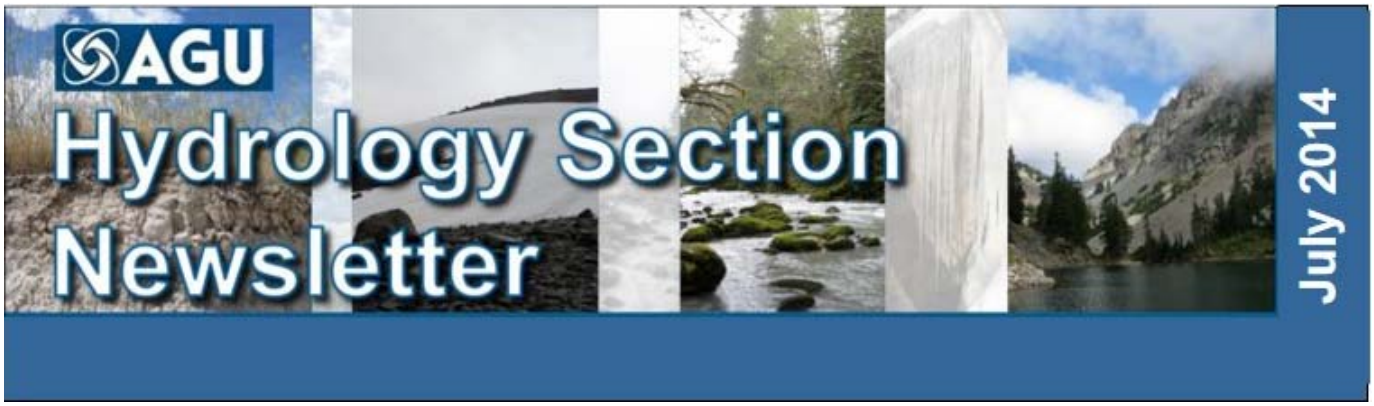
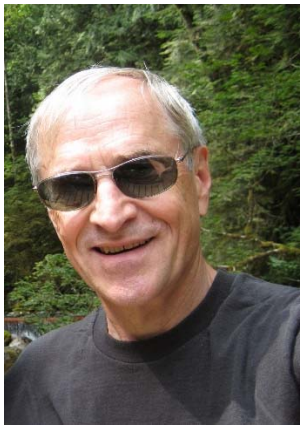


From the Section President

Eric F. Wood (Princeton University)

Summer is upon us and for those of us in the academic community, things tend to change gears from teaching to participating at conferences and workshops, doing field work, and hopefully some vacationing. It's an important time to recharge, and to pay attention to activities around us that too often get sidelined during more hectic periods of the year.



AGU is surprisingly active during the summer as preparations are made for the Fall Meeting, Headquarters initiate various "strategic planning" initiatives, and this year, election of new Union and Section officers that will start in mid-August. As I mentioned at the section's business meeting at the last FM, we are AGU and the Hydrology Section; the health of the section and the union is dependent on your participation and speaking out about how it is operating. The new governance structure has been in place approximately 5 years, with a Board making financial decisions and the Council and its Council Leadership Committee, making decisions on the scientific programs. In the five years I've been involved (section President-elect for three and President for two), I've noticed a consolidation of decision making power by Headquarter staff and

2014 Hydrology Section Awardees

The Hydrology Section has just announced our 2014 awardees. Please join me in congratulating:

Walter Langbein Lecturer: Carol Kendall (US Geological Survey)
Hydrology Career Award: Diane McKnight (University of Colorado)
Early Career Hydrology Award: Stefano Manzoni (Stockholm University)
Horton Research Grant recipients:
Kevin Befus (University of Texas, Austin); Advisor: Bayani Cardenas
Chris Gabrielli (University of Saskatchewan); Advisor Jeff McDonnell
Katherine Lininger (Colorado State University; Advisor Ellen Wohl

We also congratulate
2014 Robert Horton Medalist: W. James Shuttleworth (University of Arizona)

top-down directives to sections that requires careful attention by sections and focus groups.

It's fair to say that the goals AGU's Strategic Plan as related to increased diversity and broadening of programs have much merit; but often good intensions often go awry. When task forces and committees send out survey's to collect your thought and opinions – if possible *please respond*. The recommendations of these tasks forces can have a significant impact on the section's activities. For two recent examples, there is a Task Force on "Scientific Trends" trying to anticipate how we will do our science in the next 5, 10 or 20 years to anticipate how our scientific meetings should be structured and potentially how our sections and focus groups are organized ("discipline affiliation"). Your thoughts on these issues need to be part of the process.

As a second example, a few days ago an email floated by titled "AGU Honors Program: We need your input". On a busy day it would quickly have disappeared off the screen unread. The purpose of the email: "The Honors and Recognition Committee would like your feedback and input on the following proposed program policy changes", which got my attention. One proposal: named lectures (i.e. the section Walter Langbein Lecture) would be limited to five years and if existing lectures have existed for more than five years, the Honors and Recognition Committee proposes "(a) Review the rationale for maintaining these lectures, (b) Consider discontinuing the lecture series, and (c) Replace an existing lecture with a newly named lecture, under the purview of the H&R Committee, within the next two years (2014-2015)." Needless to say, an email quickly went from me to AGU staff (and hopefully on to Judith McKenzie, Chair of the Honors and Recognition Committee, that this *makes no sense*. And oh yes, they suggest the lecturers be by invitation and not follow a nomination process. The Walter Langbein Lecture has been a critical and important award for the section. If you feel like I do, have your voice heard by emailing the AGU Honors Committee <AGUHonors@agu.org>, its chair, Judith McKenzie <sediment@erdw.ethz.ch>, AGU staff member Billy M. Williams <BWilliams@agu.org> or AGU executive director Chris McEntee <CMcEntee@agu.org>.

So *please* pay attention to these emails!

This brings me to the issue of the upcoming AGU elections. The selection of officers is one of the most important things the section membership does, and past participation has been disappointingly low. Our officers are our voices at the Union level. In the 2012 election, across the Union as a whole, the percentage of eligible members who voted was 21.9 percent, and for the Hydrology Section it was 21.5%. Surely, we can do better – especially now that polling is done electronically, so there are no paper ballots to misplace. The voting will open 18 August 2014 and remain open until 17 September 2014. The link to the election page is http://elections.agu.org/.

Per our bylaws, the Section's nominating committee is chaired by the Past President (Dennis Lettenmaier), with four additional members appointed by me. Dennis' committee has done an excellent job of identifying two qualified candidates for President-Elect, and two for Section Secretary. For those not familiar with our governance structure, we elect a President-Elect to a two-year term (1 January 2015 – 31 December 2016), and he or she will then become the President for the following two years (the procedure at the Union level is identical). The candidates for President-Elect are Jeff McDonnell and Marc Parlange. In their articles that appear in this newsletter, I've asked them to comment on some issues facing the Section, and I suggest that you read their articles before you vote.

Dennis' committee also put forward for election as Section Secretary Terri Hogue, the current Section Secretary, and Roseanna Neupauer. Our section by-laws allows for a sitting Section Secretary to run for a second term, and when asked by the nomination committee Terri agreed to stand again. The section secretary's term is two years, effective from Jan 1, 2015. I've asked Terri and Roseanna to comment on some issues that are directly relevant to the Secretary's responsibilities, such as managing the Outstanding Student Paper Awards.

Again, I think you will find their responses insightful.

Besides the section elections, there are elections for the President-Elect of the Union, General Secretary and three directors (Board Members). One director election "pairing" is George Hornberger and Soroosh Sorooshian, two of our senior hydrologists and both past-presidents of the section. There are also slates for student and early career position for the Council.

To vote in the section elections, it is critical that you log into the AGU site by August 1 and make sure that your primary affiliation is Hydrology.

Among AGU staff, I have over and over that the Hydrology Section is exceptionally well organized. I take no credit for this whatsoever –things like having a well thought through our bylaws that prescribe how we do business (and a history of following them, at least to a great extent). This has been a huge plus and is attributable to those who've gone before me. Furthermore, our Technical Committee structure has been a huge benefit. One major push at the Union level has been to better entrain early career scientists in the governance structure. But most sections and focus groups have nothing equivalent to our Technical Committees, which effectively are an entry point for early career scientists into the Section's governance. So we've really been one step ahead of the curve there. One also finds that even the nominations process for section officers in many sections and focus groups is surprisingly ad hoc. Again, we have a well-defined nomination process, and have been able to use it to assure that the nomination process reflects the diversity within the section –by sub-discipline, gender, and geography.

Besides these thoughts, I'd like to bring to your attention the article by Tim van Emmerik, our student representative on the Hydrology Section executive. Tim is a PhD student at Delft University of Technology and is bring great energy and creativity in helping the section's students connect and become involved. He has proposed a student-focused "mini-conference" (followed by a happy-hour), which he describes in his article – and students, space is limited and you must sign up when you register for the Fall Meeting.

Water Resources Research turns 50 next year, and the editorial board, in its article, describes a special issue to commemorate the event. And during the Fall Meeting there will be a special session on WRR at 50.

As for the Fall Meeting, the abstract submissions tool is open (see the site on the AGU web page), and there are 118 proposed Hydrology session (!!) The abstract tool lists them alphabetically, so there are many "Advances in…" and "Recent .." sessions, so please look carefully at the titles to find sessions that are of interest to you.

Finally, I want to congratulate the 16 recipients of Outstanding Student Paper Awards from the 2013 Fall Meeting. They were selected from almost over 400 student presentations at the hydrology sessions. I also want to thank all of you who participated in the judging, and to Secretary Terri Hogue's OSPA committee, who worked tirelessly to fill out the ranks of the judges. If you are willing to judge student papers in 2014, each session will have an OSPA liaison (the Session Chairs should know who they are), and you can contact them that way.

In the meantime, enjoy this newsletter and may you have an enjoyable summer.

From the Section President-Elect

Efi Foufoula-Georgiou (*University of Minnesota*)

I hope the summer is treating you well with more time to think, create, reflect, and relax than during the academic year.

I decided to use a "word cloud" approach to discuss a few issues I care about and open a dialogue with you related to: (1) structuring our section's growth within the Fall AGU meeting, (2) publishing our science in diverse AGU outlets, and (3) promoting the next generation of leaders.

Figure 1: Word cloud from the titles of the 118 special sessions proposed under the Hydrology section for the Fall 2015 AGU meeting.

The 2014 Fall AGU meeting is around the corner. Figure 1 shows a word cloud of the titles of all 118 special sessions that have been proposed under the Hydrology section for the upcoming Fall meeting. We are all about *water, processes, hydrologic systems, modeling, advances, applications, resources, transport*, strongly tied together in a fabric that includes *ecohydrology, climate, management, impact, carbon* and a whole lot more. We are a very active section of 6,900 members clearly energized and motivated to organize a diverse range of special sessions that cover the breadth of our discipline (compare to 83 sessions in the Atmospheric Sciences, for example). All special sessions are accepted in the proposal stage but several are merged later on due to lack of sufficient submissions. Given these realities, I feel that we might want to adopt a more strategic approach to organizing sessions in a more thematic way that would help keep large portions of our section in the same room, same floor or same Moscone building for longer stretches of time during the AGU meeting, giving us more time for leisurely interactions rather than scurrying across floors and buildings. This would require a change in the way sessions are proposed and in the coordination phase of merging similar sessions. Please keep this in mind as you soon prepare your abstract(s) for submission. You might find, for instance, that your abstracts could easily fit in more than one session, leading to a situation where you feel the need to be in two places at once! I would love to get your thoughts on optimal approaches for use of the time of our members at the meeting.

