

**Surface Water Committee**  
**Proposed Sessions for Fall 2005 AGU Meeting**

**1. Prediction in Ungauged Basins (PUB): Data, Science and Policy**

Hydrological data are the cornerstone of hydrological science and engineering, but more importantly, the foundation for all water resources planning and policy making. The complete lack of data in many cases and the decline in existing hydrological networks worldwide are barriers to the development of robust policy. Without such data and information, Integrated Water Resources Management becomes a highly theoretical exercise. If we are to settle disputes among competing uses of water, a sound knowledge base is essential. Therefore, the International Association of Hydrological Sciences (IAHS) has recently initiated the Prediction in Ungauged Basins (PUB) programme. This aims to evaluate the hydrological methods available for dealing with data sparse catchments as well as provide a rational basis for establishing the worth of long-term data collection programmes. This seminar seeks contributions that provide examples of the necessity of hydrological data in the development of policy and water resources. Examples of where key deficiencies in hydrological networks and data in developing countries are particularly encouraged.

Session Co-Chairs:

Stewart Franks, University of Newcastle, Australia. <stewart.franks@newcastle.edu.au>

Murugesu Sivapalan, University of Illinois, Urbana-Champaign

Jeff McDonnell, Oregon State University, Corvallis

**2. TOWARDS REDUCED UNCERTAINTY IN HYDROLOGIC AND ENVIRONMENTAL PREDICTIONS**

Quantifying the uncertainty in hydrologic predictions and considering this uncertainty in subsequent decision-making is becoming increasingly important for both research and operational modeling purposes. Main sources of uncertainty are the data (e.g. spatial representation and measurements of input and output time-series) and the model (e.g. process descriptions and mathematical implementation), and the modeling approach (e.g. the method chosen for parameter estimation). An important science question is how can this predictive uncertainty be reduced?

There are three main areas where uncertainty reduction might be achieved: [1] providing new, more and higher quality information due to new, more and improved measurements and measurement techniques; [2] developing improved model structures based on better understanding of physical processes and better mathematical representation; and [3] improving the use of the available information during model identification and prediction.

We particularly invite studies that show how any of 1, 2, or 3 above do (or do not!) affect predictive uncertainty. For example, what kind of information helps to reduce predictive uncertainty and what is less useful? What data should we collect to provide this information? What methods and model structures are available or need to be developed to make use of this information? We encourage the submission of positive and (in particular) negative results with respect to these questions to provide guidance for future research into any of these three areas. This session is part of the Prediction in Ungauged Basins (PUB) initiative. However, submission of papers relating to research in gauged and ungauged watersheds is encouraged.

Session Co-Chairs:

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### **3. Streamflow Generation and Storm Runoff – Honoring the Legacy of John Hewlett**

John Hewlett transformed the fields of catchment hydrology, forest hydrology, and hillslope hydrology through his pioneering research on the processes that control streamflow during rain storms. He was one of the first to reject the widely held belief that Hortonian infiltration excess overland flow was primarily responsible for storm runoff in forested rural catchments. Along with colleagues at the Coweeta Hydrologic Laboratory, he developed the variable source area model of streamflow generation and the concept of interflow. His work has influenced a generation of hydrologists, and his ideas on runoff are the foundation of many of the rainfall – runoff models currently in use today. In his later career, John applied his understanding of hydrologic processes to developing best management practices for the forestry industry. In this session, we welcome presentations from experimentalists, modelers and theoreticians that describe and honor the legacy of John Hewlett by showing how his work has influenced research and practice in hydrology. Presentations are also welcomed that address new and emerging descriptions of runoff generation that build on Hewlett's work and look to the future of catchment hydrology through new ideas, data sources and model descriptions.

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### **4. Hydrologic implications of plant-water relations** (Joint with Biogeosciences)

The soil-plant-atmosphere continuum is a key component of the hydrologic cycle and has been an integral part of ecohydrologic research. Central to this continuum are adaptations and acclimations of plants that allow them to balance carbon gain through photosynthesis and water losses through transpiration to grow and thrive across a wide range of environmental conditions and gradients. Recent advances in plant-water relations are elucidating the mechanisms, from soil-to-root and canopy-to-atmosphere interactions, which determine how plants respond to environmental drivers. These advances are coming from laboratory and field experiments, small-to-large scale field studies, and modeling efforts across a spectrum of research fields from biology and

hydrology. The purpose of this session is to bring together a broad range of emerging theories and methodologies that specifically address vegetation controls over the hydrologic cycle. Session goals include increased discussion on the role of vegetation in hydrology at a variety of scales and better understanding of the nonlinear responses of vegetation to hydrologic, edaphic, and climatic gradients and drivers. In this session, we would like to see a broad range of papers covering a variety of spatial and temporal scales, observations and modeling, and theory and empiricism.

