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I'm Alberto Montanari, Editor-in-Chief of the American Geophysical Union (AGU) journal Water Resources Research, here to talk about the science and management of water resources. Ask Me Anything!

AmGeophysicalU-AMA [1] and r/Science AMAs[1]

[1]Affiliation not available

April 17, 2023

Abstract

I am Alberto Montanari, Professor of Water Resources Management at the University of Bologna - Italy, and Editor-in-Chief of Water Resources Research (WRR), an interdisciplinary journal published by AGU focusing on hydrology and water resources celebrating its 50th this year! WRR is addressing challenging questions for humanity: How is water best managed? How can we secure water all over the world? Is there enough water to feed an ever increasing population? What about the potential impacts of climate change on water resources? How will extreme floods and drought change in the future? Water scientists are addressing these issues in many ways, including using satellites to estimate global water availability and understand how water can be best distributed, and studying the so-called "virtual water trade", or the virtual displacement of water obtained by exporting food. A Special Collection of WRR looks back on 50 years of research activity in this area and provides a perspective for future research focusing on water systems for the development and benefit of society. Visit the site of WRR here: http://agupubs.onlinelibrary.wiley.com/agu/journal/10.1002/(ISSN)1944-7973/ I hope to answer lots of interesting questions about water science and management. I will be back to answer your questions at 12 pm ET (9 am PT, 5 pm UTC), ask me anything!

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ABSTRACT

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How can the average person do more to help with the biggest issues right now around water management?

It seems like the percentage of water used for agriculture and industry makes personal water consumption seem irrelevant.

Sure, people can take shorter showers and use efficient appliances, but it seems like a tiny drop in the bucket when you look at the global scale.

Fuck_A_Suck

Water resources management problems need to be addressed at multiple spatial scales. Indeed, the biggest challenges are large scale ones, and need to be addressed by large scale planning of the most demanding uses. Agriculture is the most important water use: water for food is the problem. To give you an idea, about 2/3 of water consumption is related to agriculture and therefore agricultural planning is the main issue, which needs to be addressed at the governmental level. Global household consumption is about 10% of the total water use. However, this does not mean that the individual behavior of people is not important. It is EXTREMELY important for local planning. Once water management is efficient at the regional level, the individual behavior is important to make sure that

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water reaches the tap. Water distribution systems at the local level are designed to meet individual water demand. If the individual behavior is not efficient in terms of water consumption, water resources systems do not work well and may fail. So, tacking a short shower is indeed important to make sure that water is available for civil use, especially in water limited regions. In short: securing water to people needs coordinated actions at different spatial scales: large scale, where challenges need to be addressed by governments and international organization, and local scale, where challenge are addressed by municipalities. In this case, people education is the prime strategy.

What is the best way to get clean water into the lives of everyone in the world? Specifically, what methods do you think are working, or can work? Should the focus be on neighborhood, or even family home, based filtration/purification/treatment, or more on big system, municipality size treatment?

shawmanic

There not one single remedy to optimize our water uses. We need an integrated action at multiple spatial scales. This is why the term “integrated water resources management” was coined. Municipality treatment is a necessity for large settlements. On the other hand family based treatment and water use optimization is a necessity for sparse settlements. In some other cases, an integration of the two systems may be the optimal solution. We need to increase our knowledge of water systems and water dynamics, and their behaviors in a changing world. We need to educate each one person, and increase the public awareness of how water can be saved. We also need to increase international connections. Water resources were always managed at local level: this is approach is no more efficient. In a changing world, where water demands are ever increasing, we need to profit from virtual water transfer, coordinated management of international catchment and aquifers, and coordinated actions for desalinating sea water. Basing on increased knowledge and education we will be able to organize an efficient, international and coordinated planning.

