December 2020

Newsletter

Hydrology Section

In this Issue:

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From the Section President

Scott Tyler (University of Nevada, Reno)

The year 2020 has been incredibly difficult for all of us, and my thoughts and wishes for a better future go out to each of you who has suffered losses through this year. The Hydrology Section lost several of our senior mentors and leaders in the past year, and they and all who have passed will be missed. I did not expect to start my last newsletter article under this cloud, but I do know that we will get through these challenges.

My term as President comes to an end after the 2020 Fall Meeting and it has been a pleasure and honor to serve our Section, and in spite of the challenges of the past year, it has been a wonderful experience and I believe we have been able to move the Section forward on several fronts.

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2022 Frontiers in Hydrology Meeting

We are moving along on schedule for the 2022 "Frontiers in Hydrology Meeting" co-organized by AGU and CUAHSI. The meeting is scheduled for late June 2022 and we are in negotiations with an exciting and friendly location city in the US as I write this. We conducted a search over the summer for the Section's programming team, and I am very pleased to announce the selection of the AGU's Program Committee Co-Chair, Bart Nijssen, Vice Co-Chair Alex Mayer, Early Career Representative Cynthia Gerlein-Safdi and Student Representative Bailey Anderson. This team has some outstanding ideas and concepts for the meeting, and along with our CUAHSI counterparts, will be building out the meeting from scratch. And if I can steal a quote from Bart, "if we simply repeat the Fall Meeting on a smaller scale, we have failed!" Expect some very creative sessions and innovations, along with both a carbon-friendly meeting. Please join Bart and the team for a Town Hall (TH038) on Monday December 7 from 13:30-14:30 EST to introduce the meeting concepts, and to start the process of engaging you in the meeting design.

WRR Open Access Evaluation

The WRR Open Access Task Force presented their findings to the AGU Publications Committee in September 2020. This was the first time that an AGU section had taken the initiative to dig deeply into the questions of Open Access and bring forward the opinions and desires of its members to the Publications Committee. The Pubs Committee commended the in-depth analysis and data gathering from the Task Force (Chaired by Martyn Clark and Charlie Luce). The Task Force also brought forward the critical need for financial transparency of AGU's publishing if our membership is to have the data necessary to really assess the publishing future. As we left the meeting, we recommended that the Publications Committee use WRR as a scenario test case to "run the numbers" to better understand what a switch to Open Access would look like, both to the readership and to the finances of AGU and its publisher. I believe open science is an important value standard for our community, and it will be up to the Hydrology Section to keep pursuing these principles by keeping them at the top of the Pubs Committee agenda in the next year

Justice, Equity, Diversity and Inclusion (JEDI) Efforts in the Section

2020 brought back the inescapable fact that the social injustice, of many forms, remains a disgusting legacy. While AGU and the Section has taken a strong stand against such inequalities, but it was from our students that true action has come forward. A team from the Hydrology Section Student Sub-Committee (H3S) has drafted an action plan for the Hydrology Section to address JEDI issues from within. The document is available for comment at (**https://drive.google.com/file/d/17b6LezeFA1UJTCsGlWgJNFtFJ9-m5cVU/view**) and I have stood up a

task force to build the operating principles for a formal JEDI committee within the Section. While some of you may ask, "why is the Section allocating it's time to this effort? are there not organizations more qualified or effective already working on the problem?" And you would be right, there may be more "qualified" organizations fighting racism and injustice, but if we do not have a just and inclusive workforce in hydrology, then we are unlikely to provide effective solutions to society's water resource challenges under a changing climate. We know that diversity and equity lead to better problem solving and innovation, and as a scientific society, this then becomes our fight.

I am tremendously proud of our students for recognizing the need for action, not just words, and encourage all of our members to review and comment on the plan and the participate in a **Town Hall (TH003)** on Tuesday December 1 from 10-11 EST to take the next steps. This will be long journey, and I know that our incoming leadership is committed to taking these first steps.

"(...) if we do not have a just and inclusive workforce in hydrology, then we are unlikely to provide effective solutions to society's water resource challenges(...)"

In help further accessibility for the disadvantaged students, the Hydrology Section has teamed with CUAHSI to offer free student registrations for the 2020 Fall Meeting. The Section leadership, CUAHSI and H3S recognized the financial hardships that Covid-19 is taking on all of our student members, and in a few short weeks, we launched a program aimed at students with need. Thanks to a generous matching donation from CUAHSI, we were able to provide complimentary registration to almost 180 students who were in need of financial support. And a special thanks to Leila Saberi and her H3S team for developing, on moment's notice, the application portal. You can read some of the student responses at **https://us3.campaign-archive.com/?u=aad7e9257f-329c1a46ebbd412&id=d20551595d**.

Witherspoon Lecture Fundraising

The Paul Witherspoon Lecture recognizes the accomplishments of a mid-career scientist for their contributions to hydrology and is one of the Section highlights at the Fall Meeting. In reviewing the Section's finances, I discovered that the endowment never reached its planned goal although is quite close thanks to the efforts of a dedicated few in the past. During the summer, I met with several of the original fundraising committee, and we decided to both revised some of the spending guidelines as well as set out to continue to grow this endowment through mid 2021. Thanks to generous donations from the Witherspoon family and some of the rest of us, we are seeing that endowment grow. This is a difficult time for many, but I do encourage you to consider contributing to the Witherspoon Lecture fund, either directly through the AGU portal (**https://www.agu.org/Give-to-AGU/Giving**) or if you would like more information, please contact me or contact Victoria Thompson at AGU.

Communication within the Section:

When I became president, I had an outstanding roadmap in hand to improve the Section's communication with its members (reference to newsletter here). We began with a complete revision of the Section's website which, after a few challenging starts, is now fully functional and easy to use. The Section's leadership can now directly contact our membership through AGU Connect and its Hydrology Community. I think you have been relieved that you only hear from me once or twice a month with this new easy to use system, and only with critical information. For less critical information, you can follow the Blog posts on the website making it much easier for the Section leadership to get information out, without filling your inbox. The new web platform has allowed most of our Technical Committees to launch their own websites, and we are developing an easier access to the Newsletter. Gone will be the days of a massive pdf newsletter, to be replaced by a more "news platform" format with more abilities to highlight graphics and video.

And finally, the Section has entered the Twitter world, at **@Hydrology_AGU**. Our students and Technical Committees long ago recognized the value in social media communication, and now the Section, i.e., your section leadership, is using Twitter to better reach our

membership for important updates.

Section Leadership

It is a pleasure to announce John Selker from Oregon State University been elected to serve as President-Elect starting in 2021 and Shirley (Kurc) Papuga from Wayne State University has been elected to serve as Section Secretary beginning in 2021. I want also to want to thank our runners up, Praveen Kumar from the University of Illinois and Matthew Rodell from NASA Goddard for their dedication to the Section and for their willingness to serve.

"It is a pleasure to announce John Selker from Oregon State University been elected to serve as President-Elect starting in 2021 and Shirley (Kurc) Papuga from Wayne State University has been elected to serve as Section Secretary beginning in 2021."

It has truly been a pleasure and honor to serve as your President over these past two years, and I am leaving the Section in outstanding hands! I owe a tremendous debt of gratitude to the many volunteers and officers for their hard work and dedication over these two years. There would be no Hydrology Section if it weren't for the tireless dedication of our outgoing Section Secretary, Charlie Luce. Charlie is responsible for the Student Travel Grant Committee, the Outstanding Student Presentation Committee and so many other things that has kept the section (and me!) running smoothly on the rails. It has truly been a pleasure to get to know him, and to recognize his strength, wisdom and judgement. Thank you Charlie!

It has been a pleasure to work with your 2021-2022 President, Ana Barros who has done outstanding work in leading our Section Fellows Committee and most recently the Water Resources Research Editor and Chief search. I look forward to working with as you begin your journey and will always be available as a resource.

Jeff McDonnell concludes his 6 years of dedicated service to our section, including leading the assembly of names for the new President-Elect position. Jeff was an outstanding mentor to me and that meant a great deal.

The Fall Meetings would not be possible without the dedication and energy of our Fall Meeting Planning Chairs and their committees. Working with Laura Bowling in 2019 and Sankar Arumugan in 2020 has given me an amazing appreciation for the work that must be done to make each meeting look perfect and seamless. I also must shout out to our Technical Committee Chairs and their teams who have really elevated the meeting content and also the communication of the section. I encourage all of you to get involved with our Technical Committees as they are great way to see how the section operates and to contribute a small amount of time for a large reward of collaboration and creative scientific discussions.

2020 also see the stepping down of Martyn Clark as Editor in Chief of Water Resources. Martyn has been outstanding sounding board for ideas, and a strong advocate for open science and the opening of WRR to public access. I'll let Martyn thank his team personally (page 9) but they are passing the journal on in outstanding shape, and we look forward to the leadership of Georgia Destouni as she comes on board to lead the journal for the next four years.

I also want to specifically recognize the amazing students and early career members of the section who have made it a pleasure to serve as your president. The energy and commitment of our H3S leaders through my tenure, Megan Brown, Caitlyn Hall, Leila Saberi and Julia Guimond has been wonderful and inspiring. Katarena Matos, our Website manager has done a remarkable job through a tough transition of our site, and her skills at modern communication has succeeded in getting me to "tweet" for the section! And there would be no newsletter without the guidance and hard work of Antonio Meira, who, along with Katarena , are working to bring the newsletter into the 21st century of communication. I also want to extend my thanks to the AGU staff, who work behind the scenes for all us. Antonio Covington, Rob Rader and Rob Burman have always been there when hard work was needed for the section and I greatly appreciate their efforts and "can do" attitude. I also want to thank Victoria Forlini and Heather Nalley for their efforts in support

of our 2022 Frontiers in Hydrology meeting and look forward to working them as we move forward!