Water Resources Research will celebrate its 50th anniversary this year and you have received emails from the Editorial team regarding a special volume they plan to produce for that occasion (see the article of the Editorial board in this issue). WRR has shaped our field and continues to do so more strongly than ever. It is our main AGU journal – but not the only outlet within AGU for our work. GRL (for rapid communications and with three times the impact factor) is another important journal that also serves our community in disseminating breakthroughs fast. Figure 2 ("The Footprint of GRL", taken from *Hinners and Calais*, GRL: Celebrating 40 years of excellence, doi:10.1002/2014GL060214, 2014) shows a word cloud composed using the titles of the 1000 most cited papers published in GRL over the past 40 years. In the words of the authors, it "summarizes GRL's characteristics: impact, timeliness, breadth, and interdisciplinarity". I challenge you to find the word "water" in that cloud. Why is this? Is this lack a reflection of our work not being cited or are we not publishing in GRL as often as we should? I would like to suggest that we put some thought in both aspects.

Macelwane Medal. A few days ago the awardees of section and Union awards and medals were announced. The Macelwane medal was established

Figure 2. "*The footprint of GRL*". Word cloud from the titles of the 1000 most cited GRL papers over the past 40 years. Taken from the original article of *Hinners and Calais* (2014) with the caption that this cloud "… exemplifies the breadth and impact of the journal – its footprint. All major Earth and Space's envelopes appear prominently, as well as observations, measurements, and models – the bread and butter of our disciplines."

in 1961, and is given "for significant contributions to the geophysical sciences by an early career scientist" (now defined as 10 years post PhD degree). It has honored many of our leading hydrologists since its inception. As a member of the Council Leadership Team (CLT) approving these awards, I was intrigued with the Macelwane committee transmission report which reported the profile of the 37 awardees since 2004 (including the 4 awardees this year) by AGU section as: 6 (Volcanology, Geochemistry and Petrology), 6 (Biogeosciences), 4 (Seismology), 4 (Paleogeography and Paleoclimatology), 4 (Atmospheric Sciences) and 3 (Planetary Sciences); the rest was not attributed. I went back to check those 37 awardees myself and I would classify 2 or 3 as hydrologists in the past 10 years. Our rising stars belong to that category but will not be there if we do not take the time and care to nominate them. We must.

The young scientists in our section are as vibrant as ever, establishing for the first time a pre-AGU young hydrologists meeting (see Tim van Emmerik's letter in this issue). Please support them and urge your students to attend.

I look forward to seeing all you in San Francisco. Until then, enjoy your summer and please email to me your ideas and thoughts (efi@umn.edu)

Representing Early Career Hydrologists

By Student Section Executive Member Tim van Emmerik (Delft University of Technology)

Since March 2014 I have to honor of serving the AGU Hydrology Section as the Student Representative (SR). My task is to represent the interests of early career hydrologists in our section, gather input and feedback from students and help realizing new AGU related student initiatives. In this article I will briefly elaborate on my affinity with empowering young scientists and discuss two examples of student initiatives.

Although I am still a newbie in the world of academia, it occurred to me that many young scientists have a limited network, often do not have a clue what their peers are working on and are unlikely to be active in the scientific community. At the end of 2012 I was involved in founding the Young Hydrologic Society (YHS), a new bottom up network for early career hydrologists. YHS aims to connect young hydrologists from all over the world, give them a voice in the scientific community and empower them in getting actively

involved. A lot has happened in the past 1 ½ years. YHS started as a two-man student initiative and grew to an organization with over a dozen actively involved early career hydrologists from all over the world. Since 2014, YHS also organizes sessions at conferences. At this year's General Assembly of the European Geosciences Union (EGU), YHS organized four sessions, ranging from a short course on Paper Writing to a brainstorm session on the future of scientific meetings. As hydrology is not limited to Europe, YHS decided to cross the pond and I applied for the position of AGU HS Student Representative. Currently, YHS is collaborating with both EGU and AGU, creating an effective environment for trying out and transferring new session formats between the two organizations. During my period as SR it my goal to get more students actively involved in AGU HS. Furthermore, together with a great student team I'm organizing two great events at this year's Fall Meeting (FM).

A fantastic example of a new student initiative is the Water Pop-Up session, organized for the first time at the 2013 Fall Meeting. The goal of this session is to offer students a platform to share their ideas with fellow (young) scientists and the general public. This session provides students the opportunity to give a 5-minute TED-like presentation on their vision on water sciences. Presentations should go beyond the scope of regular research to address broader issues like global water scarcity, future challenges of hydrology, water education or big data in water sciences. Thanks to the high attendance and interesting talks, another edition of the Water Pop-Ups is scheduled for the 2014 Fall Meeting. Young scientists often look at issues with an open mind and sharing their ideas and visions can be inspiring for all. Therefore, I would like to encourage all young hydrologists to submit an abstract to the 2014 Water Pop-Ups.

Time for another exciting scoop! Last year's FM was the first AGU conference I attended. I was pleasantly surprised by the large amount of students that attended the meeting. Early career scientists are pampered with the introduction of the student lounge and the student mixers. It was great to see how over the course of the week students got connected, had lunch together and became (scientifically collaborating) friends at the end of the week. However, I also thought it was a pity that for some people it took a couple of days before the ice was broken. Together with an enthusiastic group of fellow hydrologists we came up with an idea to give them a flying start this year: **the Student Mini-Conference** (feel free to contact me if you have ideas for a fancier name). This one-day conference is organized for students, by students and the program consists of Career Development workshops and scientific discussions. The goals of the meeting are to connect fellow young scientists before the start of the Fall Meeting, to learn and observe how to improve their academic skills and to discuss current scientific topics. Special attention will be given to getting to know each other, the struggles and pinnacles of being a beginning scientists and discussing hydrologic challenges. At the end of the day, the official program will flow into the more informal hydrology student mixer. The conference gives students a unique opportunity to get connected and talk with peers about their research. In other words, a great way to start your 2014 Fall Meeting! The student conference will take place on Sunday December 7th, so keep the date!

Getting involved at 'the other side' of AGU is interesting, fun and rewarding. Furthermore, it is extremely important that the younger generation has a clear voice within these large scientific organizations. In the end, we are the ones that have to face the consequences of today's water issues and we are the ones that will attend 40 more Fall Meetings. So why not try to shape it according to your vision? There are plenty of ways of getting actively involved in scientific communities and YHS aims to lower the threshold for students to doing so. For example, you can organize and convene scientific sessions at AGU, join AGU

committees or become active within YHS. Next year, AGU HS will need a new Student Representative. Feel free to contact me if you like to know more details about the life of a Student Representative.

Let me emphasize that I am always looking for feedback, ideas and suggestions for YHS, the Student Representative position and student activities at the Fall Meeting. I am also happy to answer your questions about how to get involved, how to help organizing sessions yourself and how to apply to become next year's Student Representative. Although it might be a little bit early, I look forward seeing you in December!

For more information:

Young Hydrologic Society www.youngHS.com

Water Pop-Ups http://watersciences-popups.blogspot.nl/

My email t.h.m.vanemmerik@tudelft.nl

The 50th Anniversary of Water Resources Research: History and Future of Water Science for People

Alberto Montanari (Editor in chief), Jean Bahr, Günter Blöschl, Ximing Cai, D. Scott Mackay, Anna Michalak, Harihar Rajaram, Graham Sander (Editors)

The first issue of Water Resources Research (WRR) was published in March 1965 and therefore the year 2015 will present the exciting opportunity to celebrate the 50th anniversary of the journal. This milestone is an occasion to look back on 50 years of research activity and to provide a perspective for future research. To formally celebrate the 50th anniversary of WRR the Editorial Board has decided to publish a Special Section**,** entitled "**The 50th Anniversary of Water Resources Research: History and Future of Water Science for People**". As the title clearly reflects, the Special Section will focus on research activity on water for the development and benefit of society. It aims to provide an overview of the scientific challenges in water sustainability, the important issues at the interface of water science and society, and the new technologies of monitoring and assessment. These offer new opportunities to move us forward in the 21st century by relying on a delicate balance between economic prosperity (food, health, education) and environmental sustainability.

The decision to focus on the theme of water and people for this important editorial initiative has been taken by the Editorial Board after a careful consideration of what has been the underlying thread of the whole history of WRR. Indeed, the interaction between water and society presents relevant research challenges for the future, for which this Special Section aims to set the basis and provide inspiration. But the topic is much more than that. In fact, it is well known that the interrelation between water and humans is as old as humans themselves. The ancient Greeks recognized water as one of the four essential elements, and water is an essential part of Hinduism and Buddhism. Challenges associated with water have marked human history and will be more and more prominent at the global level in the coming years. It is no surprise that the discipline of Hydrology, which started with its roots in engineering solving real water problems, emerged in the last 50 years as a primary discipline of Geosciences. It is now called upon to integrate across an enlarged interdisciplinary water science with fields such as geography, economics, public health, engineering and advanced monitoring technologies to solve an increasing number of water sustainability problems. WRR has witnessed the growth of the discipline of hydrology not as a passive publisher but as an instigator of science growth by defining new cutting-edge research, contributing to the solution of important open problems, and acting as a catalyst for interdisciplinary research by producing collections of papers and special volumes. The Special Section will take stock of this 50-year tradition in WRR, while looking forward to new endeavors in hydrologic science.

In order to present to the reader a coherent scientific treatment, the Special Section will be divided into three subsections (see Figure 1): (1) The legacy of WRR; (2) Future instruments and methods; (3) The future of water science for the benefit of society. The Special Section is open to contribution from the community, upon approval of a preliminary abstract that has to be submitted at wrr@agu.org by July 15. Timeliness is an essential requirement and therefore late abstracts will not be accepted. All papers must fit one of the three subthemes introduced above. The Editors will reply on the suitability of the proposed contribution within a few working days from receipt of the abstract and submissions will be accepted from Sept 1st, 2014 to December 31st, 2014. The Editorial Board is committed to avoid delays in the schedule, with the target of completing the Special Section by the end of 2015.

The papers, which will undergo the usual rigorous peer review process of WRR, will be allocated to one of the three subsections by the Editors. Manuscripts in the subsection "The legacy of WRR" should provide an historical perspective on the most important WRR contributions on the theme "Water science for people". Papers in this subsection will be organized by disciplines and

Figure 1. Sketch of the structure of the Special Section.

therefore authors should focus on their main field of expertise, while maintaining a broad view (papers focusing on narrow fields may not be accepted). Contributions that span several fields can be also considered, as well as papers on the history of hydrology and water resources management. The above papers could be structured as reviews of the literature, or could assume the form of a historical review and perspective of the development of the discipline. Manuscripts are expected to provide a solid scientific basis for future research. They are expected to be a long lasting reference for young scientists.

Contributions to the subsection "Future instruments and methods" are expected to concentrate on emerging techniques and models. These manuscripts are expected to describe new methods and could assume the form of markedly technical papers. These include novel measurement techniques as well as modeling approaches. However, they should keep a broad view and should be of interest to the international community of water scientists. It is expected that these contributions will be submitted as research articles or technical notes.

Contributions to the subsection "The future of water science for the benefit of society" should deliver a profound and forward looking vision in order to shape the future of hydrology and water resources management for people. Contributions should focus on emerging principles and concepts in a broad scientific context and provide original ideas that will further the hydrological sciences and, potentially, bring together branches of the discipline that so far have been disparate. Therefore, they may have an element of synthesis. These papers could be submitted as opinion pieces or as research articles proposing new philosophies and approaches to the science underpinning water management. These papers are also expected to provide a solid scientific basis and reference for future research.

The Editors are excited about the prospects of this special section of Water Resources Research and are looking forward to a fine set of contributions to be included in this milestone editorial initiative.