If nothing is changed regarding water usage and filtration technology, how long do you estimate it will take before water shortages will become a widespread common occurrence?

zambartas

If I looked at the amount of freshwater available in the globe, I would say that the human population may increase a lot more without inducing global water shortage. Therefore, I am confident that an improved use of the virtual water trade, an improved efficiency of the water resources systems (based on improved scientific knowledge and education) and improved agricultural techniques will offer us ways forward to minimize water shortage in the future. However, international social tensions and wars and uneven distribution of economical resources may make compromise our chances to get to target. To reach an efficient environmental management we need international cooperation. If the latter is inefficient, the extension of water scarce areas in the world will increase and will induce increased emigration and poverty in some regions. Let me say that the individual contribution to raise international awareness is important to this end: if we would like to manage earth’s resources efficiently, we need to strengthen international solidarity and to strengthen our support of poor regions. International tensions are originated by poor regions and poor regions are water poor regions. Improving water security helps to reduce international tensions, which in turns helps to improve water security. It is a classical impact/feedback circular mechanism.

Hi Alberto,

Thanks for doing this. It's great to see this sort of outreach going on!

I am an isotope hydrologist so my question is: what are the key water resources issues that isotope hydrology will be able to address to ensure water security and cleanliness in the future?

For example, do you think the importance of groundwater dating should be emphasized more to the public in light of the increasing demand for water, especially in arid regions?

What isotope tracers do you see as underutilized to date that could show large potential the future? e.g. Krypton-81

Thanks,

p.s. I just had a paper accepted by WRR so I am super stoked to see you doing an AMA!

Edit: added example of 81Kr

GeoHerod

Thank you for your kind words. Isotope hydrology is extremely important to increase our knowledge of groundwater system and groundwater paths. We could efficiently plan groundwater use if we did not know water age. This is why the scientific community is increasingly interested in these issues. You may have seen that WRR is publishing a lot of papers on water age. Interesting discussions!!

Hi there,

I'm aware this isn't exactly your expertise, but as a person who is an expert on water resources and management. I was wondering what your opinion was on the Montreal municipal wastewater dumping that is taking the North American Media by storm as of late. Thanks!

gammadeltat

Good question!! As you say, I am not expert on that situation. I should say, however, that the motivation for the dumping is credible. That is, it is indeed necessary to maintain/recover municipal waste water treatment plants to keep them efficient and to prevent ecological disasters, and their maintenance may imply that their functioning is compromised for a while. However, these operations should be planned basing on a careful modeling of their impact in terms of water quality. I do not know what kind of analyses have been done in this case, but I trust that a careful plan was set up. In general, releasing untreated waste water in rivers is less impacting than releasing in lakes. Rivers take a relatively short time to recover when pollutions ceases. Lakes are much more delicate.

Thank you for doing this! Do you think we will see water traded on a commodity exchange similar to how crude oil or corn is traded?

Foge311

No. Water is a human right (https://en.wikipedia.org/wiki/Human_rights). I do not see the risk that it is treated like a commercial product. However, it may be necessary to reduce water consumption in certain areas and there might be need to pay appropriate fees for water use.

What can we do with our usage and buying power to best conserve/use/rehabilitate the h2o we have access to? How bad is fracking and draining aquifers and rising salivation. Should I start hoarding?

australian_ultra

We strongly need to save water. Water should never be wasted! The impact of fracking is multifaceted. However, in terms of water consumption at the global level, fracking is still not much impacting. It is a great reason of concern in the US, since it is much used. To provide an order of magnitude, fracking is consuming as much water in the US as about 4 millions of people. Although this number is impressive, once fracking water consumption is averaged over the whole world it becomes less significant. However, fracking may have an impact on local water resources and therefore may be a great reason of concern in water limited regions. – not to talk on the impact of fracking on groundwater quality. Aquifers: we need to take water from aquifers, there is nothing wrong in that, provided the aquifer is not depleted. Today there is an increasing concern related to groundwater overexploitation, but any conclusion should be based on a detailed regional and local analysis. To be clear: there is fresh water for everybody on the globe, the problem is its spatial and temporal uneven distribution. Therefore, optimal planning is necessary, which should be based on a coordinated action at different spatial scales.

