

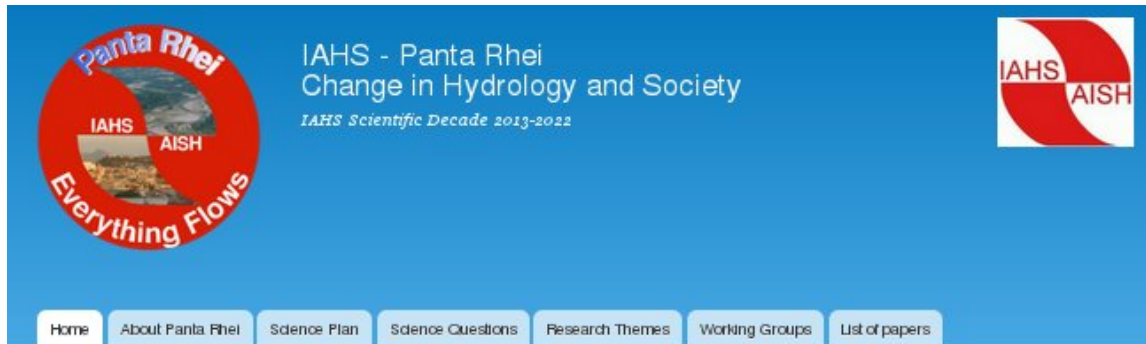
How people and ecosystems organize their storage requirements

Hubert H.G. Savenije

Hongkai Gao

Markus Hrachowitz

Panta Rhei



Panta Rhei Everything Flows

The new Science Initiative of the
International Association of
Hydrological Sciences
(IAHS)
www.iahs.info/pantarhei

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Bologna IAHS 2014-6th IAHS International Symposium on Integrated Water Resources Management

Evolving Water Resources Systems - Understanding, Predicting and Managing Water - Society Interactions

Panta Rhei at AGU and the Panta Rhei Poster

Submitted by alberto on Sun, 12/08/2013 - 15:27

The Panta Rhei session at the AGU Fall meeting is going to be held on Tuesday, December 10 and Wednesday, December 11. We will publish a report on the session that counts more than 90 contributions! A Poster on Panta Rhei will be presented in the session to introduce Panta Rhei to the international scientific community. The poster is available for [download here!](#) I am looking forward to see in person all of you that are attending AGU!

Alberto Montanari

Tags:

[Panta Rhei](#) [AGU](#) [poster](#)



[Read more](#)

Call for Research Themes and Working Groups of Panta Rhei

Submitted by alberto on Wed, 10/30/2013 - 09:57

The call for **Research Themes** and **Working Groups** of Panta Rhei was published on October 30, 2013. The publication of the call marks the actual start-up of the involvement of the community in Panta Rhei. Please read the call at the above linked pages. We are looking forward to receiving the feedback from the community, through innovative ideas and availability to establish a mutual cooperation. Please do not hesitate to contact us for any clarification!



Please beware that the first deadline for proposing Research Themes and Working Groups is fixed at January 31st, 2014.

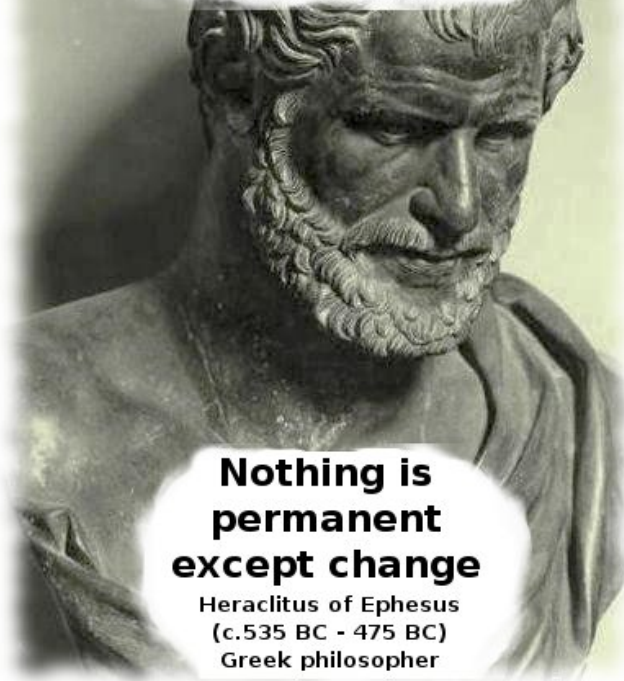


Panta Rhei: the IAHS Science Initiative 2013-2022

Launched in July 2013 at the IAHS General Assembly
Montanari et al. (2013)