President-Elect Candidate: Jeffrey McDonnell (University of Saskatchewan, University of Aberdeen; Oregon State University)

I love AGU. It's an organization that I have been a part of for 27 years. And it all started with a shock. It was October 1987 I was in the field at my research hut on the South Island of New Zealand when a telegram arrived (think pre-internet!). It indicated that I was to come to AGU in San Francisco to receive the Horton Research Grant. As a Canadian studying in New Zealand, I'd not been to AGU before. The meeting was at the Civic Center and attracted ~5000 participants. That year, Tom Dunne (my hero) received what is now known as the Hydrology Section Award. Tom had advised all my advisors, from BSc to MSc to PhD. I recall Marshall Moss, then Hydrology Section President talking on stage during the section meeting about data giving him "a warm and fuzzy feeling". I'd never heard language (or an accent!) like that before. But it resonated. George Leavesley, the chair of the Horton Research Grant committee and several committee members took me out for oysters and beer that same night. I knew no one at the meeting. Yet, I'd found a home that I didn't know existed. Now after 25 years of being a faculty member in the USA and now back in Canada, that love and commitment for the organization is ever stronger. My students, their students and their students' students are all active AGU participants.

I am honored to be asked to stand for President of the Hydrology Section. I've had the opportunity to Chair the Surface Water Committee, serve on the Hydrology Section Nominations Committee, serve on the Horton Research Grant Committee, lead and co-lead numerous AGU sessions and Chapman Conferences, serve as an Associate Editor for WRR and serve on the Hydrology Section Fellows Committee. AGU has grown immensely since my first meeting—both in terms of size and complexity. The Hydrology Section alone now has more than 6,900 members. Many new AGU sections have been added and the number of sessions in our section is mind boggling. Through it all, it still remains fun, exciting and highly rewarding.

As Hydrology Section President of the section I would continue the quality work of my predecessors and colleagues, Eric Wood and Efi Foufoula-Georgiou. I would focus my two-year term on four major priority areas if elected:

1. Developing new communication strategies for the Hydrology Section.
2. Enhancing mentoring activities for young women in the Hydrology Section
3. Fosterer greater involvement and mentoring of graduate students and post docs within the Hydrology Section
4. Exploring short course offerings before/after AGU on targeted topics in the hydrological sciences directed for young hydrologists

Communication is key to our section and as President I would work to facilitate strategic conversations between members and the AGU Council. I will build upon the newly developed Hydrology Section newsletter and develop a listserve for members to post and interact and for me to help convey important messages to the membership. This listserve will sit between the extreme of Twitter or Facebook and the standard electronic newsletter as a means to facilitate two-way comment and discussion on Union matters and their links to the Hydrology Section membership. I would fashion this along the lines of the very successful Isogeochem list serve and encourage particularly our young members of the Section to become involved.

While the Hydrology Section has good gender balance at the student level, the numbers of women in senior positions is low. In terms of awards linked to our section, a perusal of our Hydrology Section web page shows that there are no Macelwane Awards to women (out of 10 linked to the Hydrology Section); no Horton Medals to women

in the Hydrology Section (since its inception in 1976), no Bowie Medals to women (out of the 6 in the Hydrology Section), 1 Hydrological Sciences Award out of >50 made since 1956 and 2 Langbein Lectures by women since its inception. As President, I would initiate a goal of gender balance on all awards committees. I would also work with the Women in the Geosciences Committee to introduce an AGU HS breakfast or luncheon for women in hydrological sciences to attend, network and discuss key issues relating to navigating a research career: where senior women share their experience, barriers they encountered, and strategies to overcome them. I would kick this off and hope that a committee could be struck to sustain this and build upon it annually.

In terms of fosterer greater involvement and mentoring of graduate students and post docs within the Hydrology Section, I would work with the student group leader to better link faculty to students at their annual HS student meeting. Unlike the situation in 1987 when I was a first-time student attendee, people seem to be so thinly stretched now for time. I would encourage students to bring their advisor to the student reception and use it as a networking opportunity where the express focus is meeting people and making connections. It could be a good opportunity for faculty to discuss and advertise upcoming post doc positions—a speed dating site for post doc hires. Lastly, with so many people now coming to AGU, there seems to be opportunity to develop shortcourses in the days before/after AGU to capitalize on this timing. I would promote ones that serve to young colleagues, building on the "Launching an Academic Career" course that I led with Kamini Singha, Brian McGlynn and Thorsten Wagener two years ago. I would seek proposals from within our section for shortcourses that we could endorse and work to publicize within our section.

In my current position at the new Global Institute for Water Security, I have the time to commit to this important effort. Prior to my recent return to Canada I served as Director of the Institute for Water and Watersheds at Oregon State University. I've had other roles like his before, serving as Senior Advisory Editor of the Encyclopedia of Hydrological Sciences, serving as President of the IAHS International Commission on Tracers, and serving as one of the chairs of the IAHS PUB Decade on Prediction in Ungauged Basins. Most of all though, my goal as HS President will be to foster the highest quality research possible in the hydrological sciences. I am ready to put my energy in the Hydrology Section and hope that my experience and dedication to the organization can be a positive force. Thanks to the Hydrology Section for the opportunity to serve.

President - Elect: Marc Parlange (University of British Columbia, Canada)

(This statement appeared in the July 2012 Hydrology newsletter when Marc Parlange also ran for the President-Elect position). It has not been updated for this election cycle. Editor)

The Hydrology Section of AGU is the primary professional home for many hydrologists around the world. I know the AGU hydrologic community well, having served as the Hydrology Section secretary and Editor-in-Chief of Water Resources Research, and I plan to use my experience for its betterment. The AGU hydrology community is an intellectually open and welcoming environment with increasingly broad international community engagement and is the main society for discussion of scientific advances in hydrology. My recent experience at WRR gives me great confidence in the dynamic community spirit and vigor of the Hydrology Section. This is evident through the superb new science being submitted to the journal, the deep and extensive peer reviews by thousands of our international colleagues, and the dedicated hard work of all the associate editors, editors and journal headquarter

staff to help authors make the most of their research efforts. I was pleased that we were able to increase the involvement of many international associate editors; water research clearly knows no boundaries and continually broadens its scope. Similarly when I was Section Secretary and helping to organize student judging, I was most impressed by all the selfless time given by the entire community during the meetings to provide help in assessing student presentations.

I am honored to be a candidate for President-elect of the Section and look forward to working hard on behalf of the entire community. Our AGU membership in water research, broadly defined, continues to grow; thus, it is important to both expand the active participation of current and new hydrology members in the life of the Section and also maintain the warm sense of community the Section provides. As President, I will strive to continue the fantastic work of the previous presidents and many members of our community in welcoming new members to the Section and encouraging their participation in the technical committees, ad-hoc and medal committees, organizing and chairing sessions at the annual meetings, and reviewing and editorial participation with the union journals, especially WRR. As we have grown, the biannual newsletter started by Dennis Lettenmaier, along with the organization of award presentations in conjunction with the Langbein Lecture, has been instrumental in increasing the communication of activities within the Section. Continuing this, as well as implementing regular town hall meetings, which have occurred sporadically over the years, will allow broader awareness and membership participation on evolving topics of current concern. I look forward to continuing with renewed energy my predecessors' efforts to promote and recognize excellence in hydrologic research and lifetime achievements. When I was Editor of WRR, our motto was "the sun shines for all;" we wanted it to be clear that the journal was all-encompassing and that quality research in all domains was welcomed. We invited leading Associate Editors from around the world, including previously poorly represented regions (e.g., South America, Asia, Eastern Europe) and in all fields of water resources research. We felt strongly that the journal's mission was to be the prime hydrology journal worldwide, open to the community in the broadest sense, ready to promote and encourage the new hot spots of research, especially across disciplines – in essence, to be the ultimate society journal. I believe this philosophy of inclusion and openness is also critical in the Hydrology Section. For it to thrive, we need to draw on the full richness, diversity and depth that our community has to offer. It is extremely important that limited groups or sub-domains of hydrology do not become primary community representatives. The focus groups are playing an important role in supporting and enabling hydrologic research, as are other Sections, especially Biogeosciences and Atmospheric Sciences, and it is important to reinforce these hydrology-related connections in AGU. I will work to draw on the entire membership of the AGU to focus on true academic quality in nominating our colleagues for Section and Union awards, AGU Fellowships and medals. I look forward with great enthusiasm to helping to continue the fine work of the Section, which has been a source of inspiration throughout my career.

Section Secretary Candidate: Terri Hogue (Colorado School of Mines)

It has been my pleasure to serve as the Hydrology Section Secretary over the last year and a half. If re-elected, I will continue to work for you - the members - throughout the year and at the Fall Annual meeting. AGU has been an integral part of my career, since my early days in graduate school at the University of Arizona. I served extensively on the Surface Water Committee – as a member for many years and then moving to deputy chair and chair. I have run numerous sessions at the Fall Annual Meeting and last spring served on the program committee for the Meeting of the Americas in Cancun. More recently, I am serving

on the AGU Council's Scientific Trends Task Force. Outside of AGU, I serve on the National Academies Board on Atmospheric Science and Climate (BASC) as well as other agency panels and committees, working to advance science priorities for our community.

As Section Secretary, I have been able to engage with the members and society on another level. I have worked closely with the section leadership and technical committee chairs at the Fall Annual Meeting to coordinate and facilitate section activities and develop new focus groups. I also facilitated a very successful Outstanding Student Paper Award (OSPA) at the last Fall Meeting. Much of this was due to the remarkable OSPA committee (Kolja Rotzoll, Newsha Ajami, Laurel Saito and Tara Troy) that helped organize, monitor, and prod judges for our section students. We had one of our most efficient and successful years – 100% of the students that requested judging were evaluated by section scientists. This is an integral role of the section secretary, and although we still have some tweaks to make to the system, we have come far and I am glad to see our students getting the engagement and recognition they deserve. I will continue to work with AGU staff to refine the system and make it as "user-friendly" as possible for section members and our students. We also have managed to keep the OSPA committee together for the next three years to assure continued success as well as refinement of this key section activity.

If I am re-elected as Secretary, I will support the transition and efforts of our new President and President-elect as well as the technical committees and continue to facilitate communication and collaboration among members. As always, I believe the engagement of young and diverse scientists is critical to ensure a dynamic and active membership. I will continue to push for early planning of shared sessions and encourage our section members to organize Chapman conferences on cutting-edge topics in the hydrologic sciences. I will also continue to promote the inclusion of a diverse AGU community in committees, conferences and session planning.

Section Secretary Candidate: Roseanna Neupauer (University of Colorado)

The Hydrology section of AGU is a vibrant organization with strong member base that is engaged in scientific discovery on important global issues. I am honored to have been nominated for the position of Secretary of this section. My involvement in AGU has been an important part of my career, beginning with my attending the Fall Meeting as a graduate student to present my research. The professional interactions and the opportunity to learn from and share ideas with colleagues have stimulated exciting new ideas and directions at that time, and continue to do so to this day. Over the years, I have continued to contribute to the Hydrology section in various capacities. I served as an Associate Editor for *Water Resources Research* for seven years. I was a member of the Groundwater Technical committee for several years, Co-coordinator of the Outstanding Student Paper Award Committee in 2004, and a member of the Horton Research Grant Committee for three years. I served on the Fall Program Committee for two years, including chairing the committee in 2010. I am currently the chair of the Langbein Lecture Committee. Through these roles I have learned more about the exciting work in our field and about the structure of AGU and the Hydrology section.

The Hydrology section of AGU is a leading professional organization for hydrologists worldwide and continues to grow and become stronger, which is noticeable by the continuing increase in the number of abstracts submitted to the fall meeting.