Would the development of a modern sewer and water distribution system in a country like India be a good thing on the long game without a struct change of culture worldwide?

This question might sound stupid but right now in India a good part of the population don't have access to modern toilet, sewer and water distribution. The problems are that this make that a lot of water is wasted and polluted. But if they had a modern water distribution system, would the demand for water explode ? Do we have enough water to sustain a population this big if they try to copy what the population in the USA is doing ?

wowy-lied

The question is not stupid at all!! However, I think that we strongly need to target efficient water systems all over the world. Not building the systems is not an option, in the same way as not curing the cancer is not an option to control demographic expansion. We should remember that A LOT of people die every day for insufficient water supply. Of course building an efficient water system requires a careful plan to make sure that people are educated to use water carefully.

As a non-American, do you have any thoughts or insights into our two competing models of water rights in the US, e.g. 'prior appropriations' in the arid west, and 'riparian water rights' in the relatively wetter east?

kepleronlyknows

I can say that in my country, where water use has unfortunately a very long history (I say unfortunately because bureaucracy increases with increasing history), the prior appropriations prevails. I am not much prepared to reply for the US context.

Two questions come to mind.

Here in the U.S., a major reason for the water crises in our western states has to do witharchaic municipal agreements regarding water allocation. What advice could you give to ordinary citizens for bringing change to this situation?

And my second question, what are your thoughts on water privatization? Could a lack of access to clean water lead to violence or war in developing places (or has it ever)? To my mind, it's literally the most vital resource on the planet, and the idea of private companies controlling it in struggling populations seems useful in some cases but overall very problematic.

WakeUpOnFire

Regarding the first question, my first suggestion to citizens is participate, participate, participate. Governments and political parties need to get aware that water is important. Therefore, I invite everybody to participate to public consultation and assemblies, to let water managers know about the problems, and make water resources management relevant in political discussions. There is increasing awareness of the impacts of climate change, and today climate change is in the political agenda. For some reason that I fail to understand, there is not as much awareness of water changes, water scarcity and the water crisis. Water is important and must get in the political agenda as well. And the actions of the public are much relevant for this. About privatization of water: in my opinion, it is not a relevant issue. The public control on the water tariffs and to citizen's right to have safe access to fresh water is what matters. It is not as relevant that the technical management is done by a public rather than a private authority. Experience in Europe suggests that public authorities are less efficient in managing water with respect to private ones. Therefore, I see nothing wrong if water is managed by privates.

What is the issue that you most wish you had insight into?

Real_Muthsera

I wish we had long term observations of climate, river flows, groundwater levels. Why did human start to measure rainfall and river flows only one hundred on average (three hundreds at most) years ago? Had we long term observations available, we would make much better science and therefore much better planning.

What are the major barriers to the having desalination be a more adopted solution to water shortages?

Elbonio

Energy consumption, cost and environmental impact. However, desalination will for sure increasingly used.

Is there any feasible solution to the problem of the Aral sea (now a couple of lakes)? The feeder rivers, the Amu Darya and the Syr Darya used to keep it well topped up but for a while now, they are massively diverted to support agriculture but with consequences. What little water that is left often contains high levels of pesticide/fertilizer runoff and former lake bottom is a dust bowl. The countries using the water, principally Uzbekistan depends on it for cotton (a comparatively 'thirsty' crop).

doc_frankenfurter

Although I am not an expert of the Aral sea, I would say that it is a typical example where a tipping point has been passed. I think that recovering the Aral sea is impossible in a reasonable time span, given the current societal constraints. The Aral sea will be forever a meaningful proof of the importance to manage water efficiently.