Session Co-Chairs:

D. Scott Mackay, State University of New York at Buffalo, [dsmackay@buffalo.edu](mailto:dsmackay@buffalo.edu)

Brent E. Ewers, University of Wyoming, [beewers@uwyo.edu](mailto:beewers@uwyo.edu)

### **5. Drought Analysis, Prediction, and Impact Mitigation**

Proposal for AGU Fall 2005 meeting. Cosponsored by Surface Water Committee (Hydrology) and Climate and Paleoclimate Committee (Atmospheric Sciences)?

The main purpose of the special session is to bring together hydrologists, climatologists, paleoclimatologists, and water resources specialists interested on discussing current knowledge and advances on analyzing, reconstructing and forecasting drought events, describing drought causing mechanisms, and evaluating and planning drought impacts and mitigation strategies.

Droughts are extreme events whose complete characterization, prediction and efficient management remain a great challenge. Recent improvements have been made in the different aspects of droughts. Among them are the advances in temporal and spatial statistical characterization of droughts, including their most significant extreme features, improvements in forecast reliability and increasing paleo-reconstructions. They provide valuable information about previous-instrumental-era events, increased knowledge about climate dynamics and patterns that may cause such extreme events, and more complete monitoring techniques that evaluate current situations and their impact that assist decision makers in facing these threats.

Droughts are complex phenomena which require broad scientific interdisciplinary research. Examples of these are the inclusion of paleoclimate information in statistical analyses to allow the characterization of persistent events whose scale is beyond the instrumental record length. Those results are of great interest for drought monitoring and physical understanding, and for mitigation strategies. Additional valuable information comes from global climate pattern analyses that may provides physical mechanics of occurring persistent event of utility for event forecasting and of interest for decision makers.

The special session will be an opportunity for discussing a number of relevant issues of drought characterization and forcing mechanism. Monitoring and forecasting droughts has taken a significant role in the last few years and we plan to invite a presentation from the NCEP to review the latest developments in the area. Alternative techniques that rely more on statistical/stochastic methods for point and spatial studies will also be presented at the session. Recent results of paleoclimatic analyses of drought severity for the entire continental US (1200-2002) should also be presented.

Session Co-Chairs:

Juan B. Valdés (University of Arizona)

| Javier González (University of Castilla-La Mancha)

Possible participants:

- Ed Cook, Lamont Doherty Observatory, Columbia University
- David Meko (Tree-Ring Laboratory, University of Arizona)
- Henry F Diaz (NOAA CAC)
- Julia Cole (UA Geosciences)
- Somebody from NCEP
- Jose D. Salas (CSU)
- Others

## **6. The hydro-geomorphic interface: temporal and spatial interaction between hydrology and geomorphology**

### **Conveners:**

Markus Weiler, Dept. of Forest Resources Management and Geography, University of British Columbia, Vancouver, Canada. (markus.weiler@ubc.ca)

Brett Eaton, Dept. of Geography, University of British Columbia, Vancouver, Canada. (beaton@geog.ubc.ca)

It is well known that hydrology, geomorphology and some aspects of riverine ecology strongly interact within the context of a stream channel network. These interactions complicate the understanding and predicting of drainage basin-scale response to changes in land management and in climate. To date, much of the research related to the response of basin hydrology, geomorphology and ecology has proceeded along fairly narrowly focused disciplinary lines with little emphasis on the interaction between them. This session targets work that considers the linkages between two or more of these disciplines in response to either spatial or temporal variations in hydrology or geomorphology. Field, experimental and theoretical contributions are all welcome. Of particular interest are contributions considering interactions occurring at the drainage network scale, which goes to the meaningful characterization of the structure and function of the drainage basin as a landscape and management unit. Long-term studies of reach-scale interactions occurring in response to temporal variations are also very welcome, particularly those that shed light on the time lags between the response of different components.

We particularly encourage studies that focus on the following topics:

- 1) the interaction between a changing hydrologic regime (e.g. as a result of climate change), the sediment supply to the stream channel network and/or the stability of the channel morphology;
- 2) the interaction between stream flow regulation, riparian vegetation and channel dynamics over time; and
- 3) the temporal and spatial variation of channel forming flows in a drainage network.

## 7. Observations and Modeling of Land Surface Hydrological Processes

Numerous studies have resulted in observations from field experiments to study the dynamics of land surface behavior; numerical modeling of the evolution of land surface response to solar heating and precipitation; the comparison of simulations to observed quantities from field experiments; and the use of satellite remote sensing data to both drive and validate hydrological models. It is widely believed that the combination of field observations and satellite data with hydrological models through data assimilation or other procedures will produce improved estimates of hydrologic fluxes and energy budgets, soil moisture, runoff, streamflow, surface temperature, and latent, sensible ground heat, and net radiation fluxes. Papers on the above topics are invited.