While this growth shows that our organization is vibrant and active, it also poses some challenges. As the meeting size grows, and the number of concurrent sessions and the number of posters continues to increase, it is difficult for attendees to see all of the presentations of interest to them. Enhanced use of electronic media, including digital posters and presentations, can provide opportunities for attendees see presentations at a later time. In addition, since students are the members of the future, we need to continue to provide opportunities for student involvement in all aspects. The number of student presentations at the Fall Meeting remains high, and exceptional presenters are recognized through the prestigious Outstanding Student Paper Award. The judging process for this award has been streamlined over the last several years, with the transition from paper to electronic evaluations, and on-line registration of judges. Further improvements can be made in the timing of registration of judges, to ensure that all student presenters are judged consistently. We also need to encourage student participation in technical committees and in convening technical sessions, and in both formal and informal networking opportunities with other students and with professionals, such as the Hydrology Section luncheon.

I have enjoyed the opportunity to serve the hydrology community in the past, and if elected, I look forward to working with the section leadership in continuing to serve the hydrology community as the Secretary of the Hydrology section

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2013 Horton Grant Awardee

Global plant breathing revealed by stable isotopes

Scott Jasechko (Department of Earth and Planetary Sciences, University of New Mexico) (Advisors Zachary Sharp and Peter Fawcett)

For more than 60 years, isotopic ratios of the major life-forming elements (C, H, O, S, N) have been applied to determine water fluxes and processes affecting water quality. On local and regional scales, isotopes are measured to isolate sources of water and entrained constituents, and to quantify chemical reactions, advection rates and residence times. On a global scale, downloadable databases are available for ocean water (data.giss.nasa.gov/o18data) and land precipitation (www.iaea.org/water); however, data for terrestrial waters remain dispersed.

Isotopic data for lakes and rivers were compiled and applied to decouple evapotranspiration using an isotope-mass balance (Jasechko et al., 2013). Two-thirds of terrestrial precipitation is consumed by evapotranspiration, which is the combination of evaporation and transpiration. While evaporation is a physical process, transpiration plays a life-sustaining role in terrestrial plants by moving nutrients into photosynthetically active structures, and by moderating temperatures at leaf surfaces (Helliker and Richter, 2008). The effects of evaporation and transpiration upon $^{18}O/^{16}O$ and $^{2}H/^{1}H$ ratios in H_2O differ (Wershaw et al., 1966) such that isotopes can be applied to independently calculate each flux (Dincer et al., 1979; Yakir and Wang, 1996; Telmer and Veizer, 2000). When this isotope-based concept is applied on a globa-scale, transpiration has been found to be the single largest water flux from the continents, exceeding both terrestrial evaporation and the combined discharge of all of Earth's rivers (Figure 1; Jasechko et al., 2013).

Distinguishing evaporation and transpiration is important for understanding future changes to the hydrological cycle and forecasting water resource availability because ongoing land use changes and loading of atmospheric CO_2 affects evaporation differently than it does transpiration.

Land use changes, such as deforestation and cultivation, have long been known to impact water fluxes. For example, in efforts to test the impact of deforestation on water movements, 25 experimental watersheds were cleared of all vegetation and river flows were measured downstream (Bosch and Hewlett, 1983). The experiment results showed a 43% (median) increase in river discharges following clearing (10^{th}-90^{th} percentile range of 10-144%, Figure 2),

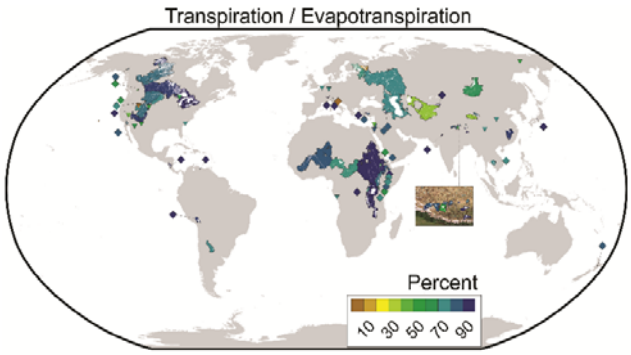

Figure 1. Transpiration as a proportion of evapotranspiration for 10% of Earth's ice free land (from Jasechko et al., 2013). Diamonds are shown as a visual aid for small lake catchments, and triangles show stand-level measurements

highlighting the governing role of plant transpiration on runoff. Indeed, cumulative global deforestation is estimated to have reduced evapotranspiration by 3,000 km^3/year (Gordon et al., 2005), which is comparable to the total annual water withdrawals by humans (3,700 km^3/year, Wada et al., 2013a).

For cultivated land, making a similar "before and after" calculation is complicated by differences in irrigation techniques and efficiency, crop type and associated photosynthetic pathways (i.e., C_3, C_4, CAM), and non-steady hydrologic conditions due to diversion of nearby rivers or pumping of groundwater. Generally, ecosystem conversion to cultivated land reduces evapotranspiration, thereby increasing water yields to rivers and aquifers (Scanlon et al., 2007).

Both deforestation and cultivation will continue to influence hydrology. Globally, 60% of ice free land is covered by forests (22%) or cultivated lands (38%, FAOSTAT data available at faostat.fao.org). Estimated annual deforestation for 2000-2005 is between 0.17%, FAOSTAT) and 0.6% per year (Hansen et al., 2010) with globally cultivated lands having decreased slightly at 0.05% per year over

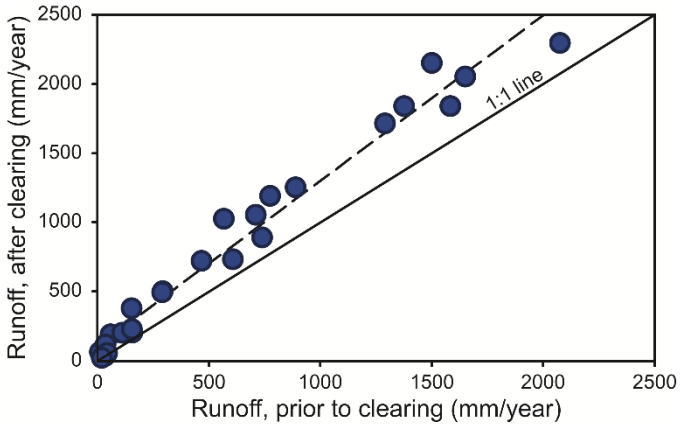

Figure 2. Runoff before and after clearing of vegetation (data from Bosch and Hewlett, 1983).

the same period (FAOSTAT). The highest rates of deforestation are occurring in the boreal and humid tropical forests (Hansen et al., 2010), with the highest rates of cultivated land expansion occurring in Africa and Asia (Foley et al., 2011), frequently overlapping whereby cultivation drives deforestation (Gibbs et al., 2010). Knowledge of transpiration's role upon water availability for various ecoregions can help to forecast changes to runoff in response to land use changes.

In addition to land use changes, the responses of transpiration and evaporation to a warmer and CO_2-enriched atmosphere require different considerations that can be appropriately weighted if each flux is known. Unlike the potential for evaporation – which can broadly be expected to increase with warming – the effect of climate change upon transpiration is complicated by several, sometimes conflicting, factors. For example, elevated CO_2 concentrations increase plant productivity and total transpiration. Conversely, CO_2 increases have been shown in experiments to increase water use efficiency (ratio of CO_2 assimilation to H_2O uptake) and decrease stomatal conductance, suggesting decreases to transpiration (Drake et al., 1997; Betts et al., 2007). Recently, the long-predicted increases to water use

efficiency have been observed at an ecosystem scale (Keenan et al., 2013). Models incorporating this natural water-carbon accounting system (i.e., water use efficiency) may be able to better predict not only future modifications to water fluxes, but also ongoing changes to primary productivity (Nemani et al., 2003), the largest carbon flux in Earth's climate system.

Different considerations are required when postulating future changes to terrestrial evaporation or transpiration. The combined evapotranspiration flux is vital to water, climate and life, and consumes two-thirds of terrestrial precipitation, expends a quarter of net terrestrial solar radiation (Trenberth et al., 2009), and – when transpired – sustains 60% of all primary production on Earth (Beer et al., 2010) including ~98% of humanity's food (Duarte et al., 2009). The future climate is likely to support increased terrestrial precipitation and decreased transpiration (Cao et al., 2010), and is certain to include increased demand for food (Foley et al., 2011) and irrigation (Wada et al., 2013b). Continued integration of physical and chemical hydrology is likely to aid projections of deforestation, cultivation and CO_2-forcings upon water availability. The critical target of this research would be a combination with the emerging state of the art hydrological models and with the science of policy, in order to enhance forecasts and management of existing human-appropriated land (40% of total; FAOSTAT) and renewable water (10% of total; Oki and Kanae, 2006).

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A Fellow Speaks: Embrace other disciplines and work with decision-makers

David C. Goodrich (USDA-ARS, Tucson, AZ)

It is truly an honor to be named a Fellow of AGU but this honor belongs equally to my generous mentors and the many colleagues, students, decision-makers, and elected officials whom I've had the great privilege work with and learn from. To effectively address ever more complex water centric environmental and social challenges I feel the hydrology community should more actively embrace a wider array of disciplines and decision-makers. My career path evolved from relatively focused research in modeling of surface water to more interdisciplinary research. First with disciplines closely aligned with hydrology (e.g. remote sensing, micrometeorology, geophysics) before moving further afield (e.g. plant physiology, ecology, scenario science, and economics) and onto integration of science with elected officials and decision-makers.

This pathway was facilitated by participation and leadership roles in international, interdisciplinary field experiments such as Monsoon'90 (Kustas and Goodrich, 1994), and SALSA (Goodrich et al., 2000); and via large, long-term research projects (NASA-EOS, Sorooshian et al., 2002 and the SAHRA NSF Science and Technology Center), and as a 14-year member of the Upper San Pedro Partnership (USPP - www.usppartnership.com).

This path has been extremely stimulating as an effective mechanism to learn from others. Perhaps, due to my own shortcomings, I find it difficult to plumb the intricacies of another discipline by diving into its scientific literature. But by working with experts in other fields, I gain key insights and can appreciate both the challenges in that field and the tools it brings to bear on the larger problems our interdisciplinary team are addressing.

While interdisciplinary research is rewarding, it is also hard work. It requires time, and often lengthy discussions, to understand each other's vocabulary and perspectives, and in the process, develop collegial trust. A key challenge faced by our teams was determining where our respective disciplines can meet to effectively integrate our knowledge while addressing the scientific information needs of resource managers and elected officials. By the nature of our research reward system, we typically need to publish "state of the science" research in more disciplinarily focused journals (at the far right of Figure 1). Figure 1 is a conceptual representation of how the various physical, biological, and economic sciences had to come together, with stakeholder input, to estimate the marginal monetary values for changes in non-market riparian ecosystem attributes based on planning decisions (e.g., where to build a groundwater recharge plant, where to expand groundwater pumping, etc.) in the San Pedro Basin in southeast Arizona (Brookshire et al., 2010). We found that the various disciplines had to back away from their discipline's state of the science to a point were each discipline had a common level of understanding and supporting data to enable coupling of biophysical models to reliably estimate

riparian changes resulting from management decisions. This caused some consternation among team members as their "best" science was not being employed. This is countered by the fact that the level of common integration that was achieved is typically far beyond the level used in current practice (left side of Figure 1).