What would the impact of flooding the Qattara depression be for the rainfall in the sahara?

awegge

Sorry, I am not expert abut this

Alright, we in California know that this conservation thing isn't going to solve everything. Residential water makes up too little of the overall pie, and no one is cracking down on agriculture. Desal isn't going to happen quickly enough and I can not imagine it's feasible to just ship it in from another state.

My question is: What are our options for when we run out of water?

McGridds

Optimal water resources management, see my reply to the other question.

Hi Alberto, do you have a response to the new study out today about how declining snowpacks are going to lead to water shortages in many different countries?

http://iopscience.iop.org/article/10.1088/1748-9326/10/11/114016

It seems like it has major implications for the 2 billion people who rely on snowmelt for water.

holyfruits

No doubt that climate change is impacting water resources in mountain regions. They are the regions where the effect of global warming is more threatening.

Which do you feel is the bigger contributor to water shortages: Weather or Politics? I hear a lot about California and their drought and I would love to hear your opinions as someone that addresses the changes in water availability.

lablizard

No doubt that politics (in terms of water management policies) and demographic expansion are the major drivers at the global level. Climate change is an important driver in mountain regions. However, given that agriculture is the main reason of water consumption, I am convinced that the solution for California should rely on improved water resources management policies. The future will bring interesting opportunities through the virtual water trade. We need to include water availability as an important constraint in agricultural planning. I saw too many examples of water problems originated by economically convenient agricultural policy that turned out to be not sustainable in terms of associated water demands.

Here in Denmark, it's illegal to use water on crops on the fields, it's only legal in green houses. You just have to rely on rain outside.

Why do you think this isn't case in the US too? It seems completely crazy to me that a state like California is used for agriculture at all, instead of the states with the right climate for agriculture.

lokesen

This is a difficult question to reply to. Agricultural and water resources management planning must rely on a careful and INTEGRAL study of the social connections, impacts and feedback. What is correctly applied in Denmark is not necessarily valid in California. For sure California is a big challenge and any mitigation requires a long term planning.

What are your thoughts on the efficacy of the Water Entitlement market in Australia, and do you think it could be a model for certain areas of North America?

Chernozem

Sorry, I am not expert about the Water Entitlement market in Australia

Will the Southwest US (Texas to California) end up like the Sahara Desert?

Own_Worst_Enemy

Not soon. What will happen in the long term nobody knows. For sure, tremendous environmental changes will occur.

I'm having a hard time convincing my conservative parents that global warming is a threat, even in the face of mounting scientific evidence. Is there anything in your particular field that would be more proof positive that this is occurring and that it is caused by man?

watermantra

In my specific field, CHANGE is an issue. Climate change, land-use change, water change and demographic change. There is no doubt that change is mostly human induced. The impact of climate change may prevail on the impact of other changes in certain regions (for instance in mountain regions) but it would be a mistake to focus on climate change only. Let's say that we need to assess and mitigate the impact of CHANGE without limiting our attention to climate change.

Hi Alberto! I am a senior undergraduate geology major about to enter grad school to get my MS, focusing in fluvial geomorphology. With today's current water supply issues, what career path would I be well suited for that would do the most good to society, and what specific skills or technology should I seek to learn while in grad school? Thanks a lot for doing this AMA!

geobsessed

The right career path depends on the region where you live. Therefore, I can only give a general advice. I would suggest you to look at global environmental challenges, by using open data and large scale modeling. Environmental planning will become more and more important, and global analysis is the key way forward. From the global perspective you may easily downscale at the local level, while the opposite pathway is hardly possible. I also would suggest you to look for the benefit of poor regions, they are the key for achieving long standing wealth at the global level. And look for any connection with society, the purpose of science is to serve all the people without any bias.

What are your predictions for water usage in the Ogallala aquifer for the next decade? Are individual states developing strategies to mitigate falling water tables? Are there any pending cases of state conflict over differences in aquifer usage?

digitalis303

This is a very specific question, sorry but I do not have the detailed knowledge that is required to answer

Which countries or areas do you think will be most effected by aquifer depletion?

