

# Hydrological Ensemble Prediction Experiment (HEPEX)

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5<sup>th</sup> International Science Conference  
on the Global Energy and Water Cycle

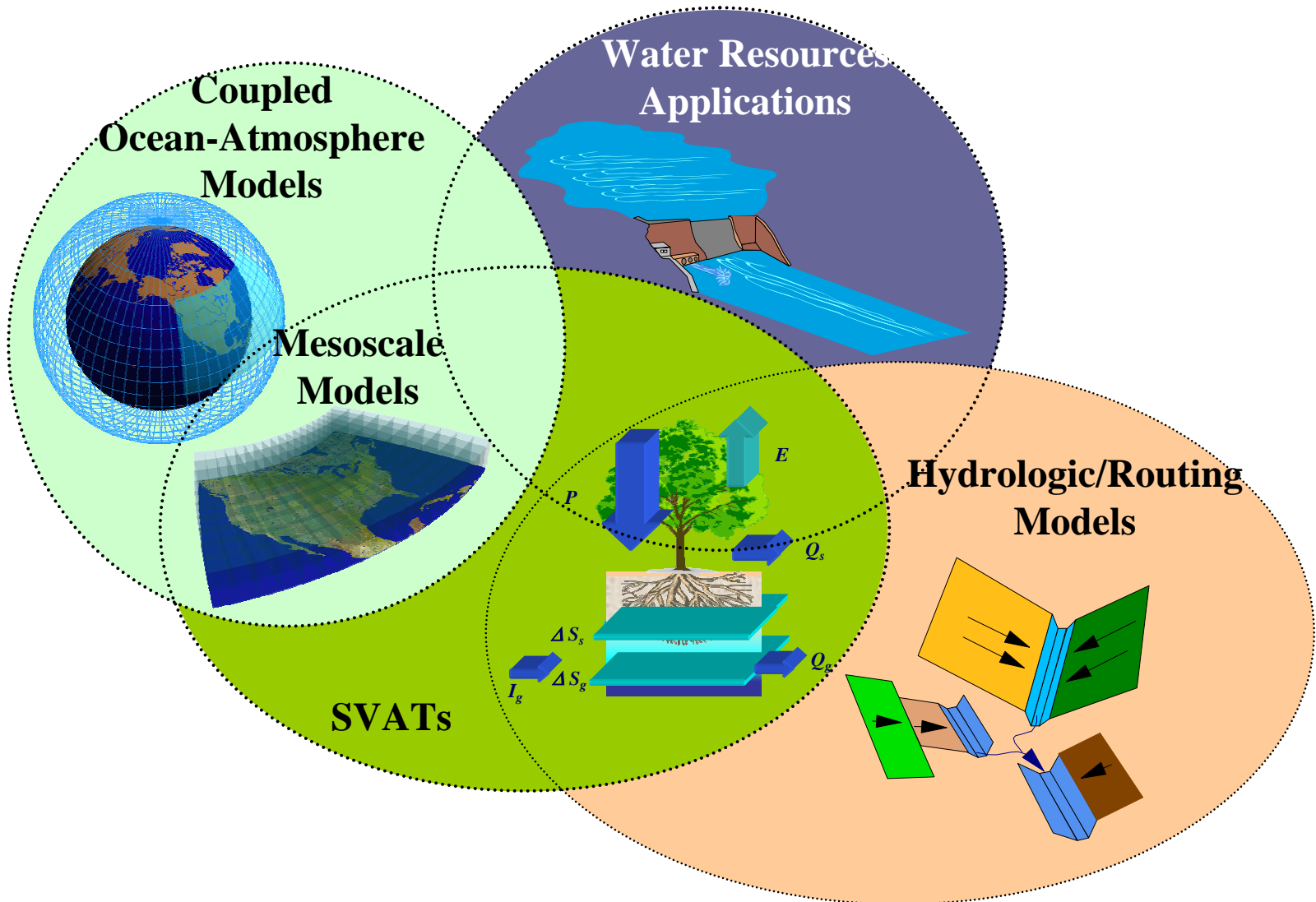
June 20, 2005

# HEPEX Goal

- **HEPEX aims to demonstrate how to produce reliable hydrological ensemble forecasts that can be used with confidence to make decisions for emergency management and water resources management.**

This will have important consequences for the economy, for public health and safety.