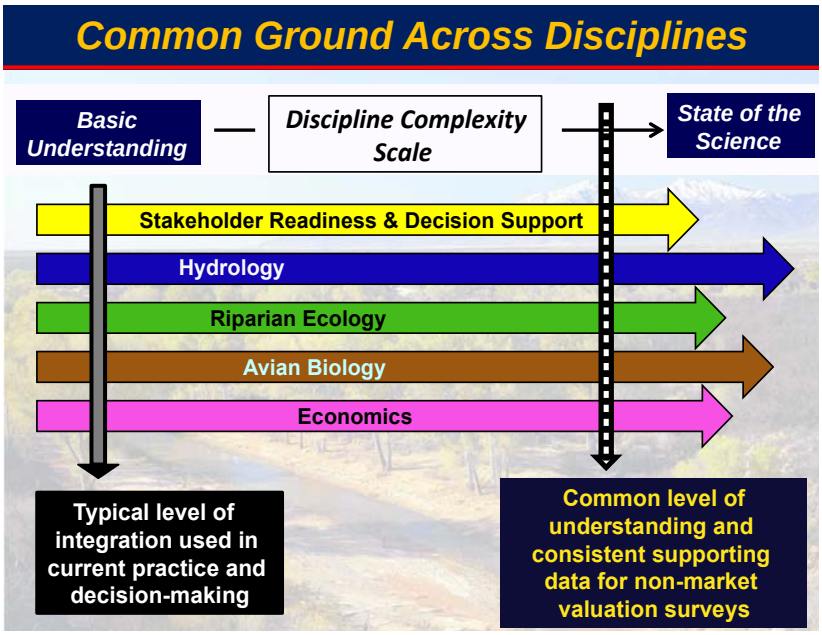

Figure 1: Conceptual representation of the level of understanding of various disciplines required for realistic coupling across disciplines to estimate the marginal monetary values for changes in non-market riparian attributes based on planning decisions.

A few words of caution for those involved in, or leading large interdisciplinary team efforts are warranted. Great care must be taken to properly include, acknowledge, and reward those involved. The quickest way to destroy the hard won trust of your colleagues is by leaving them off a paper. Futile attempts were made to develop written rules for co-authorship or acknowledgements. We finally concluded that the best method was to place the onus on the senior author of any publication to contact those who had any involvement in the research, including those who collected "basic" data, and ask them how they should be acknowledged. If co-authorship was requested in a case where it was not obvious, the colleague had to make the case that their contributions warranted it. To further ensure that involvement in large projects enhanced an individual's career progression, all investigators owned a piece of the project that they could also publish in their own discipline's cutting edge journals.

Further integration of interdisciplinary science with decision-makers presents a different set of challenges. As with scientific colleagues, building trust is an essential, but time consuming endeavor. In our case, members of our research team have been attending half-day meetings, twice a month, for 12 plus years in Sierra Vista, Arizona, located about a 90-minute drive from where they are based in Tucson. The typical three-year grant does not provide sufficient and time to build the necessary level of trust. Many investigators have come and gone in the San Pedro under such grants. These are not the same scientists that decision-makers look toward for information over the long term. They recognize that these researchers will be providing only temporary assistance, and therefore they do not invest the time to build strong working relationships that are required for this information to be integrated into their decisions (Richter et al., 2009).

In the process of on-going meetings, we learned a lot about each other's worlds. The decision-makers now know a lot more about the scientific process, the time it takes, the expense, the inherent uncertainty, and that science and models evolve as we conduct research and collect observations. We scientists know a lot more about the political and budgetary realities elected officials face in making tough decisions and the science they need to support these decisions.

Our work with watershed groups like the USPP has transcended the typical role of adapting our research to meet their needs (i.e., technology transfer) to actually designing our research to

directly address their information needs from inception. All the while the science team has published aspects of this research in numerous peer-reviewed journals. Strong established groups like the USPP have, in turn, had the political clout, to acquire funding for much of this research. Some may argue this moves research too far toward consulting. However, I would argue that very few consultants have sufficient command of a broad range of disciplines required to tackle complex problems that many decision-makers must face. Not engaging, and leaving a scientific void when decision-makers need the information will lead to poorly informed and perhaps costly decisions, or worse, an erosion of respect for the value of good science.

Every scientist does not need to commit to this level of long-term engagement with decision-makers, but a few should. Nor does this level of engagement and interdisciplinary research have to result in drop off of peer publications. Several colleagues have noted that when they embraced generosity when working with large groups (i.e. sharing ideas and data) their publication numbers increased. That is my experience as well. In addition, by engaging with the USPP I've experienced the equally rewarding bonus of knowing that my research, and that of the team, is making an impact in the very near term. Direct and sustained engagement with the USPP vastly speeds up the typical slow diffusion of our scientific discovery from peer-reviewed literature to common use in decision-making. We all need to realize that very few of our elected officials read our papers after a long day dealing with a myriad of issues from many constituencies. "Can we blame them? How often do scientists attend city council meetings in the evenings to improve their local political savvy?" (Richter et al., 2009). It took over 20 years for the publication of foundational research by one of my mentors to come into relatively common use in the consulting community. We have to do better! I often joke in seminars to aspiring student scientists that when I publish a paper I and my six best friends read it. A good colleague retorted, "Oh - you have six?!"

Given the ubiquity of water and its many critical roles in society, I feel the hydrology community needs to devote more of its efforts towards "big interdisciplinary science". In my opinion, there is greater marginal gain at the interface of disciplines than further plumbing the depths of a narrow topic. It is great to see the maturation of ecohydrology but we must continue to reach out to a wider array of disciplines as well as more actively engage elected officials and decision-makers. Think big my friends!

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A Fellow Speaks: Pursuing Snow to Advance Canadian Hydrology

John W. Pomeroy, (Centre for Hydrology, University of Saskatchewan, Canada)

It is a rare honour to be elected a Fellow by the AGU for hydrological research conducted primarily in Canada and it is my hope that this reflects positively not only on the growing capacity of "Canadian Hydrology" but on increased international recognition of the accomplishments of Canadian hydrologists. With many traits shared with the circumpolar, high altitude and temperate world, Canadian hydrology is distinctive due to long winters dominated by snow and ice processes followed by a rapid spring snowmelt freshet. Runoff is impeded by the tremendous storage capacities of poorly-drained post-glacial landscapes, causing dramatic variation in runoff contributing areas. This is in addition to the temperate zone hydrological phenomena that prevail in summer and fall. Add to this mix our vast river basins and an incredibly low density of both observations and hydrologists and one has a science that is full of excitement, adventure and great challenges. It is an environment that demands collaboration and it is not uncommon for a small team of Canadian hydrologists to be investigating an area equivalent to that of a small to moderate sized European country or US state. It is in this context that my colleagues, students and I have tried to make contributions to hydrology.

My early research was as a student of Professors Donald Gray and David Male in the Division of Hydrology at the University of Saskatchewan studying snow redistribution, sublimation and melt (Gray et al., 1988; Pomeroy and Gray, 1990, Pomeroy and Male, 1992). The seasonal snowmelt provides over 80% of annual runoff in the Canadian Prairies and while its melt rate is governed by spring energetics, the melt volume and areal depletion are governed by wind redistribution. After developing a device to measure it (Pomeroy and Male, 1988; Brown and Pomeroy, 1989), we found that mass fluxes from blowing snow transport exceeded prairie agricultural runoff, did not heed catchment drainage divides, could be managed by retaining crop stubble or wooded shelterbelts, and that in-transit sublimation could return over one-third of seasonal snowfall to the atmosphere, reducing snowmelt volumes proportionately (Pomeroy and Gray, 1995). This understanding resulted in the Prairie Blowing Snow Model (PBSM), the first of its kind (Fig. 1, Pomeroy et al., 1993). PBSM or its parts have been included in other models (e.g. Bowling et al., 2004; Gelfan et al., 2004) and has been fully distributed (Essery et al., 1999).

The Division of Hydrology conducted some of the earliest Canadian hydrology research and emphasised rigorous physics-based field and modelling studies. High demands were placed on us there because of the challenges we faced – every known hydrological model had been shown to fail in the Canadian Prairies due to their inappropriate conceptual and physical basis for application in a sparsely-gauged semi-arid cold region, and so the Division advanced cold regions instrumentation, process understanding, physically-based algorithms and modelling and eventually attracted Environment Canada's National Hydrology Research Institute (NHRI) from Ottawa to Saskatoon.

Since 'running back to Saskatoon' is more than just a song to me, most of my career has been based there with either the University of Saskatchewan or Environment Canada. However, research on cold regions does not always need to be conducted from a cold region and I was fortunate to have stints with the US Forest Service Rocky Mountain Forest and Range Research Station in the USA and the University of East Anglia School of Environmental Sciences in England under the supervision of Dr. R.A. Schmidt and Professor Trevor Davies respectively. This led to research on forest

hydrology and snow chemistry (Pomeroy and Schmidt, 1993; Pomeroy et al., 1991) that I sustained when later appointed to NHRI. One could not ask for a better institution than NHRI in its prime because of strong funding support, well-fitted laboratories in a new building and talented colleagues to work with. Our research on arctic, subarctic, boreal forest and prairie hydrology, improvements to land surface schemes and snow ecology led to an improved understanding of importance of snow interception and sublimation by evergreen forest canopies (Fig. 2, Hedstrom and Pomeroy, 1998; Pomeroy et al., 1998a), forest modification of the energy balance (Harding and Pomeroy, 1996; Pomeroy and Granger, 1997), the impact of boreal forest disturbance on hydrology (Granger and Pomeroy, 1997; Elliot et al., 1998; Pomeroy et al., 1997; 1999), snow chemistry (Pomeroy and Jones, 1996; Jones et al., 1999; Marsh and Pomeroy, 1999; Pomeroy et al., 1999), snow-atmospheric fluxes (Marsh and Pomeroy, 1996; Pomeroy et al., 1998b; Pomeroy and Essery, 1999) and snow ecosystems (Jones et al., 2001). In support of GEWEX, we instrumented basins in the arctic-taiga transition north of Inuvik, NWT (Trail Valley Creek); a mountain sub-arctic basin in the Yukon Territory (Wolf Creek), the Saskatchewan boreal forest (Prince Albert Model Forest) and the university's Kernan Crop Research Farm just outside of Saskatoon for snow process studies and model testing. With these research basins we could now better estimate, upscale and model snow redistribution (Pomeroy et al., 1997; Li and Pomeroy, 1997; Pomeroy and Li, 2000), snow interception (Pomeroy et al., 2002), and ablation and frozen soil infiltration in complex terrain and vegetated basins (Faria et al., 2000; Gray et al., 2001; Pomeroy et al., 2003).

The demise of NHRI in the late 1990s led to migration with my brave family to a lecturing post which turned into a personal chair at the University of Wales, Aberystwyth on the beautiful west coast of Wales. It was an excellent opportunity to learn the Welsh language. With support of colleagues at "Aber", we built strong collaborations with US and at "Aber", we built strong collaborations with US and UK government laboratories to study snow-vegetation atmospheric and hydrological interactions along a mountain transect from Colorado to the Yukon. This permitted detailed investigations of snow cover depletion (Pomeroy et al., 2004; Essery and Pomeroy, 2004), shrub tundra impacts on snow (Pomeroy et al., 2006, Bewley et al., 2007), radiation inputs (Hardy et al., 2004; Sicart et al., 2004, Essery et al., 2008; Pomeroy et al., 2008, 2009) and snowmelt modelling (Marks et al., 2008; Reba et al., 2012).