Awards for 2020

This year's awards have been delayed due to the pandemic so you will be hearing more from many of them in the Summer 2021 newsletter. Our Class of 2020 Section Awardees are Rafael Bras (Langbein Lecture Award), Giuliano Di Baldassarre (Witherspoon Lecture Award) and Jay Famiglietti (Hydrologic Sciences Award). Our Early Career award winners, Simone Fatichi, Veronica Morales and Niko Wanders tell their stories in this issue of the newsletter, and also presented their work in the Section's inaugural Early Career Lecture Series in November. If you missed them (and they were fantastic!) you can find recordings of the 30 minute lectures on the Section's website under "Lectures and Interviews". Also present in this issue are our three Horton Research Award winners for 2020: Molly Cain (Indiana University) Quincy Faber, (University of Florida) and Hyunglok Kim (University of Virginia). You will also hear more from all of these awardees at the Fall Meeting, where we will be recognizing their accomplishments at both the Langbein and Witherspoon Lectures, as well as at the Business Meeting.

The 2020 Class of AGU Fellows includes seven Hydrology Section researchers across the breadth of hydrology: Rainer Helmig, Shafiqul Islam, Aaron Packman, Laura Pyrak-Nolte, Remko Uijlenhoet, Andrew Western and Garry Willgoose. AGU Fellows represent ~0.1% of the membership, and this an incredible recognition of their contributions.

In 2020, the Hydrology Section took a significant share of the Union level Awards and Medals, attesting to both the talent within the section, and also the commitment of the section members to recognize our peers. My congratulations to both our award winners, and their nominators and letter writers for this effort. It is with great pleasure to announce that Robert E. Horton Medal to Martinus Th. (Rien) van Genuchten of contributions in vadose zone hydrology. I have known Rien since student days, when he took the chance to invite an untested graduate student working on something called "fractals" to speak before the wizards of soil physics! I owe a great deal of my career to his enthusiasm for early career researchers. I also want to recognize Yoshihida Wada for his receipt of the prestigious James B. Macelwane award and to Karletta Chief and Kevah Madani for their being awarded the AGU Ambassador Award for their service to the community. Also, at the Union level, congratulations to Subimal Ghosh for receipt of the Devendra Lal Memorial Award and to Faisal Hossain for his receipt of the International Award.

Closing

It is with sadness that I write my last leadership article for the Section. It has been a wonderful experience and I want to encourage each of you to consider volunteer for the section in whatever capacity you can. You will meet a wonderful team of people who you will learn to trust when things get difficult. I look forward to seeing you all virtually in December, in person in December of 2021, and at our inaugural Frontiers in Hydrology Meeting in June 2022. Until then, please keep yourself and those you love safe, and stay connected to the Hydrology Section.

"(...)I want to encourage each of you to consider volunteer for the section in whatever capacity you can."

2020 Fall Meeting

As we prepare for the 2020 Fall Meeting in virtual format, we have tried to keep as much Hydrology Section "tradition" in the program as possible. We will be holding the Langbein and Witherspoon Lectures on their traditional days (Tuesday, December 8 and Thursday, December 10 respectively) and our business meeting will move up one day to Monday, December 7th. We will present our awards during both lectures and will have live question and answer periods for both lectures. We are working to have daily "Meet the Team" events during the Virtu-ale Happy hour from 6-7 PM EST, offering anyone to drop in at visit with the leadership team, the Hydrology Section Student Subcommittee, our awardees, our WRR team and a few other surprises. Watch the Hydrology Section website and Twitter feed for daily updates, how to log in and announcements during the meeting. While it will be a different meeting, the planning committee has done an outstanding job and I am confident that it will be a fun and intellectually stimulating meeting. Please join us for all our section events, and we have summarized some of the important events and their times below:

(All times are Eastern Standard Time)

Hydrology Section Events

Date	Time	Session ID	Session Title
Tuesday 12/08	18:00 - 19:00		Hydrology Section Business Meeting
Tuesday, 12/08	13:30 - 15:00	H044	Walter Langbein Lecture
Thursday, 12/10	13:30 –15:00	H097	Paul A. Witherspoon Lecture
Monday, 12/14	13:00 - 14:00	H151	Recent Advances in the Hydrologic Sciences I

Union Sessions of Interest

Wednesday, 12/09	10:00 - 11:30	U006	Modeling Multisector Dynamics to Inform Adaptive Pathways
Thursday, 12/10	10:00 - 11:30	U011	Evolving Climate Services Across the United States: Supporting Decisions Before, During, and After Extreme Events

Town Halls

Tuesday, 12/01	10:00 - 11:00	TH003	Justice, Equity, Diversity, and Inclusion (JEDI) in the AGU Hydrology Community and Beyond
Friday, 12/04	10:00 - 11:00	TH027	What Do I Need to Know About Data Journals?
Monday, 12/07	13:30 - 14:30	TH038	Hydrologic Sciences Meeting 2022: Updates and Community Input
Tuesday, 12/08	13:30 - 14:30	TH047	A Vision for NSF Earth Sciences 2020-2030: Earth in Time Town Hall

Scientific Workshops

Wednesday, 12/02	10:00 - 13:00	SCIWS3	Scientific Writing Workshop: Essential Skills for Earth Scientists
Wednesday, 12/16	11:00 - 14:00	SCIWS13	Best Practices for Developing and Sustaining Your Open-Source Research Software

Innovative Proposals

Thursday, 12/03	11:00 - 14:00	INV06	The COVID-19 Shock As a Window into the Earth System
Monday, 12/14	13:00 – 19:00	INV09	Convergence, Collaboration, Justice, and the Future of the Sciences
Tuesday, 12/15	11:00 - 14:00	INV12	Earth, Agriculture, and Society: Toward Sustainable Development in the Anthropocene

From the Section Secretary

Charlie Luce (United States Forest Service, Boise)

What a fun four years it has been serving as secretary of the Hydrology Section! As I reflect on these years, my attention mostly goes back to the amazing people I've had the chance to work with. There is a lot of volunteer activity that goes into making our meetings and section successful in helping hydrologic science advance, and the exposure to these volunteers, and their bottomless energy is nothing short of inspiring!

"As I reflect on these years, my attention mostly goes back to the amazing people I've had the chance to work with."

The past and present Section Presidents are an easy place to start. I am deeply grateful to Scott Tyler and Jeff McDonnell for the opportunity to work with them on some great progress and initiatives. They led tremendous changes in how the Technical Committees are engaging more thoroughly with the membership and the section, nudging them to transform from a former role primarily rooted in session planning to a more general leadership of our various areas of focus and interdisciplinary collaboration. Jeff and Scott also worked hard to adjust our awards and nomination processes to better serve our growing and increasingly diverse membership. During these terms, they have been willing to experiment with funding student activities, and they tried some new ideas working around the centennial at the meetings, too. So importantly, during the last year Scott has supported the Hydrology Section Student Subcommittee (H3S) in their efforts to improve diversity, equality, inclusion, and justice at AGU. Through all of this Jeff and Scott were inclusive and encouraging about my participation, and gave me huge opportunities to learn and gain abundant perspectives about our community.

There has been another set of visionary leaders that I've had the chance to work around, leaders of a group that is fantastically productive, but seems to accomplish much in a fairly quiet way: the student subcommittee, H3S. As the secretary, I've had the chance to work with four Chairs of this subcommittee: Niels Claes, Megan Brown, Caitlyn Hall, and Leila Saberi. Every year we would visit a little in early spring to start some planning, with some rough plans and exploring budgets, and by the end of the year, they had planned and executed amazing, and sometimes complex, events serving students and early career scientists across several sections! I enjoyed sitting through and participating in a few of them myself. Their efforts to bring greater discussion, action, and accountability with respect to diversity and inclusion this year, has been deeply restorative in this challenging time, and I feel honored to have had the chance to learn from their perspectives. The level and quality of service that they bring to our community is exemplary, and it has been a great joy to see and work

around their dedication and enthusiasm.
The Technical Committees have been another inspiring force over these last four years. With some nudges toward thinking about greater missions and purpose from several recent presidents, they have stepped up their efforts in session and even meeting planning and have further transformed into groups that help coordinate within and across several subdisciplines, with efforts including websites, student mentorship, travel support for students, and student awards. TC members have been a ready source of volunteers for AGU Travel Grant judging, Scholarship judging, OSPA judging, and a number of other ad-hoc efforts.

As the secretary, I've served ex-officio with four Fall Meeting Planning Committee Chairs: Casey Brown, Megan Smith, Laura Bowling, and Sankar Arumugam. The hydrology section is one of the two largest sections in terms of abstracts, and the largest in terms of individual sessions, by far. Organizing the breadth of ideas into a coherent meeting is challenging in itself, and doing so around a lot of very smart people who may not agree with some decisions is profoundly challenging! This group of leaders is distinguished by a combination of an intense work ethic that gets the job done and a sense of humor that makes participating in that hard work with them one of the most fun activities I've undertaken as secretary.

The list of leaders who have made my time as secretary so fun and meaningful must include Martyn Clark, the Editor in Chief of Water Resources Research, whose term as EiC has paralleled mine as Secretary. One of his goals for WRR was establishing a better connection between the journal and the membership of the section that is its home. Scholarly publishing has gradually taken on more of a corporate countenance in recent decades, and Martyn recognized the value of the scientific society behind a society journal as providing something distinct from the electronic pages it produces. The pages of society journals have, as backstory to some of their articles, the conversations and events that occur at society meetings. Such journals are an integral part of communicating the value of science in society. To this end, the section and journal coordinated on a number of activities to help reconnect the journal and members of the section, including support and planning of centennial sessions and publications from them, sessions providing curatorial perspectives from editors with emergent views from early career authors of outstanding papers, collaboration with H3S on workshops for students and early career scientists on preparing and reviewing articles, and setting up a task force to engage members about the values and tensions around converting WRR to an open access journal. The opportunity to be a part of this has been personally rewarding.