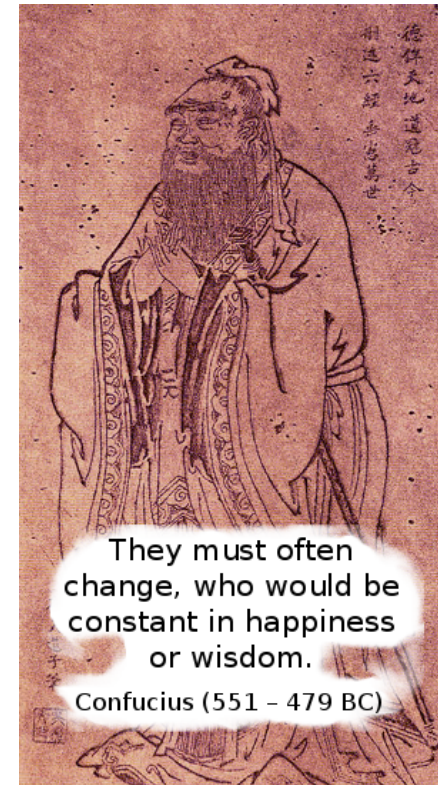
2013
Change
2022

No man ever steps in the same river twice, for it's not the same river and he's not the same man



Nothing is permanent except change

Heraclitus of Ephesus
(c.535 BC - 475 BC)
Greek philosopher

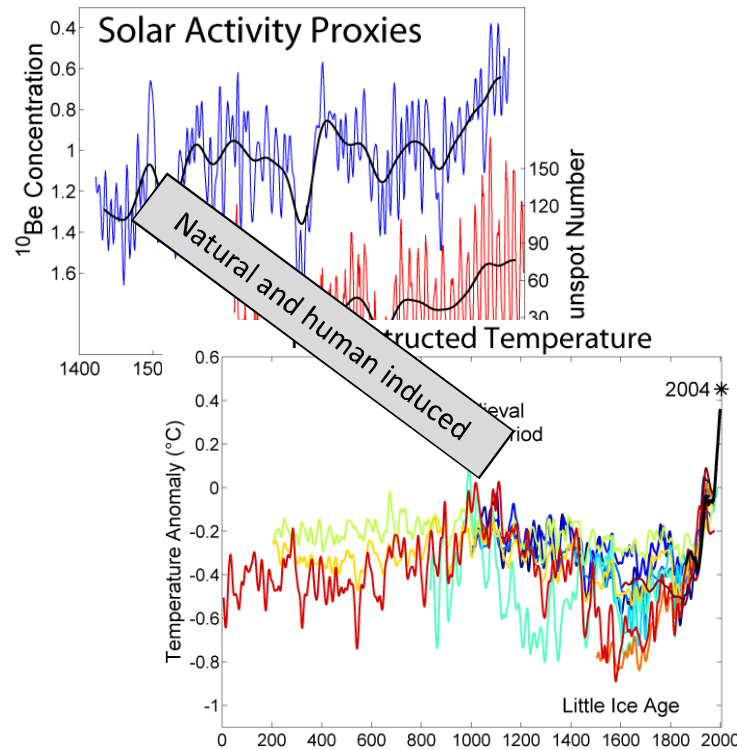


They must often change, who would be constant in happiness or wisdom.