# Model Coupling, Downscaling, and Hydrologic Applications

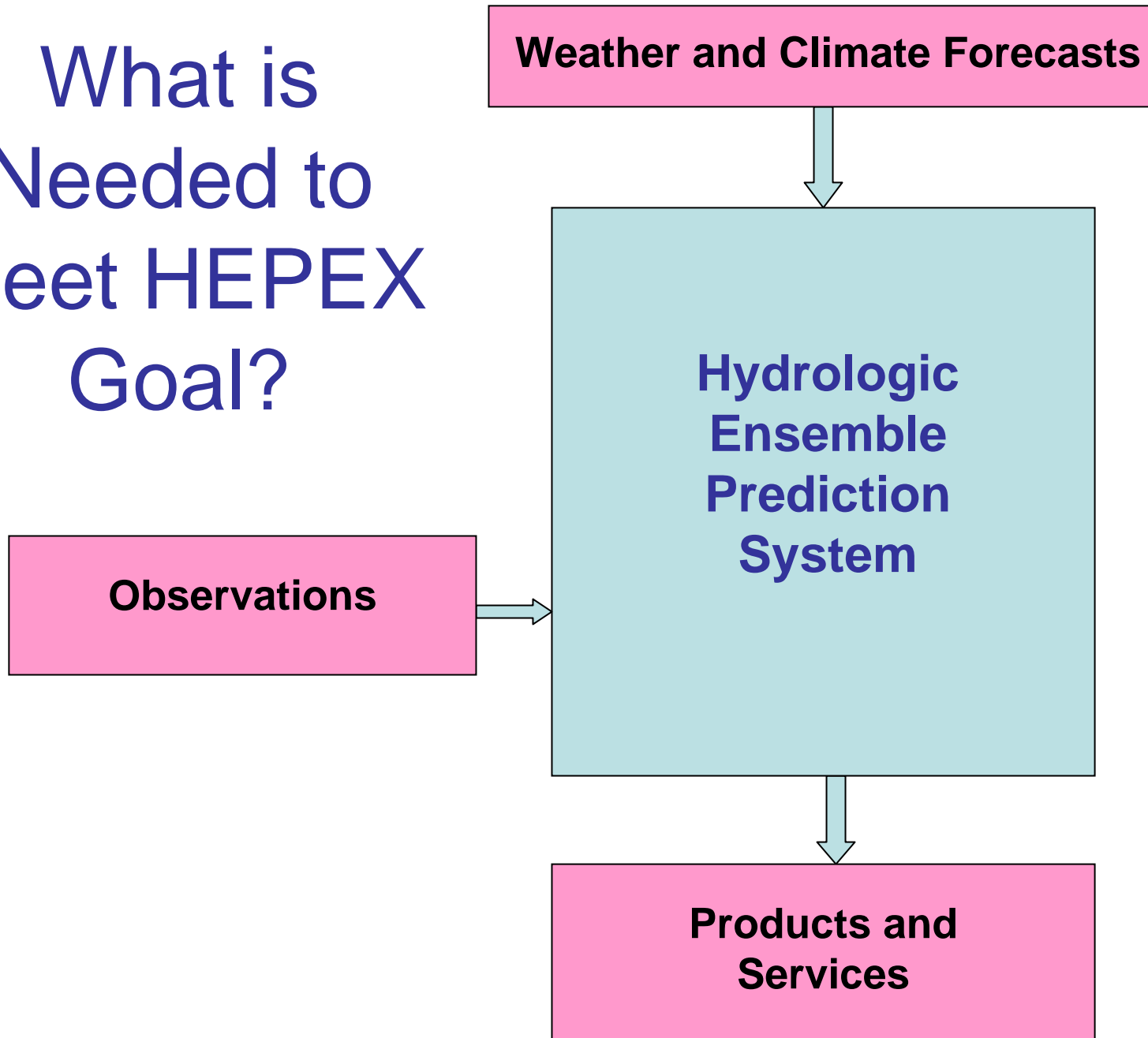


# Initial Workshop

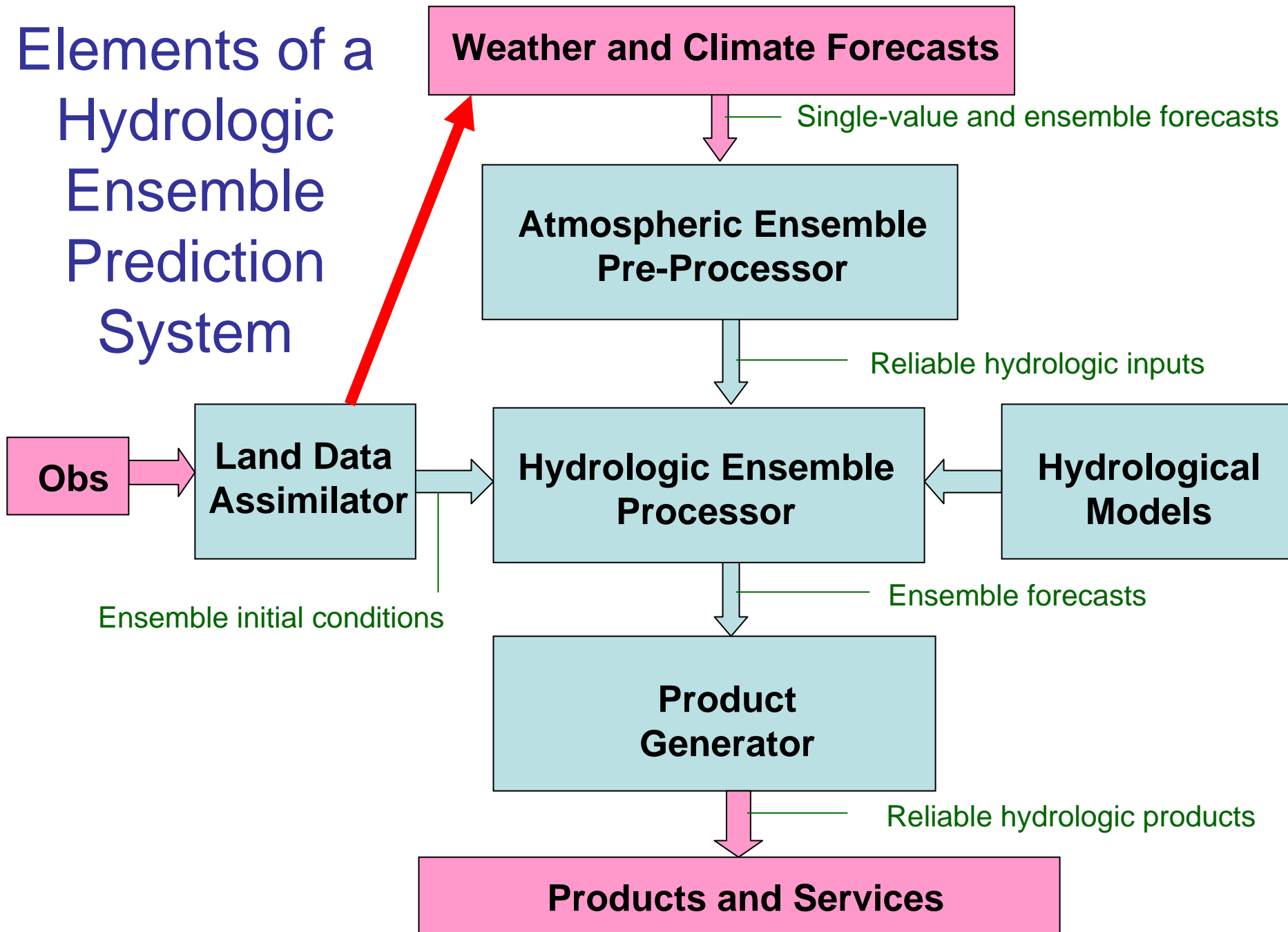
- ECMWF - March 8-10, 2004
- 80 Participants
- 16 Countries
- Users [NY Power, BC Hydro, Quebec Hydro, EDF (France), Mekorot (Israel), WMIG (Canada), CddHoward (Canada), SMHI (Sweden), BGF (Germany), ...]
- Meteorologists
- Hydrologists