Finally, I'd like to recognize and thank the volunteers who have worked with me on the Outstanding Student Presentation Committee: Alicia Kinoshita, Rolf Hut, Heidi Asbjornsen, Matthew Weingarten, Anne Jefferson, and Di Long. I've written this semiannual column with an emphasis on OSPA and the contributions of this cadre for the last four years. The job involves one phase of leaning on conveners to recruit judges (all during the pre-meeting phase when everyone is more worried about their presentation than finding a presentation to judge) and quickly pivoting to sort through 500+ sets of scores from ~3 judges each with unnormalized scoring and verbal comments (all during the post-meeting phase when their families were expecting to see them again!). Chairing this committee is one of the more time-intensive duties for the Secretary, and the assistance and support of these volunteers in delivering this program is irreplaceable. The program has grown substantially in those four years, with an unsteady rise from 420 student presentations to 564 last year! Judges have grown ever harder to find. This year, we are down to 270 presentations, because of the virus and virtual setting. Nevertheless, we urgently need judges to sign up!!

(...) the opportunity to engage with a diverse array of energetic people volunteering to further the goals of our scientific community has served to keep my attention on the positive trajectories that exist in scientific progress and the ways that people work together for diverse common goods.

I am finishing my term with great optimism. Assuredly, some is from seeing changes in general society that signal a renewed appreciation of science. But even more deeply, the opportunity to engage with a diverse array of energetic people volunteering to further the goals of our scientific community has served to keep my attention on the positive trajectories that exist in scientific progress and the ways that people work to-

gether for diverse common goods. I also look around to our increasingly active Technical Committees and Student Subcommittee, which are veritable and shining fountains producing a stream of future and present volunteers and leaders that will keep the section vibrant for some time to come. The level of membership engagement is even great enough to support a new meeting at AGU focused on water! Perhaps a more concrete reason for my optimism is the incoming Secretary, Shirley Papuga. She has already served AGU and the section in a number of ways, including as an AE and as the Chair of the Ecohydrology Technical Committee, where she led great progress. Those who have seen what she has already accomplished can't help but be a bit excited for the section's future.

I'll close with a thank you to Eric Wood and Efi Foufoula-Georgiou, who twisted my arm four years ago to run for Secretary. I was a bit hesitant at first, but if I'd known what opportunities and perspectives it would bring, I'd have been a bit more eager.

I'll look forward to "seeing" some of you virtually over the next few weeks, and actually look forward to visiting with many of you in person in a year.

From the Section Student Subcommittee Chair

Leila Saberi (University of Minnesota)

The Hydrology Section Student Subcommittee (H3S) with the support of the AGU Hydrology Section leadership and the AGU Diversity and Inclusion Advisory Board members set forth a series of goals and action items outlined in a white paper, to foster a more Just, Diverse, Equitable, and Inclusive community. We invite you to comment on the white paper, which can be found here: **https://z.umn.edu/AGU-H3S-WhitePaper**, and provide feedback on the goals and share with us what change YOU want to see within the Hydrology Section and the broader AGU. To sustain the effort for years to come, we will be holding bi-annual meetings for the community to celebrate achievements, discuss progress, and add to the goals through an open forum and online surveys. The first meeting will be held as a town hall at the 2020 AGU Fall Meeting on December 1st at 10 am ET. We invite all AGU members to join our town hall to provide feedback on the plan described in the white paper.

We are excited for Fall Meeting and the events we've organized ranging from scientific sessions to town halls on tips and tricks on landing your dream job within or outside academia. Below are all of our events and sessions that we organized and will host. The date and time for the Trivia event will be finalized soon and the registration form will be shared on Twitter (**@AGU_H3S**) and sent to all AGU members from Hydrology, GeoHealth, and Global Environmental Change sections. Keep an eye on your twitter account and make sure to register to attend.

"We are excited for Fall Meeting and the events we've organized ranging from scientific sessions to town halls on tips and tricks on landing your dream job within or outside academia."

This fall, we teamed up with CUAHSI and organized our fall cyber-seminar series on "Navigating Academic Waters: Essential Skills to Thrive as a Student and Early Career Scientist". Our September cyber-panel was focused on the pervasiveness of impostor syndrome in academia and how to overcome this challenge. Recording of this panel discussion can be found here: **https://z.umn.edu/AGU-H3S-Panel-YouDoBelong.** Our last cyber-panel was on "Improving Professional Relationships for a Better, Healthier Academic Experience" and was held on November 13. You can access the recording of this panel through **https://youtu.be/s6F2BTfJB3Y**. Follow us on Twitter (**@AGU_H3S**) to stay up to date with our events.

Join the AGU Hydrology Section Student Subcommittee (H3S) at the following events during the AGU Fall Meeting 2020!

Day	Time (ET)	Event
Tues., 12/1	10:00 - 11:00	**Town Hall (TH003): Justice, Equity, Diversity, and Inclusion (JEDI) in the AGU Hydrology Community and Beyond** Speakers: Dr. Scott Tyler, Dr. Ana Baros, Dr. Charles Luce, Dr. Margaret Fraiser, Dr. Benjamin Keisling, and Katarena Matos
Fri., 12/4	13:30 - 14:30	**Town Hall (TH032): Navigating an Academic Career: Tips, Stories, and Strategies on How to Land a Faculty Position** Speakers: Dr. Mason Stahl, Dr. Christa Kelleher, Dr. Holly Barnard, Dr. Adam Ward, and Dr. Jesus Gomez-Velez
Fri., 12/4	19:00 - 20:00	**Town Hall (TH033): Navigating a Non-academic Research Career: Gain Tips and Insights on How to Stand Out from the Crowd** Speakers: Dr. Apoorva Shastry, Dr. Mahkameh Zarekarizi, Dr. Joel A Biederman, Dr. David Gochis, Dr. Newsha Ajami, and Dr. Anthony Castronova
Fri., 12/11	19:00- 20:00	**H123 - Bridging Divides in Social and Hydrologic Science: Integrative Practices and Stakeholder Participation in Hydrologic Research I**
Fri., 12/11	07:00- 23:59	**H110 - Bridging Divides in Social and Hydrologic Science: Integrative Practices and Stakeholder Participation in Hydrologic Research II Posters**
Wed., 12/09	07:00- 23:59	H058 - Climate Change Adaptation, Mitigation: A Topic That All Scientific Disciplines Must Solve Together I Posters

From Water Resources Research Editorial Board

Martyn Clark (Editor-in-Chief), Jean Bahr, Marc Bierkens, Jim Hall, Stefan Kollet, Charles Luce, Jessica Lundquist, Scott Mackay, Ilja van Meerveld, Xavier Sanchez-Vila, Peter Troch, and Ellen Wohl (Editors)

I would like to thank the community for their support for my leadership of WRR over the last four years. I know that I speak for all Editors in saying that it has been a remarkable term for us. The scientific aspects of WRR cannot be easily separated from the political environment in which we operate. Our term was bookended by the start and end of the Trump presidency: our term started with our reaction to the marginalization of science (the Science is Essential collection), and our term concluded with our adjustments to the way science is done during the Covid pandemic. We've certainly seen some challenges along the way, and I think that we have helped the hydrologic science community thrive.

In the past four years we have seen growth in several key areas. We have published many new science advances on cryospheric research, especially on snow hydrology. We have also published many new science advances in large-domain hydrological modelling, especially global hydrology. Other areas of growth include research on coupled human-natural systems, Earth System change, and machine learning. It's terrific to see the community evolve in these new directions.

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WRR has substantial strengths. I think that WRR's most distinguishing characteristic is interdisciplinary research. We celebrate the fact that the hydrological sciences is a wickedly interdisciplinary enterprise. WRR is also distinguished by scientific rigor: We expect major science advances in each WRR paper. WRR also continues to have a high-quality

(and fair) review process: Reviewers go out of their way to provide extensive and constructive feedback, and Editors and Associate Editors provide detailed feedback to authors in reject without review decisions. WRR is also a strong part of the hydrological sciences community – WRR has a close relationship with the AGU Hydrology Section, and WRR has a strong presence at the AGU Fall meeting (e.g., the Centennial sessions, the WRR science advances session). The community wants WRR to succeed.

"The community wants WRR to succeed."

WRR will also encounter some challenges moving forward. A key challenge is to cleanly separate the scientific aspects of publishing from the commercial aspects. This includes standing up to Wiley's criticisms on the large number of rejected papers, advocating for reasonable open access publishing costs, and pushing back on initiatives to include advertisements in WRR papers. Another challenge is including the extent to which FAIR principles are addressed in the review process (that models and data be Findable, Accessible, Interoperable, and Reusable). Specifically, should code be reviewed? Should data be reviewed? And how should this be done? Should reviewers be responsible for running test cases and commenting on the organization/structure of models and datasets? A further challenge is handling hot topics in hydrology, specifically, socio-hydrology and machine learning. For socio-hydrology, how can we manage the interdisciplinary nature of the science advances, especially building on the extensive research on coupled human-natural systems that is done by other communities. For machine learning, how can we effectively document both the new capabilities offered by machine learning as well as the limitations of machine learning models.