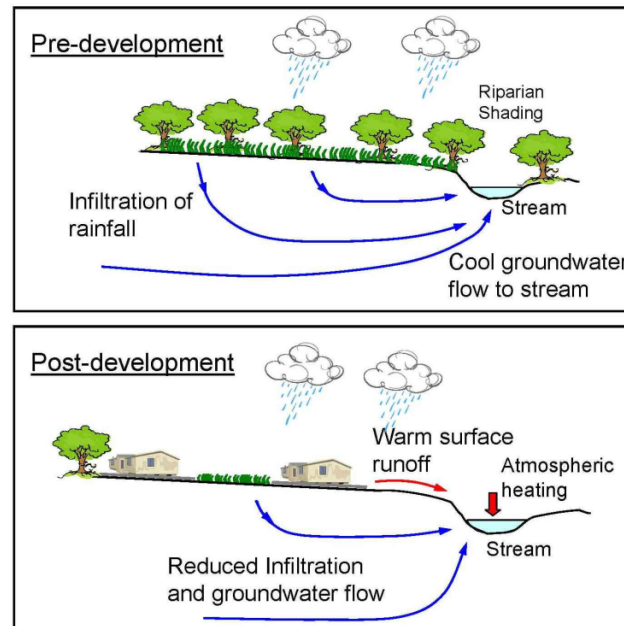
Confucius (551 - 479 BC)

Hydrological Change

Climate change



Land use change



River training



Genoa – Flood event in 2011



Tunnelling of Seveso River

From University of Minnesota <http://troutstreamresearch.safll.umn.edu/>

International scientific associations in Hydrology



EGU – European Geosciences Union (www.egu.eu)



AGU – American Geophysical Union (www.agu.org)



IAHS – International Association of Hydrological Sciences (www.iahs.info)
(along with National Hydrological Associations)

Why a major research initiative?

- Focus on an emerging scientific challenges
- Strengthen international cooperation and competition
- Facilitate international exchange and comparison of research results
- Promote the visibility of Hydrology as a science
- Inspire and create opportunities for young researchers