# What is Needed to Meet HEPEX Goal?






# Elements of a Hydrologic Ensemble Prediction System



# User Focus

- User Council – Chuck Howard
  - CEA Technologies
  - Hydro Quebec
  - BC Hydro
  - ONS, Brazil
  - ICID – India
  - WMO – HWRD
- Hydrological Services
  - NWS
  - UK
  - Canada
  - EU – JRC
  - Germany
  - Brazil
  - Australia

# Three Basic Elements of HEPEx

- Testbed Projects 
- Supporting Data Sets 
- Components of the Community Hydrologic Prediction System (CHPS) 




# What have we have achieved so far?

- The definition of the HEPEX goal
- Increased communication between hydrologists and meteorologists
- A forum for discussion: the 2 HEPEX workshops
- Special Sessions (EGU, AGU)
  - Special issue of EGU HESS Journal (under construction)
- Proposals for a way forward:
  - Test beds
  - Data sets
  - CHPS components
- Links with other international projects (e.g. TIGGE/THORPEX, GEWEX, WMO-HWRD, IAHS, WWRP)
- A web site (thanks to K Franz et al)
- An ftp site (Hydrology Component/GAPP Core Project)

# What have we have not yet achieved?

- The establishment of an organizational structure
- A better understanding of HEPEX' potential deliverables
- A clearer definition of the proposed HEPEX test-beds
- The establishment of data-set requirements
- A clear plan for the construction of the HEPEX integrated system (CHPS)
- Funding?

# What should we do next?

- Establish an organizational structure
- Define HEPEX deliverables:
  - Test-beds
    - How many?
    - Science objectives?
    - Location?
    - Leading institutions?)
  - Data-sets
  - CHPS Components
  - Reports (to be published in the literature?)
  - ??
- Listen to (end-)users' demands
- Educate users that a probabilistic approach is more valuable than a
- Define more clearly the links with other projects 
- Apply for funds?
- ???

Thank You

# HEPEX Testbed Projects

- Canada
- GE2 
- Europe
  - EU-JRC Ispra, Pan-European Flood
  - Germany, BFG-DWD, Danube
  - EU Framework 5&6 Projects (ACTIV, Floodrelief, etc.)
- Brazil
- Australia?
- TIGGE-HEPEX

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# GAPP Ensemble Project (GE2)

- GAPP contribution to HEPEX
- Three building blocks
  - Hydrologic Testbed Activities
  - Supporting Data Sets
  - Community Hydrologic Prediction System Components

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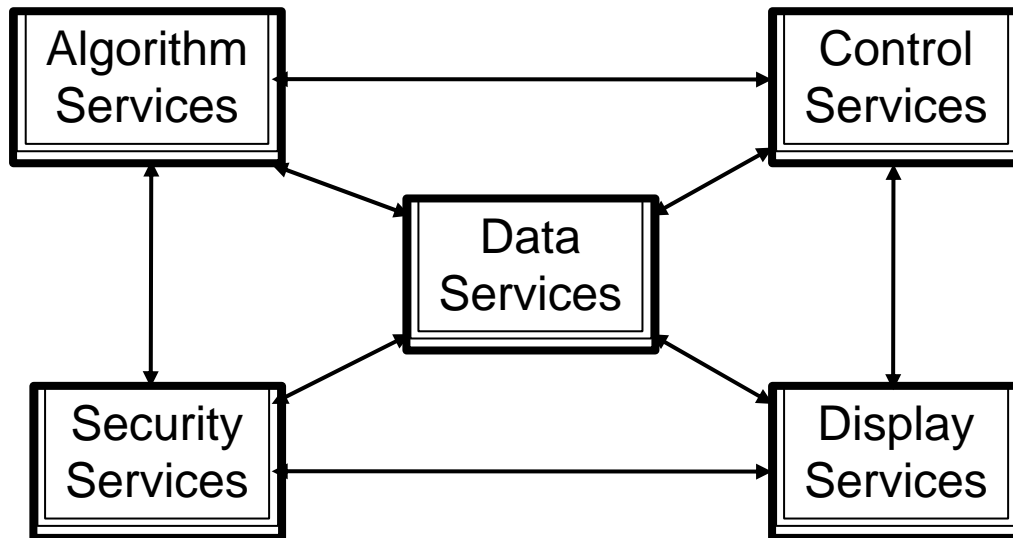
# Supporting Data Sets