How much of an effect will aquifer depletion have on food production in those areas? Or worldwide?

Lastly, how much of an effect will reduced snowpack and glaciers in mountain ranges like the Himalayas and the Rockies have on food production?

latecherry

Please look at Water Resources Research. Famiglietti and co-workers recently published a global study on GW depletion. I anticipate that a couple of VERY exciting papers on the subject will be published soon. Please follow us!! There is also the AGU Water FB page that is reporting on these papers.

How can we help people everywhere understand that they live in a watershed (or drainage basin if you prefer) not just a political entity like a city, state, or country? Would that be a useful way for people to make better decisions about water and even politics?

Nanookthebear

Yes, it is a nice idea! A guy in Sweden designated a phone app telling people in which watershed they are. It is great!! Unfortunately the database covers a limited part of Europe only. Why don't we push this idea forward?

This might come across as a stupid question, but is it really possible to waste water in an area that has an abundance of it. I live in southern bavaria and it's basically never *really* dry. So we don't really save water. Don't get the wrong impression, we try not to waste it, of course, but our concern is never: *"We must save this water or we might run out."*, because that just seems too insane to happen.

So I guess the bottom line question is: Is it possible to waste water to an extent where it causes damage in an area with a lot of water, where the cycle seems to keep itself in equilibrium? What should I do to improve water management, despite not having too little of it?

DexterVane

This is not a stupid question. Of course, where there is large water availability it would be not efficient to use economical resources to optimise water resources management to reach unnecessary targets. However, we should take into account soil moisture recycling. Water use in China may have an impact on the rainfall regime over Europe (there was an interesting paper published by WRR some years ago by Savenije et al.). Namely, when evaluating water management plans we should follow the drop of water along the full hydrological cycle. We should not limit the analysis to the single catchment or water distribution system

Hi Alberto,

I'm a grad student studying stream restoration, I've spent a ton of time reading articles from your journal so I've got a ton of questions for you...I'll try to limit myself though.

1. Since your field is WRM; do you think that the IWRM concept is still applicable in the face of non-stationarity? Or will more flexible strategies such as Adaptive Management, or Nexus Thinking be more applicable in the future?
2. Can water be viewed as an economic good? If so, who advocates for the ecological functions of a

river? Are ecosystem services the right way to approach this?

3. For myself as a river engineer, do you think it's necessary for us to recognize a new anthropogenic baseline when performing restoration projects, or should we continue to try and seek the "natural" state of streams and rivers?

4. Environmental Flows has become one of the new standards of evaluating the ecological health of a river. In areas such as the western US where water scarcity is widespread, how can we convince people that river ecosystems need a certain amount of water to function? How about in developing countries where people don't even have clean drinking water yet?

Feel free to answer as many or as few of those as you like. Thank you so much for doing this.

Edit: I just scanned through a few of the papers in your publication history and I have another question for you: How do you feel about the "room for the river" concept that seems popular in Europe right now? Is it a good way to continue fluvial geomorphic processes while mitigating the effects of flood? Or is it one more of a case by case basis depending on the river?

UndergroundMouse

1) IWRM is still applicable, as the concept of stationarity is. Please have a look at my WRR paper "stationarity is immortal". Of course we are observing non-stationary behaviors, but stationary model should still be the baseline, especially in view of the uncertainties that affect water resources management. 2) Yes, definitely it is an economic good. The ecological functioning of a river is a water good as well. What we need is a sound theoretical knowledge allowing us to better inspect the links and feedbacks between water use and environment. 3) For sure we need to focus on an anthropogenic baseline. The majority of rivers in the world are scarcely human impacted, but the most relevant ones, in terms of societal values, ARE heavily impacted. 4) Civil use has the priority. Environmental flow comes into play after the civil use has secured. We need to make sure to be able to establish the right priorities. It probably looks like a stupid reply, but very often environmental disasters occur after an erroneous identification of priorities.