Conveners:

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## 8. Stream Temperature, Low Flows, and Surface-Subsurface Interactions

Conveners: Charlie Luce, USDA Forest Service  
Dan Moore, University of British Columbia

Stream temperature is a fundamental regulator of lotic ecology and there is a need to predict effects of land and water management activities on stream temperature. Stream temperature is a function of the accumulated upstream energy balance, often dominated by radiant energy exchanges. However, during periods of low flow, localized exchanges between surface and subsurface waters (bed infiltration, hyporheic exchange and groundwater discharge) may have a strong influence on stream and bed temperatures.

These influences may be important for prediction and management of stream temperature regimes. Conversely, stream and bed temperature patterns can provide a basis for diagnosing surface-subsurface exchanges at a site and their dependence on flow. Although there is a clear linkage among these topics for people interested in stream water quality, research and presentation sessions are often organized along disciplinary lines that inhibit exchange between researchers studying surface water quality and stream-subsurface interactions. We are seeking presentations on the subjects of stream temperature, low flows, and surface-subsurface exchanges with the goal of increasing the opportunity for exchange among interested parties.

## **9. Session Title: Hydrologic and biogeochemical responses across catchment scales**

Conveners:

Shreeram Inamdar  
Jamie Shanley  
Michael McHale  
Stephen Sebestyen  
Durelle Scott  
Beverley Wemple

Hydrologists and biogeochemists have been trying to "scale up" plot and small catchment process investigations for well over a decade, but unifying concepts have been elusive. How do hydrologic and solute responses vary across space and time in catchments? How do we best define landscape attributes that control catchment hydrology and chemistry? How do hillslope, riparian, wetland, and stream controls on outflow chemistry vary with catchment size? Experimental, observational, and modeling studies that link hydrologic and biogeochemical investigations across watershed scales are encouraged as are studies of the relationship between landscape attributes and stream water chemistry. The intent of this session is to discuss these important questions and how to make the transition from small catchments to large catchments at which management decisions are made.

## **10. Hydroclimatic Prediction and Water Management**

(Alternate title: Ensemble Prediction and Water Management)

**Sankar Arumugam, International Research Institute for Climate Prediction, Columbia University, Palisades, NY 10964-8000. ([sankar@iri.columbia.edu](mailto:sankar@iri.columbia.edu))**

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It is now widely accepted that any analyses of future hydroclimatic scenarios needs to consider ensemble prediction techniques (conditional/marginal distribution of the variable of interest) since they provide an effective way of representing different sources of uncertainty in modeling and estimation. Adoption of ensemble techniques for water management provides an alternate way of expressing the reliability/failure probability of meeting future water demands/scenarios. Further, utilizing ensemble techniques for water and energy sector management could help in setting adequate contingency measures and early warning systems to mitigate the effects of hydroclimatic extremes. This session will explore research that focus on: (1) methodologies for utilizing ensemble techniques on time scales ranging from flash flood to seasons and for areas ranging from small urban areas to continental-scale river basins for operational hydrological purposes (2) development and application of approaches that incorporate ensemble based techniques for water resources management (3) issues that limit the potential application of ensemble techniques for water and energy sector management.

## **11. Surface Water Hydrology and Water Resources (POSTER)**

**Sankar Arumugam, International Research Institute for Climate Prediction, Columbia University, Palisades, NY 10964-8000. ([sankar@iri.columbia.edu](mailto:sankar@iri.columbia.edu))**

**Patrick Reed, Department of Civil and Environmental Engineering, Penn State University, University Park, PA 16802 ([preed@engr.psu.edu](mailto:preed@engr.psu.edu))**

The study of surface water hydrology focuses both on the fundamental understanding of physical processes related to the partitioning of water fluxes at the earth's surface as well as in harnessing them effectively for societal needs by developing effective management strategies. Research in this field encompasses a wide range of topics including water resources management, flood forecasting, geomorphology, ecological interactions, and water quality, large-scale hydroclimatology and land surface-atmosphere interactions. Hydrological processes that occur at a local hillslope scale to regional/continental scale influence the dynamics of near-term (0-7 days), short-term (3 to 12 months) and long-term hydroclimatology and extreme events. Further, advances in telemetry and communication provide improved methods to measure the movement of water over the watershed. This together with advances in computing provides scope for improved detailed modeling techniques such as calibration, data assimilation, and pattern recognition. Additionally, we encourage submission of abstracts for posters on surface water subjects not covered by other Fall Meeting sessions.