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"Another challenge is including the extent to which FAIR principles are addressed in the review process (that models and data be Findable, Accessible, Interoperable, and Reusable)."

A key change on the horizon is the potential transition to open access. Open science is perhaps the most important paradigm shift in the recent history of scholarly publishing: We have open data, open models, but closed publications. Changes in publishing models mean that more of the responsibility for open science is devolved to individuals. We have been transitioning away from a system where institutions pay (i.e., institutional libraries pay journal subscriptions on behalf of its readers). We are transitioning towards a system where many authors are responsible for paying article processing charges from grant funding etc. These shifts in financial responsibility create dissonance between individual self-interest and the common good. Open science (& thus open access) can benefit the common good because the science is freely available; individual self-interest can be shaped by an unwillingness to pay. These issues were evaluated in depth by the AGU Hydrology Section Open Access Task Force: The path forward requires weighing the financial feasibility of alternative cost models against the common good of open science. The inherent value of open science should frame any open access decision.

In closing, I would like to offer some words of thanks. I'd like to thank our team of Editors: Jean Bahr, Marc Bierkens, Jim Hall, Stefan Kollet, Charlie Luce, Jessica Lundquist, Scott Mackay, Ilja van Meerveld, Xavi Sanchez-Vila, Peter Troch, and Ellen Wohl. I'd also like to thank the Associate Editors. The AE's are the lifeblood of WRR and make the whole operation possible. Appreciate the thoughtful and constructive recommendations. Moreover, thanks to the reviewers. With >2000 submissions per year, we rely on the community more than ever for thoughtful and constructive reviews. Thanks for maintaining WRR's high standards. And finally, thanks to the AGU Publications staff, especially the editorial assistants Erin Syring and Phil Cobb for keeping the wheels moving and keeping everyone on track.

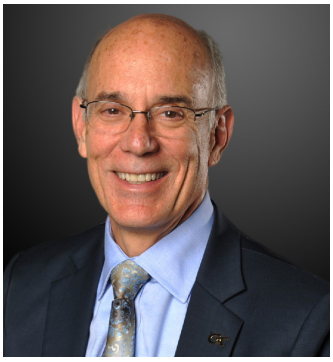
I am delighted to welcome to Georgia (Gia) Destouni as the new Editor-in-Chief of WRR. I have had the opportunity to talk extensively with Gia and learn about her plans for the jornal. WRR is certainly in excellent hands. I'm looking for-

The 2020 Walter B. Langbein Lecture:

So Much Data and So Few Ways to Use It: The Era of Data Rich Hydrology

Rafael Bras, Georgia Institute of Technology

The Walter Langbein Lecture recognizes lifetime contributions of a senior scientist to the science of hydrology or unselfish cooperation in hydrologic research. The award is named to honor the life and work of hydrologist Walter B. Langbein.



Back in 1987, Pete Eagleson and I wrote an editorial in Eos, entitled: Hydrology, The Forgotten Earth Science (Bras and Eagleson, 1987). We argued that development of hydrology had been driven by societal problems at such a rate that: "The cultivation of hydrology as a science per se has not occurred, and there has been no established platform within the hierarchy of science on which to build a coherent understanding of the global water cycle". We also wrote: "Progress in the science is currently data limited, yet we stand at the threshold of having undreamed-of resolution of hydrologic quantities in both time and space and perhaps even in real time" and ended with a call to prepare a national plan for the development of the science.

A lot has changed since 1987. Not one, but two "national plans" have been published. First, Opportunities in the Hydrologic Sciences (1991), the work of a committee chaired by Pete Eagleson and second, Challenges and Opportunities in the Hydrologic Sciences (2012) from an effort chaired by George Hornberger. And the explosion of data has occurred largely driven by advances in sensor and communication technology. Central to that explosion of data are the satellites that resulted from NASA's Earth Observing System program and their cousins (for example: TRMM, GPS, SMAP, GRACE, etc). The success of NASA in observing the Earth is an unheralded triumph of modern science and technology.

But the progress in hydrologic sciences would not have been possible without the American Geophysical Union and Walter Langbein (and the United States Geological Survey, that housed many of the pioneers of hydrologic sciences). That narrative of the beginnings of hydrologic sciences is well developed by another giant in the field, James Dooge in the1996 paper "Walter Langbein and the emergence of scientific hydrology", recommended reading for all. The Transactions of the American Union, the first and only Union journal then, was the main outlet for hydrologists. Names like Horton, Theis, Sherman, Sharp, Holtan, Schumm and Langbein appeared regularly in the journal pages. Langbein was a versatile hydrologist. He was comfortable with all the tools of the trade at the time. Generally, his approach combined the use of extensive data and a large dose of analysis to interpret the data and yield generalizable models. For the times, the records he commonly used were extraordinarily large, sometimes involving observations (for example parameters of hydraulic geometry) in hundreds of river basins. As Dooge (1996) points out, the last phase of Langbein's life focused on the problem of "usefulness of extensive programmes for the collection of basic data depends on correct and timely interpretation of the data. The matter appears to be one of emphasis. An equally eloquent plea can be made for more analyses of principles and for more sensitive data. A basic-data programme can go wrong when there is an imbalance on either side." It is at this stage of Langbein's thinking and life that I came into the hydrologic picture. My Ph.D. thesis dealt with designing monitoring networks that achieved the "right balance" – directly influenced by Langbein's ideas. But that was 45 years ago!

" (...) the cost per unit of data and the time and space coverage of key hydrologic variables over the Earth has gone down to the point that Langbein's "balance" has shifted. "

The reality now, as I stated before, is that the cost per unit of data and the time and space coverage of key hydrologic variables over the Earth has gone down

to the point that Langbein's "balance" has shifted. Until late in the 20th century, hydrology, and many other Earth Sciences, developed in a limited data environment. For the most part, researchers and practitioners availed themselves of data of very low resolution in time and space. In hydrology, that meant point observations of fluxes like precipitation and evaporation and state variables like soil moisture, temperature and topography. Those observations were rarely hourly, sometimes daily and more commonly weekly and monthly. That situation forced hydrologists to rely on significant data extrapolation and on conceptual mathematical models designed to capture broad system behavior. That situation began changing rapidly at the end of the 20th century. These day, some two dozen satellites have or continue to observe Earth and its environment at unimaginable resolution in time and space. In year 2000 the Shuttle Radar Topography Mission mapped the world at resolutions of 30 meters or less. That was a watershed moment for hydrology, it was no longer necessary to conceptualize and deal with lumped aggregated representations of basins. All of a sudden, and to this day, we have more data than we know how to use properly. This richness comes with challenges. The data is unwieldy, its errors structures are different, old models are of little guidance and new representations to match data availability are required. The tools needed to handle the data are different: the "big data" analysis era is with us.

" The Langbein lecture will explore that evolution in data and its use in hydrology. It will illustrate the challenges using analysis of precipitation, soil moisture, topography and temperature data, among others."

The Langbein Lecture will explore that evolution in data and its use in hydrology. It will illustrate the challenges using analysis of precipitation, soil moisture, topography and temperature data, among others. The message is that the wealth of data, orders of magnitude richer than what Langbein ever saw, allows us to do gain unimaginable insight and to make better predictions. Ironically, though, to exploit that newly found information properly we cannot rely strictly on statistical/analytical procedures but must fall back on our understanding of hydrology/meteorology to organize the plethora of information. In that sense, not much has changed from Langbein's times.

A few words of thanks

After 45 years in the business, I have a lot of people to thank, because I certainly did not make it here by myself. In fact, I am proud to say that the list of friends and mentors is so large that I cannot name them all here. Let me begin with those that nominated me. Juan Valdés, colleague and longtime dear friend. Dara Entekhabi, whom I know since he first applied to MIT and was a former colleague at MIT. El Fatih El Tahir, professor at MIT, former student, and loyal friend. Thank you all. Over the years, many have provided opportunities and advice. Three stand out. The late Donald Harleman, I simply would not be here without him – he literally convinced me and got me into graduate school at MIT. And he was like a father until his death. Pete Eagleson, he taught me excellence and what hydrologic science is all about. Ignacio Rodriguez-Iturbe, my doctoral advisor, whose energy and innovative thinking has opened many avenues of study in hydrology. He is a friend and brother.

I have to thank the institutions I have worked in. At the Massachusetts Institute of Technology (MIT), the University of California – Irvine (UCI) and at the Georgia Institute of Technology (GT), I have worked with the very best. All three places not only tolerated but supported the administrator that insisted on doing research. A few weeks ago, I stepped down as Provost of GT, after 10 wonderful years of leading an extraordinary university. My GT colleagues need special mention because they have lived a great adventure with me and because they have been extraordinarily kind.

It is important that I acknowledge AGU. The Union cemented my success when as young faculty member I won the Hydrologic Sciences Prize and the Macelwane medal. Those were watershed moments in my life. Hydrology has the best home possible in AGU.

Last but not least, I want to thank my many students - my friends- that keep in touch from every corner of the world. They are my proudest achievement. In fact, I dedicate the Langbein Lecture to one of my dearest students, the late Prof. Jorge Ramirez from Colorado State University.

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The 2020 Witherspoon Lecture: *Putting Humans into the Equation*

Giuliano Di Baldassarre

The Paul Witherspoon Lecture award is given in recognition of outstanding achievements by a mid-career scientist (within 10 to 20 years since PhD) in advancing the field of hydrologic sciences. The award also acknowledges that the awardee shows exceptional promise for continued leadership in the hydrologic sciences.

I am truly honoured to be awarded the AGU's Witherspoon Lecture, and deeply grateful to my inspiring mentors and amazing team members.