How people and ecosystems organize their storage requirements

Hubert H.G. Savenije

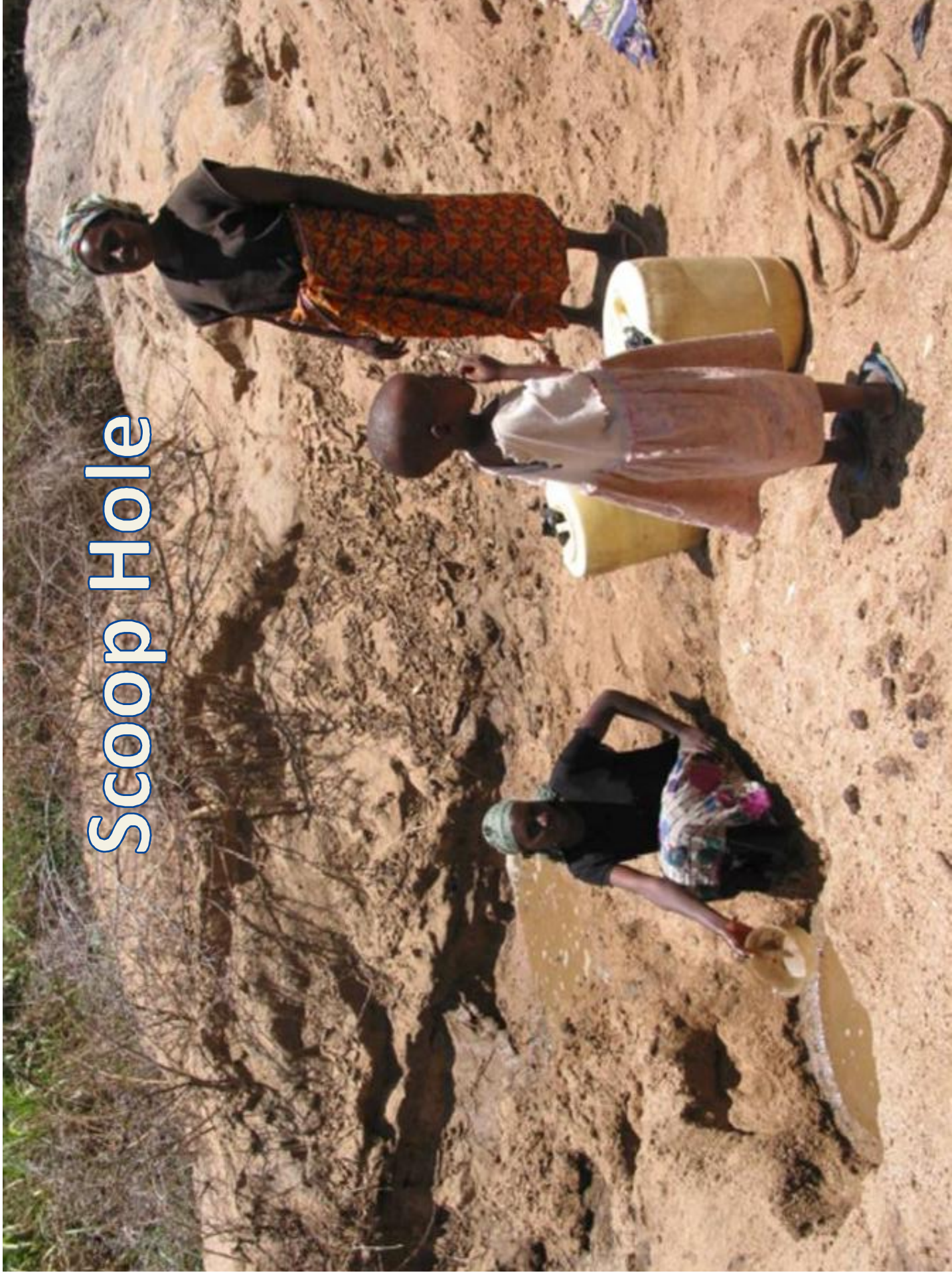
Hongkai Gao

Markus Hrachowitz

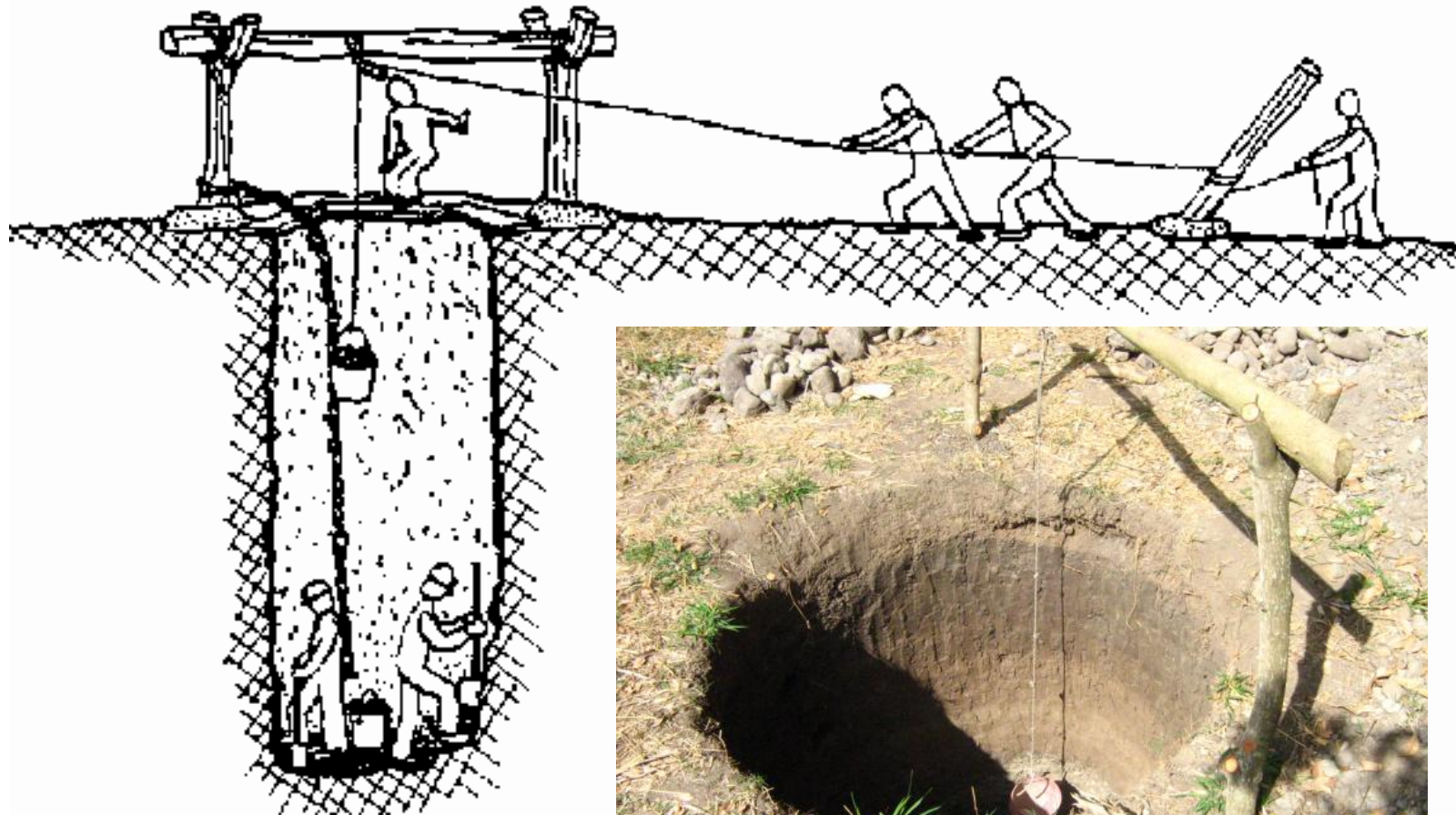
