample size on forecast verification scores and post processing parameters of hydrological ensemble predictions   | Ioanna Zalachori / Maria-Helena Ramos | 14 |
| 9:40 – 10:00             | Some Perspectives on the Relationship Between Dependent and Independent Verification Statistics Suggested by an Analysis of Ensemble Simulation Results for the HEPEX Hydrological Ensemble Post-processing and Verification Workshop | John Schaake                          | 15 |
| 10:00 – 10:30            | <i>Poster Session – Coffee-break</i>  | Coffee-break                          |    |
| 10:30 – 10:50            | Near real time data assimilation for hydrological forecasting and uncertainties   | Nathalie Voisin                       | 16 |
| 10:50 – 11:10            | Short-term HEPS - experimental design   | Bruce Davison                         | 17 |
| 11:10 – 11:30            | Short-term hybrid forecasts blending NWP rainfall forecasts and radar nowcasts for probabilistic flow predictions   | Sara Liguori                          | 18 |
| 11:30 – 11:40            | <i>Short break</i>  |                                       |    |
| 11:40 – 12:00            | Comparison of calibration techniques for a limited-area ensemble precipitation forecast using re-forecasts  | Tomasso Diomede                       | 19 |
| 12:00 – 12:20            | Tree generation for adaptive control  | Luciano Raso                          | 20 |
| 12:20 – 12:40            | Machine learning in building models of models' uncertainty  | Dimitri Solomatine                    | 21 |
|                          |   |                                       |    |
| 12:40 – 13:40            | Lunch   |                                       |    |
|                          |   |                                       |    |
| <b>Session 3</b>         | <b>Workshop Post-processing hydrological simulations</b>  | <i>Chair: Konrad Bogner</i>           |    |

|                         |   |  |    |
|-------------------------|---|--|----|
| 13:40 – 14:00           | Ensemble dressing   | Tom Pagano                             | 22 |
| 14:00 – 14:20           | Evaluation of a Gaussian regression based streamflow postprocessor using simulated streamflows for test basins in the southeast U.S.  | Satish Regonda                         | 23 |
| 14:20 – 14:40           | Post-processing and combining hydrological ensemble forecast systems  | Konrad Bogner                          | 24 |
| 14:40 – 15:00           | <i>Poster session - Coffee-break</i>  |  |    |
| 15:00 – 15:30           | Introduction to the working groups  | <i>John Schaake</i>                    |    |
| 15:30 – 17:00           | Parallel working groups<br>A: Ensemble simulation of hydrologic model predictive uncertainty  |  |    |
| 15:30 – 17:00           | Parallel working groups<br>B: Approaches to measure performance of ensemble simulations of hydrologic model predictive uncertainty  |  |    |
| 17:00 – 17:30           | Plenary summary and discussion of Session 3 working group activities  | <i>Session 3 working group leaders</i> |    |
|                         |   |  |    |
| <b>Dinner</b>           |   |  |    |
|                         |   |  |    |
| <b>Thursday, June 9</b> |   |  |    |
|                         |   |  |    |
| <b>Session 4</b>        | <b>Workshop Post-processing hydrologic ensemble predictions</b>   | <i>Chair: Maria-Helena Ramos</i>       |    |
| 8:40 – 9:00             | Rijnland data for HEPEX post-processing   | Schalk Jan van Anandel                 | 25 |
| 9:00 – 9:20             | Evaluation of a non-parametric post-processor for hydrologic uncertainty estimation and bias-correction, with application to a multi-model ensemble of simulated streamflows from test basins in the southeast U.S. | James Brown                            | 26 |
| 9:20 – 9:40             | Comparison of point forecast accuracy of model averaging methods in hydrologic applications, Stochastic Environmental Research and Risk Assessment  | Cees Diks / Jasper Vrugt               | 27 |
| 9:40 – 10:00            | Estimating predictive hydrological uncertainty using Quantile Regression  | Jan Verkade                            | 28 |
| 10:00 – 10:30           | <i>Poster session - Coffee-break</i>  |  |    |
| 10:30 – 11:00           | Introduction to the working groups  | <i>Albrecht Weerts</i>                 |    |
| 11:00 – 12:30           | Parallel working groups<br>A: Approaches to post-process  |  |    |



|                  |  |  |  |
|------------------|--|--|--|
|                  | hydrologic ensemble forecasts  |  |  |
| 11:00 – 12:30    | Parallel working groups<br>B: Approaches to measure performance of procedures to post-process hydrologic ensemble forecasts                              |  |  |
|                  |  |  |  |
| 12:30 - 13:30    | Lunch  |  |  |
|                  |  |  |  |
| <b>Session 5</b> | <b>Results and agreements on further actions</b>   | <i>Chair: John Schaake</i>             |  |
| 13:30 - 14:00    | Presentations / discussion session 4 working groups  | <i>Session 4 working group leaders</i> |  |
| 14:00 - 15:00    | Plenary discussion of all working group activities<br>Assessment of intercomparison activities to date   |  |  |
| 15:00-15:30      | <i>Coffee-break</i>  |  |  |
| 15:30 - ~        | Towards future testbed activities and inter-comparison studies<br>Special Issue in Hydrological Processes<br>Publications in Journal of Hydrometeorology |  |  |
| ~                | Closure  |  |  |