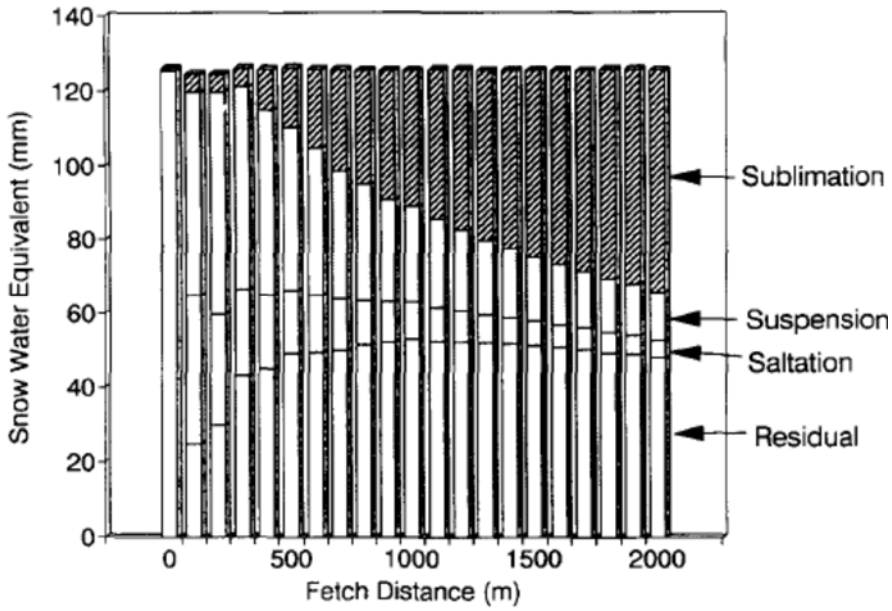


Figure 1. Cross-sectional view of the Prairie Blowing Snow Model applied to sequential control volumes along a fetch, showing annual quantities of snow eroded and then sublimated in-transit, or transported via saltation and suspension. Residual is the remaining premelt surface snowpack. Adapted from Pomeroy et al. (1993).

Since appointment in 2003 as the Canada Research Chair in Water Resources and Climate Change to anchor a new Centre for Hydrology at the University of Saskatchewan, I have worked with colleagues and students to re-instrument the venerable Marmot Creek Research Basin in the Canadian Rockies and upscale this to the Canadian Rockies Hydrological Observatory, based from the Coldwater Laboratory in the spectacular Kananaskis Valley. We instrumented a prairie wetland basin, Smith Creek, in eastern Saskatchewan - an area of dramatically increased streamflows, increased rainfall and wetland drainage. Research on how climate change impacts northern hydrology has revitalized Wolf Creek Research Basin as part of the International Polar Year. The Centre for Hydrology (www.usask.ca/hydrology) includes government hydrologists as well as academics and students, has recently led two national research networks on cold regions hydrology and Prairie droughts and an international hydrological decade and contributes to the University of Saskatchewan Global Institute for Water Security which hosts a national network on changing cold regions hydrology and North America's only GEWEX experiment.

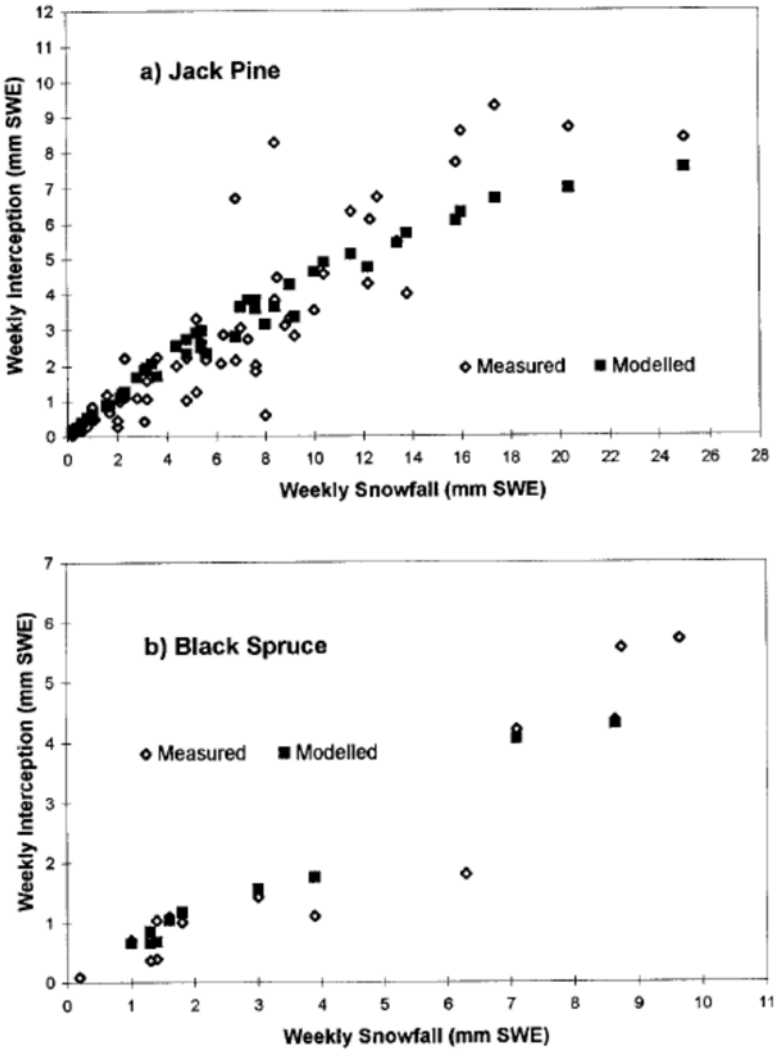


Figure 2. Modelled and measured snow interception against measured snowfall in two boreal forest stands. Adapted from Hedstrom and Pomeroy (1998).

At Wolf Creek our observations have shown an increase in tundra shrub height and with models have highlighted the changing role of snow redistribution, variable melt and permafrost soils in generating streamflow (Quinton et al., 2005; Zhang et al., 2010; Bewley et al., 2010; Menard et al., 2013). In Marmot Creek we have focussed on snow redistribution, interception and melt energetics, showing substantial sublimation from alpine blowing snow, importance of slope/aspect and internal energy on snowcover depletion and effects of advected turbulence on convective heat transfer in mountain valleys (DeBeer and Pomeroy, 2010; MacDonald et al., 2010; Helgason and Pomeroy, 2012). Mountain slope and aspect impact radiative transfer (Marsh et al., 2012) to control the influence of small forest clearings on melt rate in forests, with accelerated melt on south facing slopes and retarded melt on north facing slopes (Pomeroy et al., 2009, Ellis et al., 2011, 2013). Sublimation of intercepted snow reduced snow accumulation by half (Pomeroy et al., 2012). Hydrological responses to forest disturbance were moderated in Marmot Creek by desynchronization of melt timing

(Pomeroy et al., 2012). Observations of a large rain-on-snow flood in Marmot Creek in June 2013 are driving the next phase of research.

In the Canadian Prairies, modelling based on studies of blowing snow, melt, evapotranspiration, and infiltration to frozen soils and long term observations of increasing rain/snow proportion and increasing multiple day precipitation events has documented unmeasured turbulent heat fluxes to snow, hydrological drought development and demonstrated a multi-year hydrological memory caused by depressional storage due to hysteresis between depressional storage and contributing area (Helgason and Pomeroy, 2012; Fang and Pomeroy, 2008; Armstrong et al., 2010; Shook and Pomeroy, 2011, 2013). A comprehensive model of prairie hydrology including simple wetland dynamics has been developed (Fang et al., 2010) and used to evaluate the impact of wetland drainage in Smith Creek, Saskatchewan (Pomeroy et al., 2010). Drainage or restoration substantially altered discharge rates and long term flow volumes. Recent research is seeking to understand the role of wetland drainage and climate change in the widespread prairie flooding of 2011.

The Snow Acoustic Sounding System (SAS2) is an acoustic reflectometry device based on a new theory of snow thermo-acoustics that is capable of observing the depth, density, wetness, temperature and structural properties of a snowpack without invasive measurements (Kinar and Pomeroy, 2009). It is expected that this device will improve the performance of cold regions hydrological modelling and flood forecasting.

Frustration with repeated hydrological model failure in Canada due to weak physical or inappropriate temperate zone conceptual bases led to the development of the Cold Regions Hydrological Modelling platform (CRHM) with former Division of Hydrology hydrological modeller, Tom Brown as the CRHM programmer. CRHM is a flexible, modular, physically-based model that simulates hydrological processes for a wide range of environments (Pomeroy et al., 2007; Dornes et al., 2008; Fang and Pomeroy, 2009; Ellis et al., 2010). Outside of Canada, it has been tested successfully in Spain, China, Chile, and Germany (Lopez Moreno et al., 2012; Zhou et al., 2014). It has been developed as the core of an ensemble flood forecast system for the 51,000 km^2 Smoky River basin, Alberta (Pomeroy et al., 2013). Its algorithms support improvements to Environment Canada's MESH large scale model (Dornes et al., 2009). Recent developments include improved precipitation phase discrimination (Harder and Pomeroy, 2013) and multi-objective evaluation of uncalibrated prairie and mountain hydrological models derived from CRHM (Fang et al., 2010, 2013). CRHM is a contribution to the IAHS Decade on Prediction in Ungauged Basins (PUB), and demonstrates my fundamental philosophy – that predictive uncertainty can be reduced by improving our understanding of hydrological processes and basin function and reflecting this in physically-based algorithms applied in an appropriate model structure.

References can be found at http://www.usask.ca/hydrology/Pubs.php .

A Fellow Speaks: 1200 words to make sense of chaos: The Selker Scheme

John Selker (Oregon State University)

Being elected a fellow of the AGU was an amazing honor, and I thank those who so kindly nominated me, somehow crafting a silk purse from the assorted bits and pieces I have left behind over 25 years. I take this opportunity to address non-technical aspects of my experience. After all, the science is easily found on-line, whereas the ins and outs of personal scientific strategy rarely see the light of day.

My research is the outcome of local optimization scheme with the objective of identifying the next

most opportune study. This was a problematic approach when faced with calls for proposals which I saw I could address, thus seemed opportune, but did not deeply stimulate my curiosity. I was lured into that trap a few times. But in time, putting greater weight on "the likelihood that I will be excited by the work" than "the chances that the ideas will be successful" and putting "the chances that I would be funded" last, my research program took a turn for the better (right around the time I got tenure - funny how that works). Behind this all lurks the fact that I am more fascinated by *challenges* than *questions*. I do not see this as an advantage: great scientists seek answers to great questions, not just engaging puzzles. I tend to be hooked on a question, which sometimes take decades to unravel.

This "strategy" (more accurately a propensity) is best understood by an example of a question and its resolution. Here's one which can be explained compactly, which we could call "the steam water quality sampling conundrum:" design an ultra cheap sampler of 1-month time-averaged stream chemistry. What a neat problem! So we started with the fact that a sampler must have a vessel to hold the material collected. Next, if it is to sample from a stream, it would be good if it sank. So at a minimum we must have a weighted brown glass bottle. At this point a little context is needed. David Rupp had just found significant pesticide in runoff and wondered how many stream might have this problem (Rupp et al., 2006), so we needed to sample at hundreds of points for the little money I could gather: about $1,000 - the cost of the bottles. So we stared at a bottle: the answer must be here. "Fine, let's just drill one tiny hole in the bottle cap and call it done." When the stream water warms the bottles air expands sending out 2% of the air from the hole (PV=nRT and T changes about 6 ^{o}K out of 300 ^{o}K). Cooling contracts the air, drawing in water. It fills half-way in a month. David and I had a great time making and testing these bottles. By the time we were confident in the design, the project was by over, but we got enough data to publish (Selker and Rupp, 2005). How important was this work? The paper has been cited twice (and those only citing our work to justify that weird sampling strategies are publishable. A wonderful puzzle solved, but that interested fewer people than would be invited to a dinner party.

So should we follow the branching Fibonaccian web of passion or a single path? Eternally seduced by the next "cool problem" means that I do not tend to follow otherwise discernible "lines of investigation" and is likely to lead to lost papers such as the sinking bubble bottle. I have been told that this is not the best route to "success," and that staying focused on a single theme brings greater recognition of your work. Yes, I agree, in the abstract. But this theory is trumped, in my opinion, by the absolute requirement that a researcher's spirit be engaged in their work if they are to have a hope of accomplishing anything truly original and important. If you don't find yourself dreaming about it, you just aren't fully engaged: you are just using a tiny fraction of your brain, missing out on the chance to excel.