Are you concerned with like biological warfare that could potentially be spread through the water supply?

paigeroooo

I am not much concerned

If we start desalinizing on a large scale will that eventually create a dead sea situation on an oceanic level? Or are you not introducing salt back into the ecosystem after removing it? Would that cause too much salt to be lost when the water flows back? Seems rather delicate. How is that being handled?

grundalug

There are plenty of studies on desalination and related impacts. The main concerns are related to costs and energy

I work at a water reclamation facility in the United states, what do you feel is the best or most efficient way to treat out waste on average, aerobic BNR or anerobic systems and which do you think would benefit global poor communities. Obviously stabilization ponds are good but many are dealing with toxic waste that needs more treatment than that.

Thank you for coming on and discussing these issues, not often we in western or developed world get to stop and think about our water resources until they're polluted.

Brwright11

This is a difficult question to reply in a few minutes. Basically, the optimal strategy depends on local conditions. I may describe what is my practical experience but it is a long story

Hello! Thanks for doing this AMA. I am currently in school for chemistry and environmental science, hoping to enter the water field in the next several years. Is there any advice you could give to a prospective water scientist? What are the areas where help is needed most or is there any general/specific knowledge that would be beneficial to have before diving head first (pun intended) into the field?

Thanks so much for what you do!

SilentRadiator

Monitoring!! And global modelling. Please ask yourself the question: how the water cycle is monitored and what are the challenges? We have A LOT of remotely sensed information coming into play, and we barely know how to share and use it. In my opinion virtual water laboratories are the future!

Thanks so much for your time Dr Montanari. I'm a geography student at Texas State University in San Marcos Texas. We've had two historic floods here in Central Texas in the past 6 months, and I'm working with our Water Resources professor on mapping the most recent flood's extent - it's pretty exciting.

Anyway, my point...

Here in Central Texas we seem to be experiencing only extreme weather. We've got historic years-long droughts with these occasional massive floods. Our houses are getting washed away by the massive water volume, but our aquifers aren't getting significantly recharged in these flood events.

With Global Climate Change, it looks like many areas of the Earth will be following our lead and experiencing these bimodal precipitation patterns.

How do you think we will or should address the problem of water supply restoration when our precipitation events are increasingly extreme and infrequent?

chiliedogg

Mitigation of climate change depends on the magnitude and type of change. Mitigation entails a relevant risk: given the uncertainty associated to climatic predictions, mitigation plans may imply unsustainable economic costs. I am firmly convinced that our first priority is to make sure that mitigation plans are feasible. Feasibility can be ensured by using the so called “bottom-up” approach for mitigation planning: solutions are devised by including their feasibility and sustainability as a priority constraint. Furthermore let me say once again that priority should be given to no-regret solutions.

I found that a lot of research as well as media coverage is mostly negative about the impact on climate change on water. I myself live in the Netherlands and water is such a big theme, climate change how ever not so much. So I'm researching if a more positive approach to climate change can result into a learning process that results in more action. I personally think that the negative approach is paralyzing

a lot of people. Just to make clear, I do think that climate change is real, I do think that there is action needed, I just think a different approach will cause more action. Is there any positive effect climate change has on water resources?

OwlsSecretlyRuleUs

For sure there are positive implications of climate change on water resources! They are often not considered. The motivation for this outcome would be the subject of an interesting discussion, but an entire AMA would be needed :-)

Every ancient civilization (except Egypt due to the Nile) has perished due to the irrigation making the soil too saline to grow anything.

I imagine that (due to the dying of the oceans, the population growth, global warming, etc.) fertile soil will become more and more important.