## (Under Construction)

- GFS Fixed Ensemble (1979 – present)
  - Temperature and Precipitation
  - Selected Regions
  - Ensemble mean, pop, cavg, ccv + members
- Precipitation and Temperature Analyses
  - Selected Regions
  - Multi-scale
- Hydrological Basins (MOPEX)
  - Forcing
  - Basin characteristics
  - Streamflow
  - Snow, soil moisture, satellite, etc
- TIGGE Ensembles
- CPC Products (for US)
- Other? (e.g. ECMWF, CMS, etc.)

# Community Hydrologic Prediction System (CHPS)

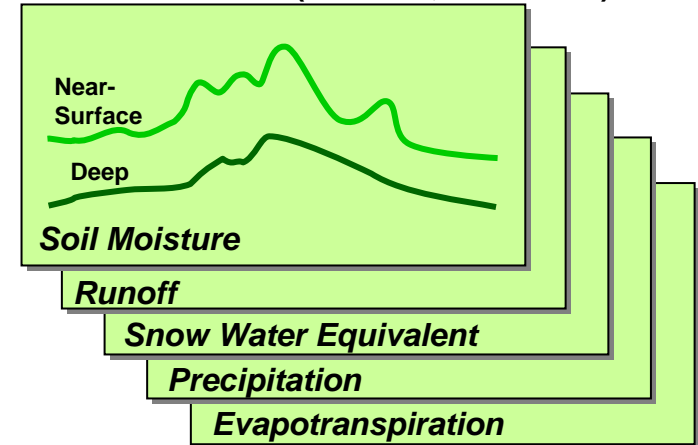
Federal agencies  
State, regional, and local cooperators  
Universities  
Private sector  
International organizations



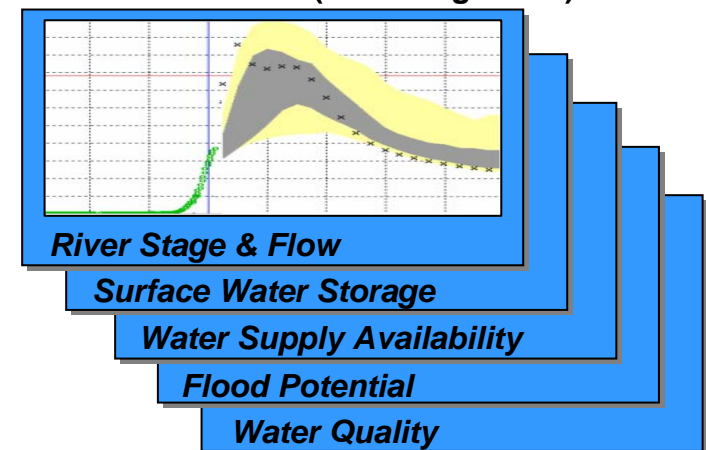
Hydrology XML Consortium

<http://www.weather.gov/oh/hydroxc/index.html>

Point Information (Stations, Grid Cells)