How do we balance these factors? Don Nielsen's question needs to be added to the criteria for selecting a research project: is the problem important to humanity? And he means REALLY important!

Stumbling in the dark you are sometimes lucky enough to bump into a lump of gold. Marc Parlange is uniquely expert at helping people stumble productively. Preparing to come to Switzerland on sabbatical to work with Marc he suggested I work on glacier melting. The problem is that glaciers melt largely due to shortwave radiation absorption, and if you stick anything in the glacier to measure the radiation or temperature, it gets hot in the sun, and melts the ice. "What if I had an entirely transparent thermometer?" I recalled hearing about fiber optic temperature measurements, so I started to check on that approach. We tried hard to measure the glaciers melt with fiber optic distributed temperature sensing (DTS), but the bottom line is that I never got any important publishable data. I tip my hat to all those studying snow! But the DTS method allowed measurement of 10's of thousands of temperatures across scales of 0.1 to 10,000 m. These are precisely the scales at which

hydrological theories are challenged and span "point" measurements and remote sensing. This is an obvious gold mine for our science (opportune? Yes!). We have now used DTS to "see" air movement, quantify groundwater upwelling in streams, measure soil water content, observe lake stratification, surface temperatures of the ocean, and flow in deep boreholes. A wonderful aspect of the scientific endeavor is that we move as a community. We (my DTS buddies Scott Tyler and Nick van de Giesen) have now put on 15 hands-on workshops training folks how to use the method, and started an NSF-funded center (CTEMPs.org) where we make the gear and technical support available to others who have ideas that DTS might help address. It has been a delight.

The bottom line is that life is too short to:

1. Study problems that don't matter;
2. Try to "go it alone" rather than feeling the joy of community;
3. Get stale studying the same old thing. If you feel it is fresh, great. If not, then open your eyes to new problems;
4. Worry about others stealing your ideas! The jokes on them – you are multiplying the number of people who are helping you answer the questions that you can't wait to understand. Share your ideas, your data, your time.

Here's a little secret: the coolest problem ever is just around the bend. Take the corner, and enjoy the ride. I can't point the way, but following a few simple rules I promise you'll have a great time wandering.

Rupp, D.E., K. Warren, E. Peachy and J.S. Selker. Diuron in Surface Runoff and Tile Drainage from Two Grass-Seed Fields. J. Env. Qual. 35:303-311. 2006.

Selker, J.S. and D.E. Rupp. An environmentally driven time integrating water sampler. Water Resour. Res. 41. W09201, DOI:10.1029/2005WR004040. 2005.

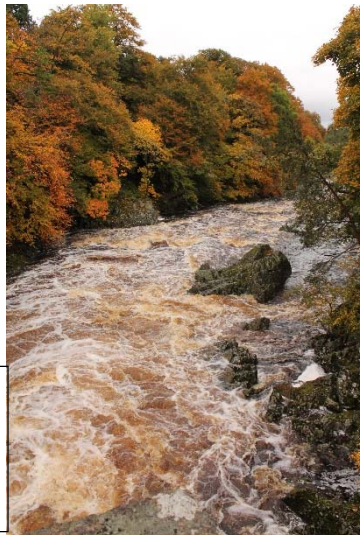
Report from the Surface Water Technical Committee

Doerthe Tetzlaff, Dan Moore, Theresa Blume, Sean Carey, Anna Coles, Jim Freer, Sarah Godsey, Jennifer Jacobs, Shinjiro Kanae, Anna Kauffeldt, Brian McGlynn, Jim McNamara, Takahiro Sayama, David Tarboton, Nicolas Zegre

Structure and function of the Surface Water Technical Committee

AGU Technical Committees provide a way for you to promote ideas for activities within AGU to advance Hydrology. The Surface Water Technical Committee has recently been reorganized to include new members with fresh perspectives and is eager to hear your input. All Technical Committees are now composed of a Chair, a Deputy Chair, and approximately a dozen other members, chosen to provide diversity of gender, subject area expertise, nationalities and career stage. The committee provides a venue for the generation, nurturing and development of ideas for meeting special sessions, Chapman conferences and topical articles for publication in the section newsletter. Below are some of the ideas generated at the 2013 Technical Committee meeting. We encourage all members of the surface water community to consider proposing these topics for sessions at the Fall Meeting or to write a topical article for the Hydrology Section newsletter.

The committee sees itself as "communication facilitators" and is open to input from the entire AGU hydrology community. We invite interested AGU hydrologists to contact committee members with ideas and suggestions. Further, we encourage colleagues who are proposing sessions to involve



Understanding the processes which control and influence the quantity and quality of our surface waters is still a major research challenge

students as convenors to support the enhancement of junior scientists. Currently, the Surface Water Technical Committee comprises Doerthe Tetzlaff (U Aberdeen, Scotland, UK) as Committee Chair, Dan Moore (UBC Vancouver, Canada) as Deputy Chair, and the following members: Theresa Blume (German Research Centre for Geosciences GFZ), Sean Carey (McMaster, Canada), Anna Coles (University of Saskatchewan, Canada), Jim Freer (U Bristol, UK), Sarah Godsey (Idaho State, US), Jennifer Jacobs (U New Hampshire), Shinjiro Kanae (Tokyo Institute of Technology, Japan), Anna Kauffeldt (Uppsala University, Sweden), Brian McGlynn (Duke University, US), Jim McNamara (Boise State, US), Takahiro Sayama (International Centre for Water Hazard and Risk Management, Public Works Research Institute, Japan), David Tarboton (Utah State, US), Nicolas Zegre (West Virginia University, US).

Potential topics for meeting sessions and newsletter articles

Future developments and new insights into catchment heterogeneities and spatial patterns: The patterns and processes influencing surface waters are manifold and fundamental to addressing scientific and management questions. Landscapes, and more specifically catchments, are heterogeneous at all scales due to variability in driving fluxes (precipitation, snowmelt, radiation), geology (material, bedrock topography, fractures), soil (matrix properties, macropores, soil moisture, thermal status, layering), vegetation, and land-use. While the variables influencing catchment dynamics such as runoff sources and flow paths seem fairly well-established, it is now necessary to generalize beyond our respective study systems. Information on the internal behaviour of catchments is necessary to identify similarities and differences between respective catchments in terms of their response to natural and anthropogenic disturbance and change.

New techniques and novel technologies for hydrologic observations: New technologies have the potential to new insights into the heterogeneities of catchments, patterns and surface water dynamics. Advances in datalogger, computer and sensor technologies, which are increasingly

In Situ Sensors for Dissolved Organic Matter Fluorescence *provide the opportunity to measure water quality parameters at high temporal resolution even at remote headwater sites.*

affordable and reliable, allow for automatic measurements at high frequency. The development of low-cost sensors provides opportunities for better characterisation of spatio-temporal variability across scales. Applications of sensor technologies are not restricted to surface water dynamics, and a possible cross-cutting theme could be the application of new technologies to enhance our understanding of water and energy transfers across atmosphere-surface and surface-subsurface interfaces. Wider conversations on novel techniques and approaches are critical to allow comparative research across environments and scales, and to find appropriate, common techniques that link research across different study systems. At the AGU Fall 2013, a successful session on the application of novel sensors was organised (H51T "Taking the Riverine Pulse: Monitoring and Research Through the Lens of Continuous Water Quality Data"). A continuation of such a theme would be valuable to the community.

Other novel sensing techniques sessions have included the so-called MacGyver Sessions – poster sessions with a focus on unusual hydrologic experiments under financial constraints. This involves creative, out of the box thinking and cross-cutting use of sensors that were often not intended to be used for hydrological and/or environmental applications. Authors usually bring their newly developed equipment and allow first-hand testing at the poster session. These sessions have been going on since 2009 and we encourage the continuation of this session theme.

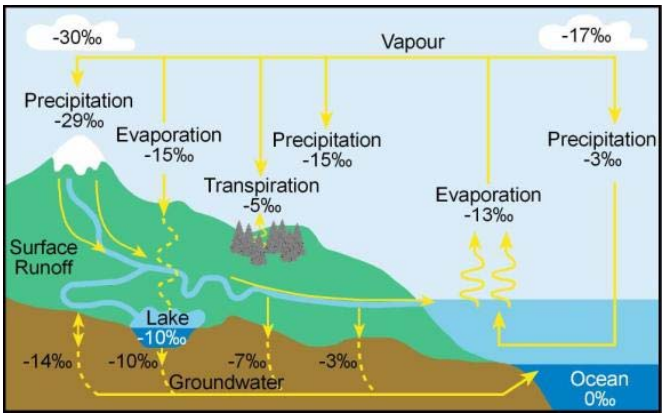
Use of unmanned aerial vehicles: One technology that held considerable interest during the committee discussion was the application of UAVs (unmanned aerial vehicles). The improvement in performance and endurance of electronically powered flying platforms, such as multi-copters and fixed-wing airplanes, combined with the decreasing size and weight of different sensors, has led to an increase in the use of UAVs in scientific applications. Small UAVs offer safe, fast response tools that can be used for hydrological monitoring, mapping, aerial photography, and remote sampling. Despite having enormous potential for field research, there are considerable policy, regulatory, and legal considerations. Oversight involves interconnected policy and regulation at national, regional, and international levels. For example, in the US, UAVs are legally categorized as aircraft and therefore come under the jurisdiction of aviation regulators. The existing regulatory framework permits UAVs to fly in segregated airspace only as opposed to common airspace, significantly limiting applications in many areas. The use of UAVs for all purposes raises technical, policy, and legal considerations that need to be understood

New insights into understanding storage dynamics - measurements and modelling approaches: One recent effort in the hydrological community has focused on understanding storage dynamics in catchment systems. Storage is as important as understanding commonly studied fluxes such as runoff, groundwater recharge, and evapotranspiration. The increasing awareness of the importance of storage to catchment processes is not independent of the recent paradigm shift that runoff generation is mediated by thresholds, controlled by hydrological connectivity and dictated by the heterogeneity in storage capacity in soils, hillslopes and catchments. Changes in storage can have disproportionate effects on runoff responses depending on how close catchments are to meeting saturation and storage capacity thresholds. The volume of water stored within a basin and its partitioning between groundwater, soil moisture, snowpack, vegetation, and surface water ultimately characterises the state of a hydrologic system. Changes in storage moderate the fluxes and exert critical controls on a wide range of hydrologic, chemical and biologic functions of a catchment: storage can regulate discharge; affect biogeochemical processes through its control on residence time; influence plant health and ecosystem function; and in part determine the sensitivity of the system to climate variability and diffuse pollution. Future meeting sessions and newsletter articles focused on novel techniques and approaches would help advance our understanding of storage dynamics across scales.

New insights in connectivity in catchment science: The concept of hydrological connectivity remains

a popular and useful frame for understanding spatial variations in runoff generation. Understanding the importance of connectivity in ecohydrological systems is crucial for management given the degree to which such connectivity has been affected by human activities, such as river regulation or water abstraction. However, despite a series of studies there is still no consensus about how to define and measure hydrological connectivity. It is timely for researchers studying hydrological connectivity to reflect on the way in which we approach, conceptualize and implement research design. Capturing the actual processes controlling and driving hydrological connectivity remains a major research challenge. There is a need to develop our understanding of hydrological connectivity using a range of techniques and to communicate effectively with stakeholders responsible for land management. Comparative inter-site research across different environments, vegetation and scales is necessary to understand the range of mechanisms and processes of runoff production to inform our understanding. And finally, again, new sensors and field techniques provide excellent opportunities to enhance our understanding of the processes controlling hydrological connectivity.

