Monday 8 March

0830   Registration

Session 1  0915-1045 – Introduction
Chair: Roberto Buizza

0915   Welcome – Philippe Bougeault – ECMWF
0925   Logistics – Roberto Buizza and John Schaake
0935   Introductions – all
0945   Workshop Objectives – John Schaake and Roberto Buizza
1000   Introduction to HEPEX – Soroosh Sorooshian

1030   Break

Session 2  1100-1230 - User Perspectives
Chair: Jim Wallace

1100   Ad De Roo
1110   Paolo Reggaini
1120   Martin Best
1130   California – Rob Hartman
1140   Hydropower Industry – Chuck Howard
1150   NYPA – Richard Mueller
1200   BC Hydro – Eric Weiss
1210   Hydro Quebec – Noël Dacruz Evora
1220   Hydropower generation in France – Pierre Bernard

1230   Lunch

Session 3  1400-1500 - Organizational Perspectives
Chair: Soroosh Sorooshian

Very brief statements concerning possible organizational interest in HEPEX

GEWEX – Soroosh Sorooshian
European Union – TBA
IAHS/PUB – Jim Wallace
IAHS/GEWEX/WRAP – Alan Hall
GEWEX/GAPP – Jin Huang
WMO – Wolfgang Grabs
ECWMF – Philippe Bougeault
NASA – Christa Peters-Lidard
NOAA/NWS/NCEP – Zoltan Toth
NOAA/NWS/AHPS – John Schaake
Canadian WMIG – Richard Mueller
CUASHI – Rick Hooper
THORPEX/WWRP – Zoltan Toth
USWRP – Bob Gall
Session 4  1500-1830 - Weather and Climate Ensemble Prediction
Chair: Philippe Bougeault

1500  Introduction to Ensemble Forecasting – Tom Hamill

1530  Break

1600  Flood prediction with the ECMWF EPS – Roberto Buizza
1615  NCEP Ensemble Prediction – Zoltan Toth
1630  Met Office – Brian Golding
1645  SMHI – Per Kallberg
1700  Assessment of Ensemble Forecasts – Steve Mullen
1715  Ensemble forecasts in the European Flood Alert System – Ad de Roo
1730  COSMO-LEPS Ensemble Prediction System – Chiara Marsigli
1745  Precipitation verification – Anna Ghelli
1800  Parameterization of moist processes – Glenn Shutts
1815  Canada's Meteorological Ensemble Prediction System – Gilbert Brunet
1830  Operational short-term flood forecasting for Bangladesh – Tim Palmer
1845  Adjourn

1845  Reception

Tuesday 9 March

Session 5  0915-1230 – Hydrological Ensemble Prediction
Chair – Eric Wood

Introduction
0915  Operational Hydrologic Ensemble Forecasting – Rob Hartman

Hydrological Ensemble Forecasting
0945  Results of the EFFS Project – Paolo Reggiani
1000  CEH Ensemble hydrological forecasting – Bob Moore

Hydrological Models
1015  Hydrologic forecast model uncertainty issues – Hoshin Gupta

Data Assimilation
1030  GSFC’s land data assimilation systems – Christa Peters-Lidard
1045  Land data assimilation at NCEP – Dag Lohmann

1100  Break

Case Studies
1130  Seasonal hydrological forecast system for the Western U.S. – Andy Wood
1145  Case studies of the August 2002 Danube flood – Gabor Balint
1200  Ensemble forecasts for the Po Basin Flood of 2000 – Pedro Viterbo

Verification
1215  Ensemble forecast verification – Allen Bradley

1230  Lunch
Session 6  1400–1800 - Break-out Groups (1)
Chair: John Schaake and Roberto Buizza

(Break @ 1530)

Group 1  Meteorological Aspects of Ensemble Prediction
Co-leaders: Tom Hamill and Ken Mylne

What are the requirements for meteorological ensemble forecasts to support hydrological ensemble prediction? Do meteorological ensemble forecasts account for important meteorological and climatological uncertainties? What are the scientific issues or questions that need to be addressed to meet these requirements? What is the role for operational forecasters? How do long-range Ocean-Atmosphere phenomena (i.e. El Niño) affect short- medium- and long-range hydrological forecasting?

Include the following brief presentation:
- Daniel Shertzer - Quantifying EPS forecast skill

Group 2  Hydrological Aspects of Ensemble Prediction
Co-leaders: Sanja Perica and Bob Moore

How to measure (validate) performance of ensemble forecasts at different time and space scales? How can hydrological uncertainty be accounted for? What are the requirements for hydrological ensemble forecasts to support water management, emergency services and other users? What are the scientific issues or questions that need to be addressed to meet these requirements? How does the uncertainty in weather forecasts translate into hydrological uncertainty? What is the relative role of weather and climate forecasts vs initial hydrological conditions in affecting the skill of hydrological forecasts? What is the role for operational forecasters? What interface is needed for forecasters to control the operation of a hydrological ensemble forecast system? How to post process ensemble predictions?