Paul A. Witherspoon was a global leader in hydrology and "was widely acknowledged as having possessed an unusual gift for identifying really important problems, finding the resources to work on them, communicating clearly, and making friends and trusted colleagues across disciplinary and geographic boundaries" (Faybishenko et al., 2015).

In this piece, I would like to acknowledge the inspiring work of three scientists, who have had a key role in broadening the scope of my research: Elinor Ostrom, Erik Swyngedouw, and Daniel Kahneman. Their work has stimulated my scientific curiosity and motivated my research on sociohydrology. Below, I give a flavour of the core of their research that have enriched my knowledge about social norms, power relations and cognitive heuristics.

Elinor Ostrom challenged the traditional assumption that water resources that are used collectively will be over-exploited in the long run (tragedy of the commons). She invalidated this myth by working on the field and investigating how communities manage shared resources, such as fishing waters. She also showed how social norms (Ostrom, 2000) can evolve in a way that is economically, socially, and ecologically sustainable. Elinor Ostrom received her Nobel Prize in 2009 "for her analysis of economic governance, especially the commons".

"The interplay in time and space between social norms, power relations and cognitive heuristics shapes the way in which humans influence, and respond to, hydrological change."

Erik Swyngedouw showed how water and society are deeply intertwined and discussed the major role played by power relations in this interplay. During my postdoctoral studies, I was fascinated by reading

his work on the Spanish waterscape (Swyngedouw, 1999). In a human-dominated world, hydrology is not directly influenced by society as a whole, but by the most powerful groups that have resources (and predominant ideas) determining the development and operation of large water infrastructure.

Daniel Kahneman showed how cognitive heuristics and biases (Tversky & Kahneman, 1974) can influence human behaviours, attitudes and the way in which people think about multiple risks, such as floods and droughts. Heuristics also explain how strategic and operational choices are made by decision-makers, including the ones related with water management and hydrological risk reduction. Daniel Kahneman received the Nobel Prize in 2002 "for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty".

The interplay in time and space between social norms, power relations and cognitive heuristics shapes the way in which humans influence, and respond to, hydrological change. As such, drawing from the work of Elinor Ostrom, Erik Swyngedouw and Daniel Kahneman (among other political and behavioural scientists) can help us advance hydrology and put humans into humans into the equation.

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Hydrologic Sciences Early Career Award:

Verónica L. Morales, University of California, Davis

I am humbled to be one of the recipients of the Hydrologic Sciences Early Career Award. I extend my greatest appreciation to the exceptional mentors, collaborators and students, who have inspired me to explore new frontiers and taught me not be afraid of failure. Thank you to my colleagues who nominated me for this award. I share this recognition with them and with my endlessly supportive family and friends.

My fascination with groundwater systems was kindled through a course in hydrochemistry at UCSB taught by Dror Avisar, who challenged me to work on a puzzle whose individual pieces are difficult to gauge with precision yet must be assembled correctly in a black box. Since then, I have been motivated to shed light on the subsurface puzzle (at times literally, at others figuratively) in my rummage for answers to questions about flow and transport in porous media. The environmental engineering graduate program at Cornell provided me with ample exposure to a broad range of topics—water chemistry, soft matter, agricultural engineering, soil physics, physical hydrology—from which I built a robust toolbox for studying colloidal filtration in agricultural settings. The intellectual environment promoted by the faculty and the student cohort instilled in me the practices of rigorous research, collaboration with brilliant and exciting scientists, and skepticism, particularly toward one's own work. Furthermore, Tammo Steenhuis and J-Yves Parlange engrained an awareness of academic privilege that should be used, at least from time to time, to address pressing problems in society. For this reason, I became involved in several university-community partnerships as well as the prison education program.

The bulk of my postdoctoral time was spent at ETH with Markus Holzner, where the fear of becoming pigeonholed as "the colloid lady," motivated me to dive headfirst into environmental fluid mechanics. Markus gave me the freedom of following my curiosity in any system that resembled groundwater. Together, we worked on developing an experimental scheme to study pore-scale particle dynamics for static or dynamic heterogeneous media, which flexed significantly the topic for which I had originally secured postdoctoral funding. The theoretical component of our experimental work was obtained through vastly enjoyable collaborations with Marco Dentz who sensitized me to the ubiquity of anomalous transport, as well as the versatility and elegance of Continuous Time Random Walk theory. From grad school through postdoc, I periodically carried out Friday night experiments (also known as project unicorn among close friends), which were a labor of pure curiosity, with neither formal funding nor proper sanction from the adviser. Over the years, these unicorns led me to sample new scientific interests, including bioclogging, evaporative self-assembly, biochar engineering, and anomalous transport. Many of the creative ideas that eventually came out of these fringe projects have shaped the core of my research today.

"From grad school through postdoc, I periodically carried out Friday night experiments (also known as project unicorn among close friends), which were a labor of pure curiosity, with neither formal funding nor proper sanction from the adviser. Over the years, these unicorns led me to sample new scientific interests (...)"

In 2017 I started my career as an assistant professor in Civil and Environmental Engineering at the University of California, Davis where I strive to emulate the best mentoring practices I picked up throughout my training—fostering curious minds, building mutual trust with mentees, and leading by example. The goal of my research is to advance fundamental understanding and predictive capabilities of flow and mass transport through soil, rock and other heterogeneous porous media. At UC Davis I have the opportunity to explore the following interconnected

questions with my own students: a) What emerging physico-chemical processes control macroscopic filtration of colloids/nanoparticles in porous media?; b) How does the microstructure heterogeneity of porous media underpin flow channelization and anomalous transport?; And, c) How to incorporate and upscale these small-scale processes into efficient, physically-based stochastic models for effective transport prediction? Though intrinsically fundamental, the broader impacts of this research include minimization of the impact of agricultural activities on groundwater quality, managing groundwater pollutant spreading and mixing, and properly assessing the risks for disposal/on-site storage of hydraulic fracturing wastewater. My students work across and connect emerging processes at scales ranging from the interface-, to the pore-, to the continuum-scale. Our integrative approach blends advanced lab-based experiments, quantitative image analysis, graph-theory, fluid mechanics, and computational modeling techniques.

Embracing the challenges of coping with multiple scales in search of simple, yet informative representations of key processes that can be readily upscaled is necessary to move the field forward. Recent advances for collecting spatially resolved data (e.g., micro X-ray Computed Tomography, pore-scale direct simulations, particle tracking velocimetry, and microfluidics, to name a few) have opened a wealth of possibilities for identifying important small-scale processes that elicit large-scale system responses. In combination with physical-based approaches for predicting flow and transport, these data enable improvements to model structure and performance with minimal parameter tuning or without inverse fitting altogether. For example, we explain the time evolution of the velocity process by a Markov chain with multiplicative noise, in a simple model parameterized from velocity distributions that captures superdiffusivity and intermittency (Morales et al., 2017). Going forward, there are many exciting opportunities to apply these new approaches to answer outstanding scientific questions and solve impending engineering problems about groundwater flow and transport.

"In addition, I would like to acknowledge my responsibilities and opportunities as a role-model for women and underrepresented minorities in education and nd underrepresented minorities in education and STEM."

In addition, I would like to acknowledge my responsibilities and opportunities as a role-model for women and underrepresented minorities in education and STEM. In my relatively short career, I have already seen an appreciable increase in professional women mentors/leaders in our field. This brings me hope for continued growth in the diversity of scientists and engineers, which will in turn positively impact the field.

Hydrologic Sciences Early Career Award:
Niko Wanders, Utrecht University

It is a great honor to receive the Early Career Award in Hydrological Sciences. As a European-based researcher, I have the honor to join some of the great names in the American hydrological community of AGU. In doing so, I am delighted to realize we are one big global hydrological community. A special thanks goes to my nominator, Reed Maxwell, and to all those who wrote letters of support. I also want to thank some of the amazing mentors that have selflessly supported me to choose my own path, and provided space and time to allow me to develop my research ideas. This is something I would like to encourage all mentors to do, and something I continuously aim to do for my students as well to help support and develop the next generation of researchers.

Coming from the Netherlands, a country where floods are "the enemy", working on drought was something that not many people did when I first started to analyze CMIP3 **drought projections** in 2008. This was something new and interesting, and it sparked my enthusiasm for a Ph.D. in hydrology, as I wanted to study the relatively unknown and complexity of hydrological droughts. Ironically, I ended up working on **flood forecasting** for my doctoral research. However, as my advisors realized that my passion for droughts and climate change research was strong, they supported me to pursue multiple side-projects related to drought, which led to some very interesting and productive collaborations. During my Postdoc at Princeton University, I continued working on droughts, mostly focused on the potential for improving **seasonal hydrological forecasting**. During this time I learned a lot about the American research community, the available resources and the differences in approaches on either side of the Atlantic ocean. Nowadays, I hold a position at **Utrecht University** in the Netherlands where my research focuses on droughts, their impact on society, and how we can predict and **project** them in a rapidly changing climate. In my work, I am trying to see how climate change will impact future drought occurrence and how this will **impact** water availability in our societies. With recent research, we have already showed that not only does climate change impact hydrological drought around the world, but that also humans play a key role with regards to current and future droughts.

"Coming from the Netherlands, a country where floods are "the enemy", working on drought was something that not many people did when I first started to analyze CMIP3 drought projections in 2008."

Digging deeper into drought research, it has become apparent that the natural system is strongly intertwined with society and human activities, in the form of water management, reservoirs and large-scale water abstractions. This means that a large part of the hydrological cycle can no longer be seen as purely natural, and that **taking into account the human component** becomes increasing important. This calls for more interdisciplinary research teams and approaches, new modeling tools that can incorporate human interventions, and an improved understanding of **human water management**. This is especially important when dealing with natural hazards like drought, that occur over large spatial regions for an extensive duration, and that are **strongly affected** by increases in human water demands and water management.