Tracer applications in catchment hydrology: The tracing and assessment of dominant, cross-scale processes is a key concern in catchment sciences. Important tools for upscaling and identifying dominant processes include hydrochemical and isotopic tracers. Natural isotopic and geochemical tracers can provide insights into the hydrological functioning of catchments and can be particularly useful in upscaling studies as their dynamics in natural waters reflect the integration of process interactions at spatial and temporal scales. Nested tracer studies integrating the soil profile-hillslope-catchment scales allow the filtering effect of catchments on tracer input signals to be investigated directly. The passage of conservative, environmental tracers through and between different hydropedological units can then be monitored to test hypotheses about how input signals are damped and lagged by internal mixing processes and connections between different spatial units, including deeper groundwater. Some examples of current research directions are time varying transit time distributions, the role of plants in subsurface soil water mixing and water availability and the role of bedrock water contributing to runoff generation. The integrative approach of assessing stable isotope dynamics and estimation of stream water age is still relatively little used in urban catchments. The reason for this might be the fact that methods developed in relatively undisturbed experimental sites may not translate to perturbed urban environments and tracer signals from urban runoff may be confounded by other anthropogenic influences such as leaking supply and sewer pipes and water imports. Originally, the laboratory analysis of isotope sample has be time and cost intensive. Recently developed laser absorption spectrometers allow for cost-effective generation of high-resolution δ^2H, $\delta^{18}O$ and even $\delta^{17}O$ data sets. The consequent increased availability of high-frequency (sub-daily) multiple isotope data now facilitates detection of short-term transport and mixing processes that coarser sampling resolutions and single isotope data might mask. Still, despite these advances in technologies there remain major challenges in measuring, analysing and



Using $\delta^{18}O$ to identify pools in the hydrologic cycle ($\delta^{18}O$ is expressed conventionally as per mil). Fractionation processes differentiate the isotopic signatures of different components of the water cycle. These differences in the signatures allow us to trace water movement and partitioning within the landscape. New analytical technologies allow many more samples to be analysed in a cost effective way and one can therefore sample on much finer scales (figure obtained from and after IAEA).

interpreting tracer data and the community should continue to share these experiences and learn from each other. Interestingly, despite their value to assess flow paths ways

Influence of resource utilization on surface water hydrology: Given the extent and scale of contemporary anthropogenic disturbances, there is an urgent need to understand how human activities influence hydrology across a range of scales. Examples of landscape-scale disturbances associated with contemporary resource use include surface mining for hydrocarbons and coal, hydraulic fracturing, industrial forestry and agriculture at large scales. How watersheds respond to environmental change from these activities has important implications for sustainability of water resources, ecosystem resilience, and effectiveness of civil structures to accommodate change. Previous research has tended to focus on single types of land use, particularly forest harvesting, often in small headwater catchments. Given that many contemporary extraction activities occur at the landscape scale, often in conjunction with other human activity and in catchments with a legacy of past land use, there is a growing need to develop methods for assessing cumulative effects of multiple environmental stressors, including their interactions with climate change. In addition, there is currently uncertainty about how hydrologic processes evolve following a disturbance (e.g., through forest regrowth) and the effectiveness of mitigation and restoration activities.

Examples of human activities influencing hydrology

New Technical Committee on Hydrologic Uncertainty

Mary Hill (USGS), chair

As scientists measure, theorize, and calculate, we are continually aware that our ideas and conclusions are subject to uncertainty. Uncertainty quantification is important to all users – from scientists to the public – because it provides a needed perspective when considering decisions to be made based on both data and model results. When addressing societally relevant topics, our methods of quantifying uncertainty and resulting risks are evolving with our mathematical and numerical methods of integrating ideas and data. Further, the methods of uncertainty analysis are sometimes poorly understood even by statisticians and mathematicians. A forum whereby the theory, meaning, and utility of uncertainty methods and measures can be discussed is needed.

The AGU Uncertainty Swirl is now two years old, and has enabled session conveners to associate their sessions with the topic of uncertainty. In 2013 10 Hydrology sessions identified themselves with this Swirl. In response to the popularity and importance of this topic, the Hydrology Section of AGU launched a *Technical Committee for Hydrologic Uncertainty*. Bearing in mind that Hydrology is the only section of AGU with Technical Committees, this committee can be

thought of as serving a widespread need across AGU. Given that the creation of technical committees is rare, the importance of the topic of uncertainty is reflected in the creation of this committee.

This new technical committee on hydrologic uncertainty has adopted the following purpose statement:

> Hydrologic scientists use uncertainty concepts and measures in many ways, from testing theories against data to providing regulators with defensible quantification of uncertainties associated with sometimes controversial environmental problems (e.g. sustainability, integrated water resources management, climate impacts, carbon sequestration, energy production, including fracking, and waste disposition). This technical committee seeks to improve how uncertainty is evaluated and measured by scientists in the Hydrology section of AGU by providing a forum to discuss and communicate ongoing experiences and new methods, and to develop scientific sessions.
>
> Because uncertainty is a cross-cutting issue, the Hydrology Section Uncertainty Technical Committee also coordinates with other Sections of AGU, as well as other organizations such as SIAM, GSA, EGU, IAHS and so on.
>
> Issues of interest include
>
> - how conceptual and data uncertainties are represented, evaluated and reduced;
> - uncertainty quantification in cost assessment, risk analysis and decision support;
> - how legal structures do and don't integrate the reality of uncertainty;
> - probabilistic and non-probabilistic metrics used to judge models against data, rank alternative models and test hypotheses;
> - sensitivity analyses used to unravel sources of uncertainty and the underlying simulated processes and properties;
> - strategies (data collection, field testing, etc.) for uncertainty the potential for their optimization;
> - use and usability of uncertainty analysis, including how scientists and policymakers view and use uncertainty methods and measures; and
> - novel ideas not yet considered.

The Technical Committee on Hydrologic Uncertainty is currently composed a chair, four co-chairs, and 14 members. The chair and co-chairs are listed below. The members can be found on the sections web site in the technical committee section (http://hydrology.agu.com/committees.html).

Mary Hill, USGS, chair. Hydrologic modeling. Local and global sensitivity and uncertainty analysis

Katharine Hayhoe, Texas Tech University. Co-chair for coordination with other AGU sections. High-resolution climate projections and impacts of climate change on human society and the natural environment.

Luis Samaniego, UFZ. Co-chair for Quantifying Uncertainty of Data and Model Input. Distributed mesoscale hydrologic model (mHM) with land-vegetation-atmospheric interactions.

Ming Ye, FSU. Co-chair for Quantifying Model Prediction Uncertainty. Simulation of flow/solute transport in saturated/unsaturated porous/fractured media. Bayesian uncertainty & risk analysis, HPC

Velimir (Monty) Vesselinov, LANL. Co-chair for Communicating uncertainty to decision makers and in legal contexts. Simulation of flow/transport in saturated/unsaturated, porous/fractured media. GLUE.

These committee members represent a broad range of methods and opinions about uncertainty, with a view to facilitating and encouraging the kind of healthy debate and community involvement that is needed for scientific advance and for the development of practical solutions. Given that we are arguably still in the early stages of understanding how to model the Earth system and its components, perhaps the one certainty is that our knowledge and understanding about models and model analysis methods will continue to change and develop over time. Accordingly, our goal is for this committee is to be on the cutting edge of that evolution.

As anticipated, the technical committee is already becoming a hub of activity, as the wider Hydrology and AGU scientific community engage with committee members. For the 2014 Fall AGU meeting, six session proposals were submitted with committee initiative, and all of these sessions were accepted. Session conveners come from both inside and outside the committee. The approved session titles and conveners are as follows. Three were submitted to the Hydrology Section, one to the Global Environmental Change (GEC) Section, and one to Earth and Space Science Informatics (ESSI).

- **Quantification of Simulation Uncertainty in Geophysical Modeling (ESSI) --** Ming Ye (FSU), Jasper Vrugt (UC Irvine), Bryan Tolson (U Waterloo).
- **Uncertainty and Sensitivity in Models and Observations and their Impacts on Decision Making related to Geological, Hydrological and Environmental Applications: Estimation Methodologies and Site Applications** -- Monty Vesselinov (LANL), Hoshin Gupta (UA), Lenny Smith (LSE), Joseph Kasprzyk (UC-Boulder)
- **Understanding the Interface Between Models and Data** -- Grey Nearing (NASA), Ben Ruddell (ASU), Ken Harrison (NASA, U of Maryland), Jasper Vrugt (UC Irvine)
- **Knowledge translation: Mobilizing environmental data and modeling for uncertain and changing decision and policy contexts** – Ted Melis (USGS), Tony Jakeman (ANU), Pat Gober (ASU/U of Saskatchewan), Shaleen Jain (U of ME)
- **Characterizing Epistemic Uncertainty in the socio-hydrological system** -- Paul Smith, U of Lancaster
- **Quantifying Climate Impacts on Human and Natural Systems: Which Uncertainties Matter? (GEC)** – Katharine Hayhoe (TTU), Edwin Maurer (SCU), Zhangshuan (Jason) Hou (UA), Mary Hill (USGS).

We invite all interested colleagues to submit their abstracts to these sessions and all hydrology sessions in the Uncertainty Swirl. In addition, we encourage you to talk to the current committee members, introduce ideas, express concerns (hopefully constructively and with good humor), and get involved in whatever ways your talent and interests lead!

2013 Outstanding Student Paper Award Winners

Name	University	Presentation	Advisor
Rose Abramoff	Boston University	Root phenology at Harvard Forest and beyond	Adrien Finzi
Masoud Arshadi	University of Colorado at Boulder	High-Resolution Experiments on chemical oxidation of DNAPL in variable-aperture fractures: Delineation of three time regimes	Hari Rajaram

Tania Bakhos	Stanford University	Fast Solvers for Transient Hydraulic Tomography based on Laplace transform	Peter Kitanidis
Paolo Benettin	University of Padova	Coupling hydro-chemical models and water quality datasets: signatures of mixing patterns and non-stationary travel time distributions	A. Rinaldo and G. Botter
Cameron Bracken	University of Colorado at Boulder	Variability of Hydroclimate Extremes on Seasonal to Multidecadal Time Scales in the Western US	Balaji Rajagopalan
Linyin Cheng	University of California Irvine	Nonstationary Extreme Value Analysis in a Changing Climate: A Software Package	Amir AghaKouchak
Jana von Freyberg	University of Neuchatel	A field study in the Swiss Rietholzbach basin to understand landscape filtering of hydro-climatic drivers and its effects on streamflow composition	Mario Schirmer
John Gardner	University of Maryland Center for Environmental Science	Quantifying N2 and N2O production in agricultural streams using open channel methods: a tool for finding missing watershed nitrogen	Thomas Fisher
Si Gou	Texas A & M University	Simulating Groundwater-Plant-Atmosphere Interactions in a Semiarid Savanna	Gretchen Miller
Jonathan Herman	Cornell University	Multi-Agent Many-Objective Robust Decision Making: Supporting Cooperative Regional Water Portfolio Planning in the Eastern United States	Patrick Reed
Paul Micheletty	Colorado School of Mines	Application of MODSCAG and MODIS snow products in post-fire watersheds in the western U.S.	Terri Hogue
Kristen Rasmussen	University of Washington Seattle	TRMM precipitation analysis of extreme storms in South America: Bias and climatological contribution	Robert Houze
Noah Schmadel	Utah State University	The role of spatially variable stream hydraulics in reach scale, one-dimensional solute predictions	Bethany Neilson
Colby Thrash	Clemson University	Monitoring Changes in Soil Water Content Using Subsurface Displacement	Larry Murdoch
Mohammad Javad. Tourian	University of Stuttgart	Estimating runoff using hydro-geodetic approaches; assessment and comparison	Nico Sneeuw
Samuel Tuttle	Boston University	Using Large-Scale Precipitation to Validate AMSR-E Satellite Soil Moisture Estimates by Means of Mutual Information	Guido Salvucci