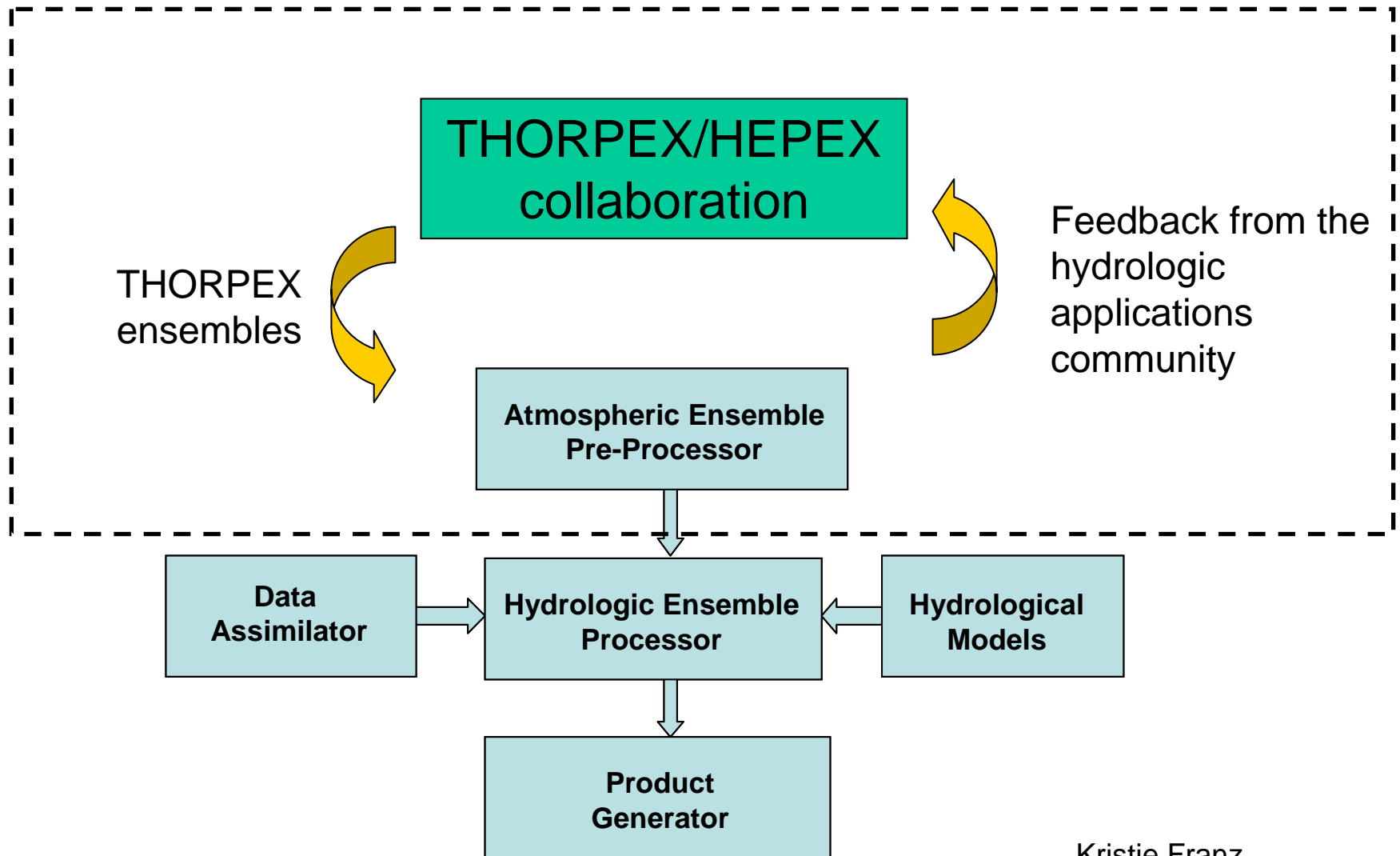
Vector Information (River Segments)



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# Focus of Proposed THORPEX/HEPEX Hydrologic Application Project



Kristie Franz

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Thank You

# HEPEX Meetings

- EGU 2005 – Special HEPEX Session
  - HESS special issue TBD
- AGU Fall 2004 – Special Ensemble Session
- IAHS 2005 – Water Resources Workshop
- 2<sup>nd</sup> HEPEX Workshop – NCAR – July 2005