Start of the Anthropocene

- First: Tapping from nature

Scoop Hole

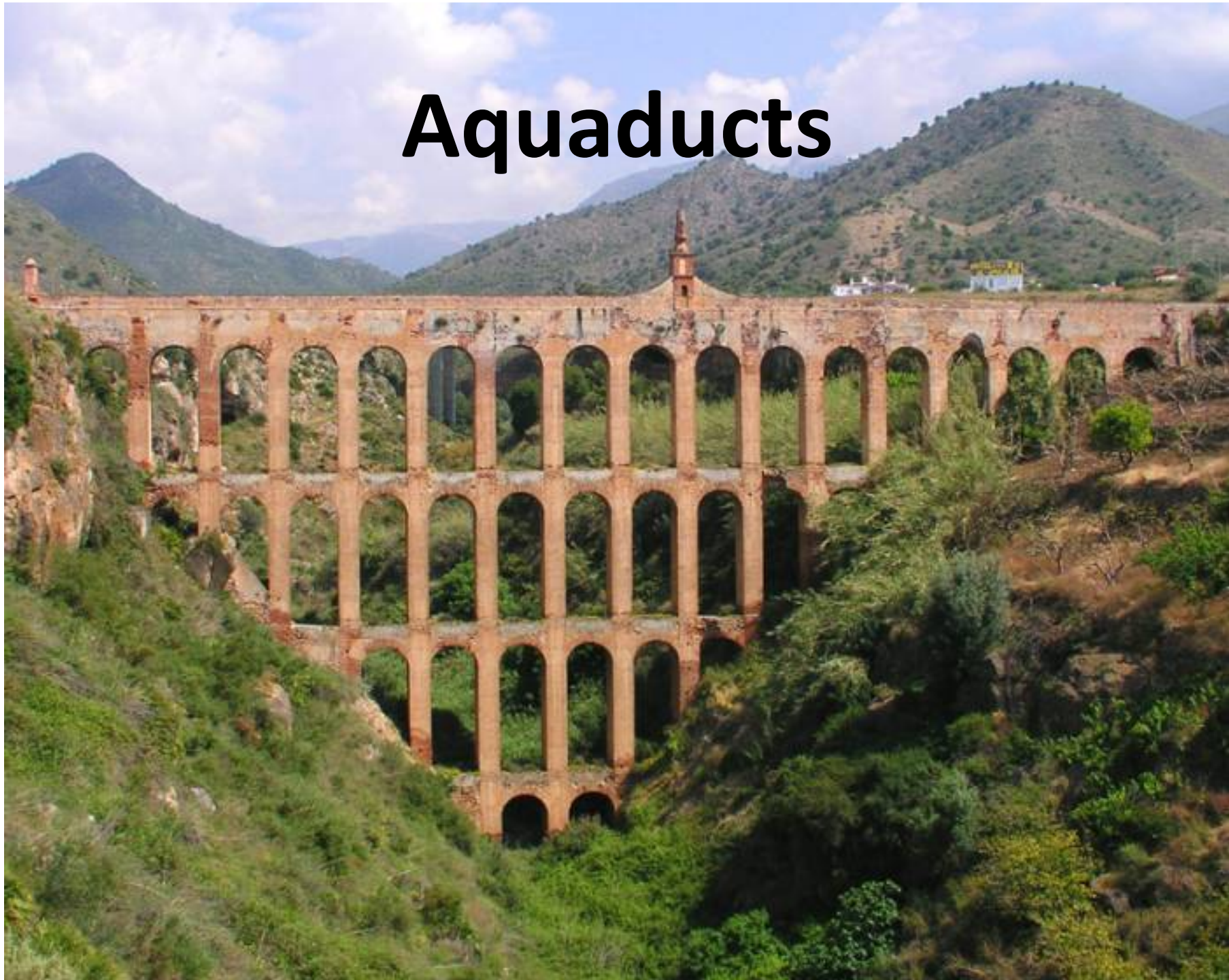


Hand dug well





Aqueducts



Start of the Anthropocene

- **Firsts: Tapping from nature**