As part of my work I have always found it very rewarding to communicate my science, not only to the general public via the media and public lectures, but also to students and children at schools. In my opinion, from activities such as encouraging kids to run experiments in their back yards and public lectures in a former church, it all contributes to the support we get as a scientist from the wider community. This is especially relevant when talking about important topics like climate change, which will mostly affect the younger generations. I would like to encourage all of you to **share your science** when you can, whether it be in the classroom, as a public lecture or digitally on **Twitter.**

I know that these outreach activities do not result in additional citations or papers, but they will help to give a sense of purpose and achievement that cannot be achieved from just inside your office.

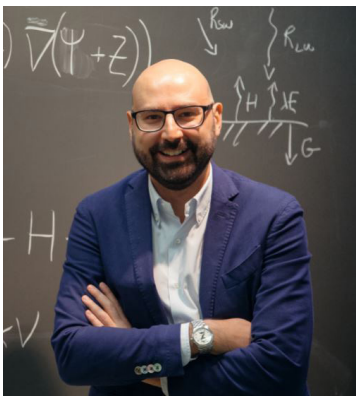
Coming back to the hydrology, I feel positive that a lot of new and exciting opportunities are opening up in our research area. We see the development of more powerful modeling tools that allow us to answer new questions, stronger interdisciplinary collaborations allow us to learn from each other and tackle problems that we have long worked on, and new techniques like machine learning enable us to find relationships between processes that we are yet to capture in models and theory.

"As part of my work I have always found it very rewarding to communicate my science, not only to the general public via the media and public lectures, but also to students and children at schools."

However, while we are all working on these very exciting opportunities and important questions, I would like to encourage everyone to make sure that you have a healthy work-life balance, especially in these challenging times. I have had the pleasure to work with some amazing mentors, collaborators and students, who apart from working on our research projects, have also made the time to go for bike rides, meals or just hang out outside office hours on departmental happy hours. As a result, I now have some wonderful friends all around the world and enjoy still expanding my research with them. For all early-career scientists out there, I can only emphasis how important it is to try to maintain this delicate work-life balance, as it keeps you fresh, enthusiastic, motivated and creative to do the work. Living by this philosophy has kept a career in academia always very purposeful, rewarding and interesting for me.

Hydrologic Sciences Early Career Award:

Simone Fatichi, National University of Singapore



I am deeply honored to receive the "Hydrologic Sciences Early Career Award". Being recognized by the hydrology community of the American Geophysical Union for my scientific career over the past ten years is both thrilling and gratifying. Needless to say that this would not have been possible without an incredible team of collaborators, many of them - also friends. I am also grateful to the colleagues that have drawn me in exciting scientific discussions and debates about ecohydrological processes and especially to those who have challenged and inspired me. I am grateful to my PhD students that have contributed significantly to my development and motivated me to be a better scientist and mentor.

It would take pages to list all these people here, so I will make sure to thank them personally in the appropriate way. I would like to express my unquantifiable thanks to all those who were generous with time to write the nomination letters, and have supported me for so long. Well, really, Thank you! Finally, I wish to thank my parents to whom I am indebted for the unconditional support they always provided me, and who would have liked to see me more often at home.

An occasion such as this one is always an opportunity to think over where and when fascination for the disciplines of hydrology, first, and ecohydrology, later, started. I think part of the story is related to my childhood interest for meteorology and extreme weather events, my quite diligent way of keeping statistics of many different things in old copybooks (yes, pre-digital era for a kid), and, maybe, also my mushroom picking hobby (and see at the end how this is linked to my latest research). During my engineering studies, hydrology was a spark: it was really reconnecting

my deepest curiosity about nature and weather with a topic that has direct implications on societally relevant problems such as protection from natural hazards and water resources management. However, it was only at the beginning of my PhD, after having started studying the topics of stochastic and statistical hydrology, that ecohydrology and, especially, the reading of the article by Ivanov et al., (2008), motivated my interest in plant-water interactions. That article probably changed my life, as it first brought me to Michigan that, as I was reminded right after landing, "is 'not' California" – and afterwards to do research in five different countries, and on three continents.

I did not expect ecohydrology to be only the beginning of an exciting journey across disciplines, but I soon ventured much deeper into topics ranging from plant physiology to soil-biogeochemistry. I always had the feeling that hydrology is more accomplished when it links and complements the related environmental sciences. In this journey, interdisciplinarity has been the beacon of my research pathway. However, penetrating other disciplines came with a great burden, the challenge of learning "new languages" to communicate with colleagues from different disciplines. I admit that this challenge was also one of the greatest rewards of my scientific path so far. I remember a colleague that knew me for my research on hydrological modeling, a bit surprised after having heard me giving a talk on soil biogeochemistry. He approached me and said: "you are really a generalist!". I never understood whether it was a compliment or an irony, but it motivated me even more to combine depth with breadth.

"I always had the feeling that hydrology is more accomplished when it links and complements the related environmental sciences."

In my research, I combine hydrology (and my engineering background) with soil-science, plant physiology, and forest ecology, but treating all fields at the same level. I think that only by addressing the interactions among the various components of the hydrosphere, biosphere, and pedosphere, we can considerably advance our understanding of complex environmental systems and improve the prediction skills so much needed for identifying environmentally sustainable strategies. In this diversity of topics, however, there have been two common threads that linked all my work, one is "modeling" and the other one is "climate change".

Modeling. Starting from my PhD time, I lead the development of a novel ecohydrological (terrestrial bio-

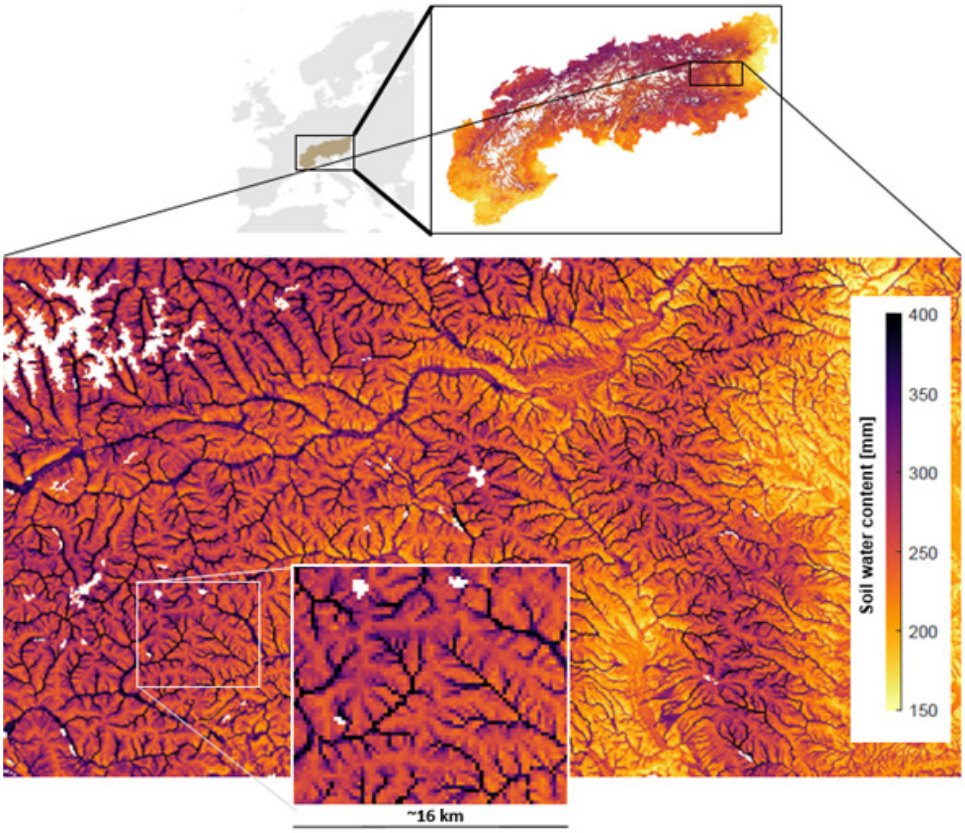


Fig. 1. Mean soil water content integrated over 1 m depth simulated by the ecohydrological model T&C over the 2001-2003 period in the region at the border between the Italian, Slovenian, and Austrian Alps as derived from the high-resolution (250m x 250m) hourly-scale ecohydrological simulations carried out in Mastrotheodoros et al., 2020 over the entire European Alpine region. Rock, glacier, and lake land covers are masked.

sphere) model, Tethys-Chloris , (T&C) (Fatichi et al., 2012). The development and application of this model to address a variety of science questions will probably stay with me (and hopefully with the community) for a long-time. T&C is designed to simulate the fully-coupled energy, water, and elements budgets for any terrestrial ecosystem with a high-level of mechanistic description of land-surface and vegetation processes. It resolves the physiological cycle of plants representing different carbon and nutrient compartments. Importantly, the model can also simulate distributed domains accounting for the topographic effects controlling incoming radiation and lateral water transfers (**Fig. 1**, Mastrotheodoros et al., 2020). Something that typically, large-scale land-surface models do not account for despite increasing evidence that topography and lateral water transfers impart important controls on land-surface exchanges and carbon cycle. The model allows tackling scientific questions about global change and the future of water and carbon resources where complex non-linear interactions between hydrological, soil, and vegetation dynamics occur. It has helped in addressing a number of research questions including insights on the effect of elevated CO2 and rainfall manipulation on plant response, the role of temporal scales in vegetation productivity, transpiration and evapotranspiration, the effect of land-use and land management on ecohydrological fluxes, the understanding of processes leading to banded vegetation patterns in semi-arid catchments, reasons for recent changes in water use efficiency, controls of spatial variability of soil moisture, effect of soil structure on runoff production, and the role of plant traits heterogeneity in terrestrial carbon and water dynamics (e.g., Pappas et al 2016; Manoli et al 2018; Paschalis et al 2018).