Include the following brief presentations:
- Barbro Johansson - Hydrological ensemble prediction plans at the SMHI
- Emmanuel Roulin - Hydrological ensemble forecasts for Belgium
- Peter Krahe - Use of ensemble forecasts for flood warning in Central Europe
- Günter Blöschl - Operational flood forecasting system in Lower Austria
- Kristie Franz – Ensemble forecast verification
- Ezio Todini - Bayesian combination of analogs and ensemble forecasts
- Jost von Hardenberg - Evaluation of uncertainty propagation

Group 3  Data Assimilation
Co-leaders: Christa Peters-Lidard and Per Kallberg

What is the role of data assimilation in hydrological ensemble prediction? How can LDAS projects contribute to HEPEX? What are the opportunities to assimilate satellite data? How to account for uncertainty in initial conditions? Is there a role for ensemble precipitation analysis (PQPE)?
Group 4  Hydrological Modeling  
Co-leaders: Hoshin Gupta and Gabor Balint

What are the sources of uncertainty in hydrological models? What are the implications of hydrological models being imperfect representations of real hydrological systems? How can hydrologic uncertainty be quantified? What are the hydrological modeling science issues that are important for HEPEX to consider? How can uncertainties in hydrological models, model parameters and hydrological initial conditions be represented in hydrological ensemble prediction?

Include the following brief presentations:

- Praveen Kumar – Identification of parameter dominance 
- Eric Gaume - Choice of rainfall-runoff 
- Michele Ferri - Geomorphologic – MonteCarlo models of hydrologic response 
- Florence Habets - Monitoring of the water budget over France 
- Thian Yew Gan - Short-Term Climatic and Hydrologic 
- Paolo Reggiani – Representative elementary watershed modeling 

1700 – 1800  Plenary reports from break-out groups and discussion  
Group 1 - Tom Hamill and Ken Mylne 
Group 2 - Sanja Perica and Bob Moore 
Group 3 - Christa Peters-Lidard and Per Kallberg 
Group 4 - Hoshin Gupta and Gabor Balint

1800  Adjourn

Wednesday 10 March

Session 7  Plenary  
Chair: John Schaake

0915 USWRP and HEPEX – Bob Gall

Session 8  0930–1230 - Break-out Groups (2)  
Chair: John Schaake and Roberto Buizza

(Break @ 1100)

Group 5  User Roles in HEPEX  
Co-leaders: Wolfgang Grabs and Richard Mueller

What are user perspectives of HEPEX? How can users participate in HEPEX? What must be done to demonstrate credibility of ensemble hydrological predictions? How can weather and climate information, including ensemble forecasts, be used reliably? What are operational forecast requirements? How can hydrological ensemble forecasts be verified, and what can be done to gain confidence that a given forecast system is reliable?

Group 6  Community Hydrologic Prediction System (CHPS)  
Co-leaders: Dag Lohmann and Eric Gaume

How can the space and time scale properties of weather and climate forcing together with space and time scale properties of hydrological systems be best integrated in a hydrological ensemble prediction system? Is there a role for a Community Hydrological Prediction System to integrate contributions to HEPEX and to accelerate infusion of new science into operational forecast systems? What are the main components of a CHPS? What needs to be done to organize and develop a CHPS?
Group 7  Organizational Framework for HEPEX  
Co-leaders: Zoltan Toth and Jim Wallace  

What are the roles of the various ‘groups’ (basically meteorological and seasonal climate prediction centers and university/research center investigators)? Ideas → plans → research money → results/implementation? How should the HEPEX steering group be organized and how should it function? Is there a role for HEPEX sub-projects? How can HEPEX maintain affiliation with many different groups?

1130 – 1230  Plenary reports from break-out groups and discussion  
Group 5 - Wolfgang Grabs and Richard Mueller  
Group 6 - Dag Lohmann and Eric Gaume  
Group 7 - Zoltan Toth and Jim Wallace  

Lunch 1230  

Session 8  1400–1530 - Break-out Groups (2 contd)  
Chair: John Schaake and Roberto Buizza  

Break 1530  

Group 8  Contributions & Future Activities  
Co-leaders: Alan Hall and Steve Mullen  

What kinds of contributions should HEPEX aspire to produce? Is there a role for future “test beds” and case studies? If so what are they? What role should HEPEX play in developing a CHPS?

Group 9  Science & Implementation Strategy  
Co-leaders: Eric Wood and Martin Best  

What are the key elements of the science and implementation strategies for HEPEX? What are the key science questions that need to be addressed by the HEPEX science plan?

Group 10  Education/User Applications/Product Development  
Co-leaders: Chuck Howard and Ad de Roo  

What needs to be done to be sure that HEPEX results are useful? What should be done to help users to use probabilistic products? What needs to be done to facilitate product development?

1600 – 1700  Plenary reports from break-out groups and discussion  
Group 8 - Alan Hall and Steve Mullen  
Group 9 - Eric Wood and Martin Best  
Group 10 - Chuck Howard and Ad de Roo  

1700 – 1800  Workshop summary and discussion  

1800  Adjourn