Are there methods to fight this effect and even reverse it?

evil_boy4life

There are studies on-going on that. Some researchers are convinced that using desalinated water may help to reduce soil salinity, but the results are still under investigation

For those living in Siberia, to what extent should we care about water usage? How do we know if we use more water than is returned through precipitation? How do we know if we are heading towards water shortage and what are the chances of droughts? Thank you.

Hellishnoob

Global hydrological modelling may be useful to give a reply to your questions. The global models help in setting the boundary conditions for local models. Large scale (global models) -> small scale (physically-based models). This is the way forward

At the current rate of acidification of the world's oceans - how long until there is a mass die-off of ocean species?

shadowmonk10

I have no expertise on ocean monitoring and modeling. But please keep into account that ocean acidification is strictly related to global temperature

Hi Alberto, thanks for the AMA. I'm looking into doing sustainable engineering as a PhD so I'm looking forward to your answers. I believe wars could be fought over water this coming century if we're not careful so thank you for the work you do!

So, I've always wondered about how the international space station recycles all of its water. Their efficiency is impressive. Would it be possible to take that technology and adapt it to work in a single unit, one that you could sell to individual households much like we do home appliances today? Therefore each house would be able to recycle as much water as possible in a highly local way. **All the shower/bath/tap water and urine from houses, skyscrapers and businesses recycled.** Even a small uptake would have an immediate effect on relieving pressure on the sewers and increasing

urban water efficiency.

edit: wording

arandombritishguy

There are experiences of building self-sufficient buildings, where water is 100% recycled. They are still expensive.... but the nice feature of water science is that there's still much to learn and explore

Can you tells us how you're using GIS technology for water resource management and conservation?

DavidAg02

We use GIS technology every day!! Global modeling would be impossible withoout GIS.

Hi Prof. Montanari,

Can you give us some thoughts on:

- the use of satellites and remote perception on the management of water resources,
- uncertainty (of weather prediction) and climate change,
- the impacts of climate change on developing countries and strategies of mitigation.

(I'm translating questions from colleagues from Bolivia)

- What about underground water and it's use for drinking and energy? (Can you give us some information -books, articles- on this topic?)

Thanks!

edit: reformulate and added questions

edit2: added one more question

edrin1987

I am firmly convinced that new monitoring techniques will offer unforeseen opportunities for improving water resources management and for mitigating water related risks. There is an enormous amount of information that is not currently used. Uncertainty: it is unavoidable when dealing with water resources. Therefore, we need to properly take it into account. It is difficult to quickly report my thoughts on climate change. Mitigation of climate change: a combination of reduction of CO_2 emission and appropriate water resources management strategies, planned with the bottom-up approach

What are your thoughts about the increasing role of private companies, like the French Veolia Environment and Suez Environment being allowed to own the source of the water and managing its distribution, sanitation and re-use world-wide?

whatatwit

No problem if the tariffs are controlled by a public authority. Sometimes private companies are more efficient in managing public goods. If they are, why not? The important thing is that management is carried out by respecting the human rights

The way I see it, most of the water issues are not technological but are political. Is water discussed at

international levels in the way that the economy and fuel are discussed? How does a country like Canada with lots of water guarantee their soveriegnty while support water starved neighbours? What about border resources like The Great Lakes? For example, a canal draining Lake Michigan (completely within the US) would also drain Georgian Bay (completely with Canada).

StuWard

Of course many water issue are political. But let me reiterate that we need to improve our knowledge of water systems, and our knowledge of the links and feedbacks between human and water systems

Do you see any of the desalination technologies becoming viable in the near future, or will this never be the way to go?

silentialpass

It will be the way to go!

How do you feel about water privatization?

Momoneko

Please see my replies above

What are the biggest issues you have to worry about with water in a place like California vs. Pennsylvania?

Burgh_Pride

Climate change, and the natural tendency of climate extremes to occur in clusters (see Cohn, T. A., and H. F. Lins (2005), Nature's style: Naturally trendy, Geophys. Res. Lett., 32, L23402, doi:10.1029/2005GL024476.)