Very recently, we dove into the modeling of soil biogeochemical processes including an explicit representation of microbial communities (Fatichi et al 2019). We also developed an urban-adapted component UT&C to unravel ecohydrological dynamics in cities (Meili et al 2020). This philosophy of linking environmental processes – from soil microbial dynamics, plant mineral nutrients, plant growth, and up to the landscape level and land-atmosphere interactions – is a fundamental feature to design complex virtual experiments. These experiments can be used to systematically study the effects of environmental variables on water and carbon cycles, plant stress, nutrient leaching, and soil biogeochemical processes including fungi (as you can see here, mushrooms are coming back to the story).

New hypothesis testing and research questions will be enabled by such a mechanistic modeling approach thanks to the diverse range of scenarios they allow to explore. Essentially, such a model is not only a prognostic tool to project climate or land-use changes. It is not only a diagnostic tool to elucidate complex non-linear interactions among processes, but it also represents a summary of how the current understanding of natural processes and their inter-relations are represented through mathematical equations. This suits very much goals of advanced education as well. The model allows building a continuous legacy, as it persists longer than the applications, which are conducted with it. New advancements build around the structure of the old model, as modern cities are built on the foundations of ancient ones. Of course, such a tool would never exist without all the amazing colleagues who have collected, and continue to collect the most various datasets of ecohydrological variables. I am very indebted to them and I am expecting the two-ways dialogue between data-collection and model-development to become even more symbiotic in the future.

"New advancements build around the structure of the old model, as modern cities are built on the foundations of ancient ones."

Climate change. Climate change has been permeating my research as many of the questions we have been asking are devoted to enhancing the understanding of global change and its implications on terrestrial ecosystems and hydrology. For instance, we recently untangle the drought paradox, with evapotranspiration increasing in large part of the Alps during warm and dry summers (e.g., Mastrotheodoros et al., 2020). Concurrently, however, I never abandoned the work on stochastic hydrology, which led to the development of a point scale hourly weather generator, AWE-GEN (Fatichi et al., 2011) and its two-dimensional version (Peleg et al 2017). These tools allow downscaling climate change projections at high space-time resolutions. With these models, we were able to characterize the sources of uncertainties in local-scale climate change projections, with direct relevance for the design of engineering

works and adaptation strategies (Fatichi et al. 2016). In summary, an approach that integrates conventionally compartmentalized disciplines into unified numerical tools has already proven to be very useful in addressing non-trivial questions, while concurrently quantifying a large spectrum of variables and fluxes. I expect in the future that computational and theoretical advancements could allow transcending the deterministic nature of current studies and offer better ways to quantify the uncertainty intrinsic to natural systems that currently hampers certain investigations. Regardless of uncertainty, I am convinced that a mechanistic and truly interdisciplinary consideration of Earth systems will lead to discoveries and solutions, which would be difficult to obtain otherwise. The approach will complement and enhance field-data collection and data-driven approaches, by representing feedback mechanisms or by simply preserving energy and mass conservation principles. For instance, process-informed modeling of belowground processes will likely lead to critical discoveries. Belowground is difficult to observe, it is "dark and often wet" as I like to say, but soil physical and biogeochemical responses to environmental changes will be critical for a wide range of ecosystem services.

Beyond fundamental science, mechanistic modeling of the Earth system has also a lot to offer to address societal challenges, such as those related to conservation of the natural capital, assessment of ecosystem restoration projects, or simply to guide planning of urban greening infrastructure. In this regard, giant steps can be made to improve usability of numerical tools by a wider community. I think we are still in the infancy of such a type of modeling philosophy that combines different disciplines at a similar level of mechanistic detail. Improved data-informed parameterizations and innovative use of observations to verify the reliability of numerical results are still very much required. The overused sentence - getting the right answer for the right reason – is never more relevant given the environmental issues, which are laying ahead. Surely, we will need the continuing support of the AGU community to meet the challenge, as currently interdisciplinarity is often advocated but less realized in practice.

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2020 Horton Research Grant Awardees

In 1982, the Hydrology Section of AGU was granted access to a portion of the income of the Robert E. Horton Fund for Hydrologic Research. This permitted the initiation of the Horton Research Grant for Ph.D. students, with a purpose to promote excellence through encouragement of the next generation of professionals in the hydrological sciences.

Hyunglok Kim, University of Virginia

I am deeply honored and excited to have been selected for a prestigious Horton Research Grant this year in support of my doctoral research at the University of Virginia. Thank you for giving me this opportunity to write my story here.

I can still recall the exact time and place when I decided on the course of my future career. The words reverberate in my memory and stir my emotions even today: "Main engine start and liftoff of the Delta II rocket with SMAP, making global observations of soil moisture for climate forecasting." With these words, NASA's SMAP satellite was launched into space on January 31, 2015; and I was certain that I was watching a seminal moment in the advancement of our shared knowledge of global climate systems. Later, in my first year of Ph.D. studies, I seized the opportunity for a summer internship at the United States Department of Agriculture and NASA's Goddard Space Flight Center (GSFC). There, for the first time, I watched as researchers utilized satellite data and numerical modeling to predict natural disasters and investigate the water cycle. This experience kindled my research interests in global-scale hydrology and earth system science.

Figure 1.SMAP Lift-off

I am currently pursuing both my Ph.D. (3rd year) and a master's degree in data science at UVA, where I am studying hydrology, applications of Bayes' theorem, and global-scale water cycles. The overarching goal of my research is to provide accurate hydrological variables and solve the major challenges related to Earth system science that we will face in the coming decades. My work has practical applications for improving the quantity and quality of satellite- and model-based data to more accurately predict natural disasters and to provide a better understanding of the role played by hydrometeorological factors. I would like to briefly introduce two of the many intriguing projects on which I am working.

The first project is titled "Developing a method for a satellite-based soil moisture retrieval algorithm using GPS signals". Last year, I was fortunate enough to secure the NASA research grant (FINNEST - expand) for the period 2019-2022 for this project, and this scholarship is now supporting me in pursuit of my master's degree in Data Science. In December 2016, NASA successfully launched the Cyclone Global Navigation Satellite System (CYGNSS) constellation of eight micro-satellites into low Earth orbit[1]. CYGNSS was designed to measure the ocean's surface wind field using a bistatic scatterometer technique with Global Positioning System (GPS) reflectometry receivers. In contrast to other well-known microwave-based soil moisture (SM) retrieval satellites in sun-synchronous orbit (SSO), such as SMOS and SMAP, which have revisit times of 1 to 3 days, the CYGNSS micro-satellites randomly receive surface-reflected GPS signals at several revisits per day. As the temporal repeat of the existing satellites in SSO ranges from about 1 to 3 days depending on overpass latitude, the higher temporal repeat of the eight micro-satellites would add value to existing microwave-based satellite SM retrieval systems. In a recent publication, I proposed a method of using CYGNSS observations in SM estimates; and I emphasized three main benefits of using CYGNSS-derived SM data[2]: 1) Filling the gap in SSO satellite observations to allow temporally continuous observations, 2) Improving the accuracy of current data assimilation systems, and 3) Allowing analysis of observational-based diurnal SM variability in areas that have not been studied before, using existing space-borne microwave and bistatic radar techniques.

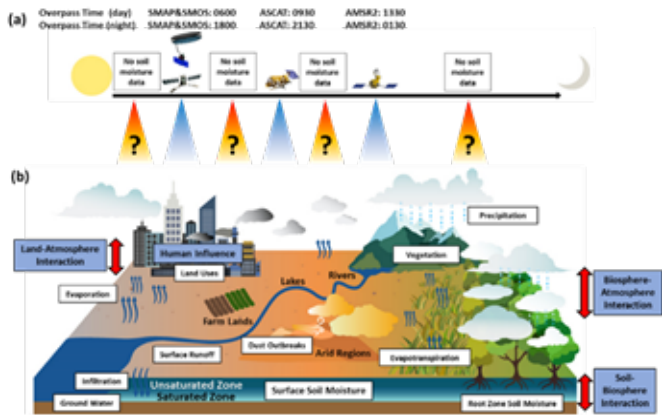

Figure 2.(a) Satellite-based soil moisture observation systems and (b) Water cycle over land.

The second project I would like to discuss is called "Assimilating satellite-based soil moisture data into land surface models based on parallel computing". Various factors can increase errors in remotely-sensed soil moisture (SM) retrievals and land surface models (LSM) SM products[3-5]. SM in LSM will be affected by the model parameters and formulation, as well as by errors in the meteorological forcing variables. Specifically, anthropogenic effects such as irrigation activities cannot be integrated into LSMs without observational data. Recently, in order to remedy these uncertainties in both remotely sensed and LSM-based SM products, and to produce superior combined SM estimates, the Earth Science field has begun discussion of land data assimilation systems based on an Ensemble Kalman filter (or other filters)[6-7]. The LSM-based SM is revised using observational estimates contingent on the degree of correction regulated by the level of error associated with the model and observational products. These revised SM estimates affect the quality of antecedent wetness conditions, meaning that they can improve our knowledge of SM status and allow us to better forecast extreme climate events[8]. Assimilation systems and SM estimates from current sun-synchronous orbit satellites provide only limited surface wetness conditions because of the discontinuity in spatial and temporal coverage. However, I believe that integrating high temporal resolution SM data from space has the potential to efficiently complete the SM diurnal cycle and improve hydrologic simulations in LSMs.