# HEPEX Workshop

## Boulder – July 19-22, 2005

<http://box.mmm.ucar.edu/events/hepex05/>

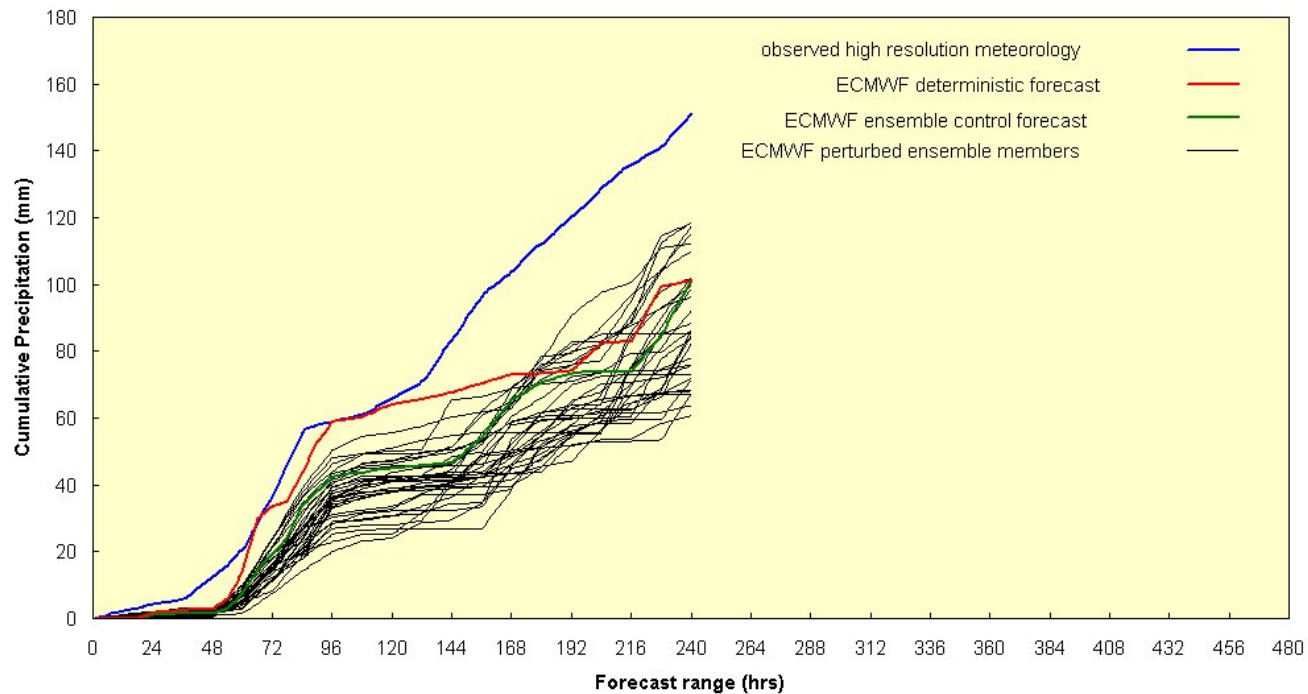
- Workshop Topics

- User Needs
- Hydrologic application of atmospheric ensembles
- Data assimilation (hydrologic initial conditions)
- Modeling hydrologic uncertainty
- Hydrologic ensemble processing
- Verification
- Community Hydrologic Prediction System (CHPS)
- Demonstration Projects
- THORPEX Applications Project