I am extremely concerned about unsustainable aquifer withdrawal rates for irrigated agriculture. I have heard that municipalities and other units of government do NOT have to have scientific measurements of a sustainable withdrawal rates in the aquifer under their jurisdiction (withdrawal rate < recharge rate). Ogallala is one example of what appears to me to be an apocalyptic problem (est depletion date 2028)- our aquifers are dissapearing, and once we go back to rain-fed agriculture, we won't be able to feed 7 billion, let alone 9-10. How are these rates determined and legislated? What % of agriculture relies on aquifer irrigation? Am I overstating the problem, or are we screwed?

elfzaxer

I replied above

What does the future look like for California? Should we get ready to house millions of climate refugees in Michigan, when the Okies.. cough.. Cali's come looking for water?

elfzaxer

I cannot answer your question because I am not prepared enough, but I wouldn't be so pessimist about

the future of water resources, provided the public and the governments realize that WE NEED TO PROTECT WATER SYSTEMS. Please check the IAHS statement on the adaptation of water resources systems at www.iahs.info

Are advanced mathematical models really helpful to the management of water resources? Could you make an example of a successful model that greatly improved the efficiency of water management at the moment it was introduced? What did it take in account that previous models didn't?

_Sakurai

Flow routing models. They help us in deciphering the river flow and they tell us of a water withdrawal structure, or a levee, should be designed. They were made possible by numerical mathematical modeling

What is your educational background?

randomly_masturbates

Civil engineering

Is there a reason why rainwater isn't collected in towers and its potential energy extracted as it gets filtered? (e.g. using its weight to power filtration systems)

NSNick

It is not economically convenient

Knowing that meat production is a huge component of water consumption, what are your thoughts on in-vitro vegetables and meat?

komasai

In principle, I do not have any problem with it, as I do not have any problem with OGMs. I know this is controversial....

How much do the pesticides used on GMO crops impact our water supply? Is it any more or less than organic farming would?

I live near Lake Erie and Toledo's water was shut off for a few days last year due to algae bloom. Is that connected to our farming methods?

pilgrimboy

Farming methods have a significant impact on the quality water resources, no doubt on that. For this reason, there are strict regulations. Pesticides help in improving the crop yield. However, their use entails risks, as we know. Therefore they need to be correctly used. I do not see the necessity to ban their use, but I do see the need of regulations and monitoring.

Based on current trends and predictions about water management in the states, what is the current the biggest concern and something to look forward to (advancements, possible solutions being theorized, etc.) that we can see coming within the next 5-10 years?

maltsie

The current biggest concern is overexploitation of aquifers for several reasons (fracking, droughts, climate change, increased demands....). I think we need to find the solution in improved agricultural practices and virtual water trade. There are relevant economical implications, so it's a socio-hydrological problem

Is Lake Mead going to dry up in the next few years and if so, will this cause a catastrophe for the Western United States?

WoodenLaser

Sorry, I am not expert on this specific case.

In the Pacific Northwest we get a lot of our electricity from hydroelectric dams. How will reduced snowpack effect this in future summers?

jubalince

The impact of climate change on hydropower management is a topical issue. It will depend on local conditions. However, the dam is by itself an integrator over time. Therefore, it is the seasonal change that is effective on dams. Meaning that a reduced snowpack is not necessarily a heavy impact, if the total precipitation volume does not change.

Hey Alberto,

Where do you see the majority of geophysicists working in the next 10-20 years? Eventually oil and gas will no longer be able to support all of the geophysicists working in that industry, and they will need to do something else..

mxlytn

Geophysicists are not only working in the oil&gas sector. I am a geophysicist myself, I am in a research group of some 15 people and none of them is involved in O&G. I think the emerging issue is environmental protection and restoration.

How many years until my water bill in the US will be doubled? Tripled?

lamabioticgod

Many.... :-)