Thanks to the support of the AGU Horton Hydrology Research Grant, I will now have more flexibility and intellectual freedom to think outside the box. With this grant, my life's work of better understanding of the water cycle and helping people adapt to the greater frequency of hydrological impacts of severe weather, viz. droughts, floods, landslides, etc. Now I feel certain that I am on the right track to becoming an expert who can help solve the major challenges Earth system science will face in the coming decades.

In conclusion, I give heartfelt thanks to my advisor, Dr. Venkat Lakshmi, for his generous advice regarding both my research journey and life in general. I would like to close my letter with a quote from him that I love the most: "If people are not kind to others, there is no reason to live".

Figure 2. Prof. Venkat Lakshmi (left) and Hyunglok Kim (right)

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Molly Cain, Indiana University

I am grateful to be selected as a Horton Research Grant recipient and excited for the work this grant will enable me to do. After learning I received the award, I discovered a list of past Horton Grant recipients that includes many of my hydrology role models and leaders in the field. I am humbled to be following in the footsteps of these incredible researchers. I would like give a special thanks to my mentors who have supported my work and cultivated my love of hydrologic research. I am also indebted to my lab mates and fellow IML-CZO students who have left the comforts of their hydrologic models to trudge through floodplains and accompany me on late night storm sampling campaigns.

The overarching goal of my dissertation research is to improve our understanding of how modification of landscapes for agriculture alters the transport of water and nutrients to downstream waterways and, in turn, assess the role of natural floodplains in transporting and transforming water and nutrients. Thus far, my floodplain research includes a field-based, feature-scale study of inundation mechanisms and river corridor exchange fluxes, with a focus on surface-subsurface connectivity. The Horton Grant provides key support for the development of a landscape-scale floodplain model to augment this work.

Project overview: Floodplains are typically conceptualized as flat, featureless expanses which exist in a binary state of either dry or flooded once a threshold river stage is reached. Contrary to this depiction, extensive networks of ephemerally-flooded channels are common in low-gradient, floodplain systems[1-3]. Typically dry, these channels activate prior to river water overtopping all banks, thereby enhancing hydrologic connectivity between rivers and floodplains for moderately high flow stages. Despite their prevalence in meandering river systems, studies are just beginning to quantitatively characterize the role of floodplain channels in conveying flow. In one recent example, Czuba, et al. **2** demonstrate the continuum of lateral river-floodplain connectivity that occurs over a range of flow stages in a meandering river system, with a focus on how these connections influence surface water residence times and exchange fluxes. However, it remains unknown how surficial river network expansion via floodplain inundation influences surface-subsurface connectivity and resultant ecosystem functions, including nutrient transport and transformation.

Assessing the influence of floodplain hyporheic exchange on transport timescales is particularly relevant in agricultural catchments of the Midwestern U.S. In these landscapes, extensive fertilization results in high nutrient loading to streams and ditches draining into large river systems[4,5] and hyporheic exchange has been identified as a potentially important denitrification mechanism[6,7]. Although only periodically activated, floodplain exchange could be central to annual river budgets because inundation provides additional biogeochemical opportunity under high flows which often carry a disproportionate amount of nutrient export in streams in agricultural catchments[8]. Despite their perceived importance, floodplain channel exchange mechanisms and their associated biogeochemical potentials have not been characterized using basin-scale hydrologic models. The exclusion of floodplain exchange from modeling frameworks ignores important biogeochemical sources and sinks along the river network, as well as potential management opportunities. The Horton Grant will support research to address this gap. Primarily, I will use a 3D flow model to quantify floodplain hyporheic exchange fluxes and residence times through a river-floodplain network across event to annual timescales. Ultimately, this information will inform strategies for river corridor management, including planning for the natural attenuation of flood peaks and removal of excess nutrients.

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Quincy Faber, University of Florida

I am honored to have been selected as a recipient of the 2020 Horton Research Grant. This grant will support fieldwork in Greenland next year looking at the impacts of ice algae on meltwater generation and nutrient cycling. Formation of algal blooms on the surfaces of the Greenland ice sheet have been shown to increase ice melt1. Photoprotective pigments produced by glacier algae darken the ice and lower albedo (i.e., amount of light reflected by the surface). This generates a positive feedback in which growth accelerates meltwater production2. A diverse array of microorganisms inhabit supraglacial environments, but algae and cyanobacteria are of particular importance due to their biogeochemical role as primary producers and fixers of carbon dioxide and nitrogen.

Beneath the ice surface to depths of ~2m, the penetration of sunlight forms a porous aquifer, termed the weathering crust aquifer, that exists during the melt season and possesses enough light to support photosynthesis3,4,5. Although biogeochemical alteration during hydrological storage in the weathering crust aquifer affects the composition of meltwater delivered to proglacial systems, knowledge of the processes occurring in situ are lacking6. Increasing temperatures in the Arctic will increase melt season durations, and thus, there is a critical need to better understand the impact of supraglacial biogeochemical processes on carbon cycling and albedo effects.

My research will examine carbon cycling and albedo effects of ice algae inhabiting the weathering crust at several sites on the Greenland Ice Sheet. My first objective is to determine rates of photosynthesis and respiration in the weathering crust. My second objective is to understand the spatial distribution of algae and determine how these affect albedo and meltwater production in the ice. My third objective is to determine how seasonal changes in hydrology and microbial activity affect nutrient composition in supraglacial runoff. Field sites will be located near Kangerlussuaq in Western Greenland and Narsarsuaq in Southern Greenland. I will be working with researchers at the University of Florida, Aarhus University, and GFZ German Research Centre for Geosciences.

Being a recipient of this grant provides me with funding needed to collaborate internationally with the leading experts in glacier hydrology and photobiology. Through interdisciplinary collaborations, I hope to bridge the gap between algal biology and hydrology. My overall goal is to provide a more holistic assessment of algal contributions to nutrient fluxes in glaciated high latitude environments. I would like to thank former and current mentors at the Georgia Institute of Technology and the University of Florida. I would also like to thank AGU and the Hydrology section for this opportunity.

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A New Chapter for the Hydrology Newsletter

Antônio Meira (Hydrology Section Newsletter Editor)

Katarena Matos (Hydrology Section Webmaster)

Since July of 2010 the Hydrology Newsletter (HN) has served as a fundamental channel to disseminate information throughout the Hydrology section. The HN provides a platform where we can all read updates from the section leadership, hear from our section's award winners and keep updated about important actions, events, and task forces. When we look back through the 21 issues already published, one can get a snapshot of where we stood as a section - our goals, struggles, and accomplishments. But the HN goes beyond a mere communication tool. Most importantly, the newsletter serves as a rich archive where we are able to learn about the experiences of the leaders in our community: How they got to where they are, obstacles they faced along the way, and their advice to future generations. The personal tone within these pages allows us to get to know our colleagues in a much more intimate way- something that would never be possible through scientific papers and talks. To convey a feeling of community to a large membership is perhaps one of the main assets of the newsletter.

While it is impossible not to acknowledge all the benefits the HN brings to the hydrology community, we can also recognize some opportunities for its further enhancement. Unlike a journal publication, the choice of publishing each issue as one single document might not be ideal if one decides to share its specific content. Although visually appealing, the PDF format is not ideal to be read on devices other than a personal computer. Also, the current format makes it hard to associate articles within social media platforms which are currently used by many of our members. Not only that, but the rich legacy of previous issues is not searchable within the current format (by authors, keywords, topic). Few people know about the rich stories and testimonials from previous issues written by great hydrologists. Such information is not to be found online unless the user knows in which exact issue the information of interest is in. A simple experiment was performed following the release of the July 2020 issue, where we posted about specific articles within the July 2020 issue of the HN on Twitter, with a brief headline, followed by an acknowledgment of the authors (including their Twitter handles, whenever applicable) and the link to the PDF. We know, for example, that 1950 people saw the tweet about the WRR Open Access Taskforce, and that 61 people interacted with it (by clicking on it, linking it, or retweeting it). Moreover, many of the task force members with Twitter handles were able to communicate with their followers about the importance of their participation. We also detected much higher traffic in the Hydrology Section Website following the newsletter release on social media. Much more could be done if each article could be individually shared and authors could be tagged.

"We are currently planning a new format for the HN that will take advantage of current technology embedded within the new AGU virtual platform to make it more accessible, shareable, and therefore increase its impact on our community. "

We are currently planning a new format for the HN that will take advantage of current technology embedded within the new AGU virtual platform to make it more accessible, shareable, and therefore increase its impact on our community. This development is currently in the planning phase and we would like to hear from the community about a few key decisions that will be made. We would like to emphasize that this transition will not exclude the previous Newsletter format (a single PDF that is ideal for printing), as it has definitely been the preference of many of our members. We would like to ask for volunteers (preferably with web design skills) to help us continue this work.

"We would like to ask for volunteers (preferably with web design skills) to help us continue this work."

A survey will be sent in January through the Hydrology Section Website and Twitter to ask a few simple questions to guide us throughout this process, as we also hope to hear from you individually with questions and suggestions (antoniomeira@gmail.com and katarenamatos@gmail.com).

So, keep an eye open and join the process! The newsletter is changing and it's for the better!

"Are you thinking about a career in academia, or navigating your way through the demands of your first few years in an academic job? Jeffrey McDonnell, AGU Fellow and Past President of the AGU Hydrology Section, recently pulled together some advice for people on the academic pathway in a short book. We asked him to share a few nuggets of advice from his book."

- On the Job, AGU Pathfinder