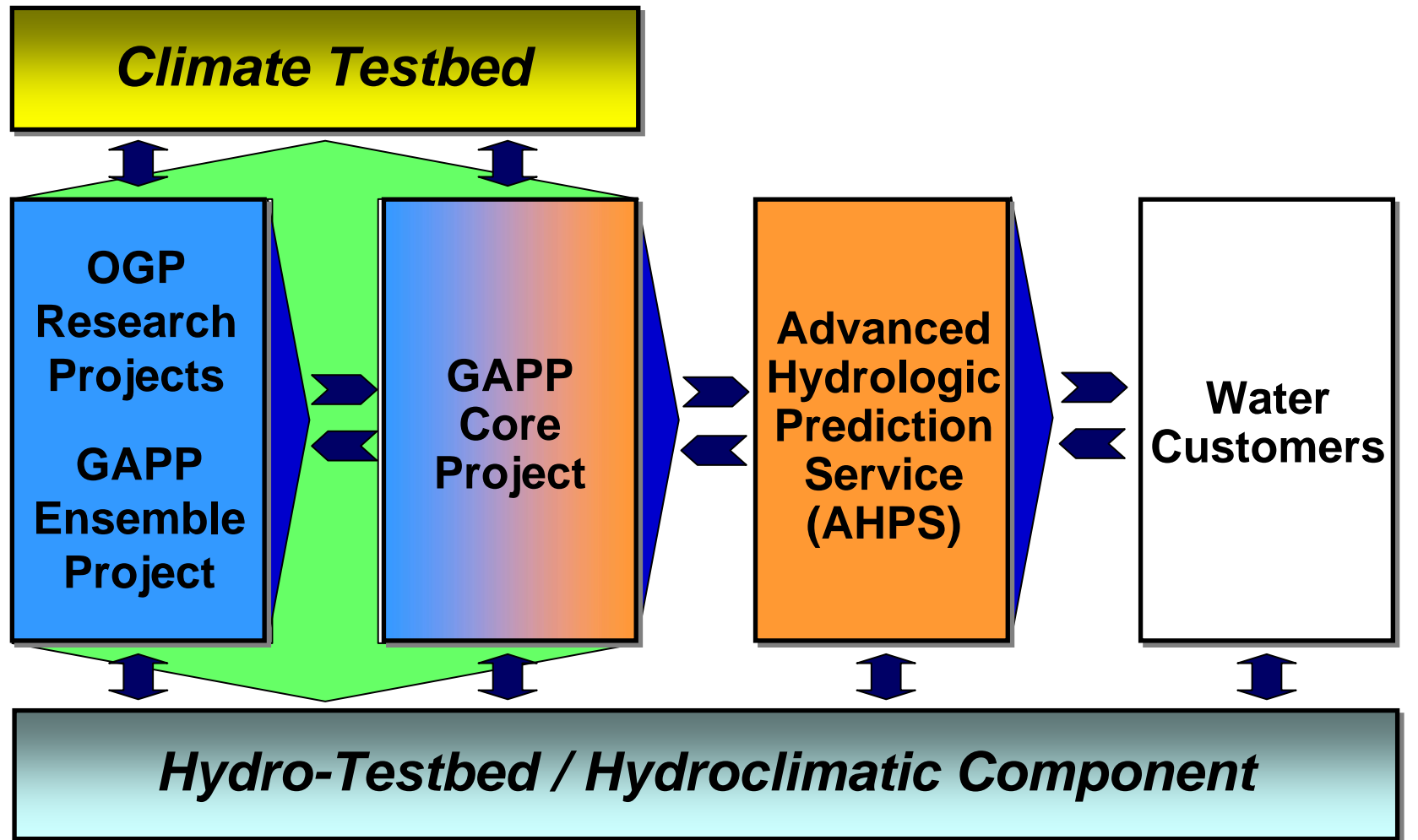
## Towards probabilistic forecasts at JRC *(from Ad de Roo, JRC)*

JRC has been working to develop a European Flood Alert System (EFAS) that could provide probabilistic predictions starting from the ECMWF EPS forecasts.

EPS' precipitation forecasts can be used to 'drive' directly hydrological models, as shown for the case of the Meuse (Borgharen) flood of 19-28 January 1995.



# Vision of a NOAA Climate-Water Research-to-Operations Program



# Hydrologic Testbed

- **Enable Full Utilization of Existing Observing Systems**
  - Development of data processing and assimilation capabilities
- **Science-to-Operations**
  - Test new stream flow prediction models and forecasting techniques for time scales of hours to months