 - 9500-7000 BC dug well in Cyprus (Fagan, 2011)
- **Second: Building reservoirs**
 - Around 3000 BC in the Middle East

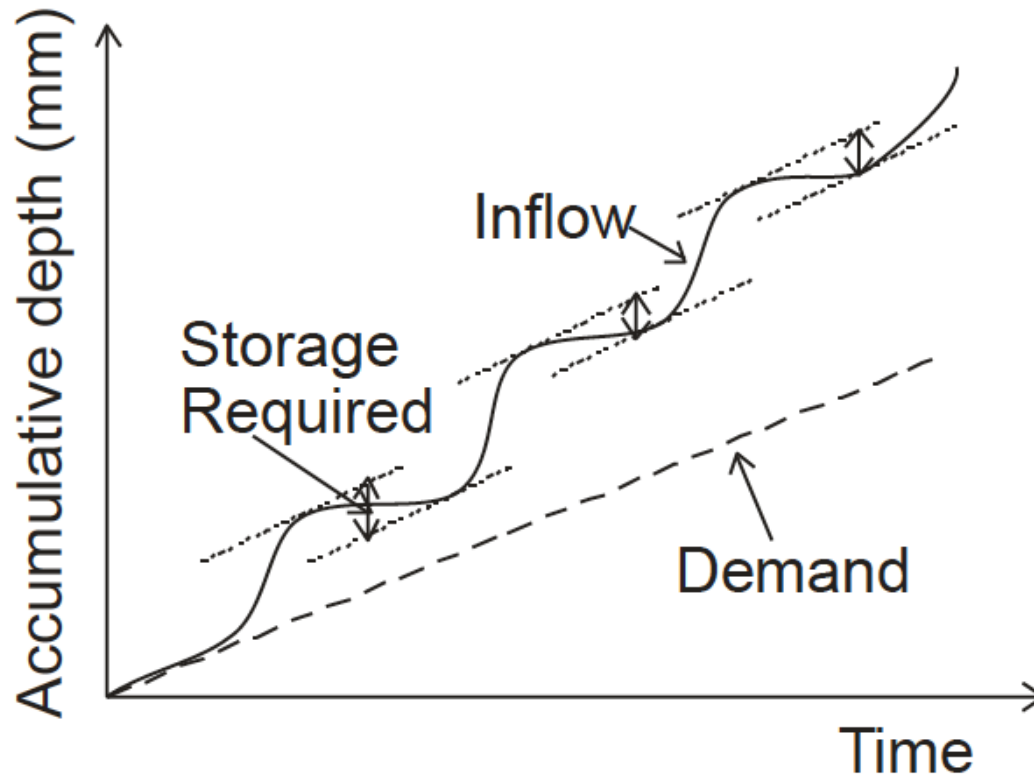
Dams in the Anthropocene



Marib dam
Yemen

Dam design

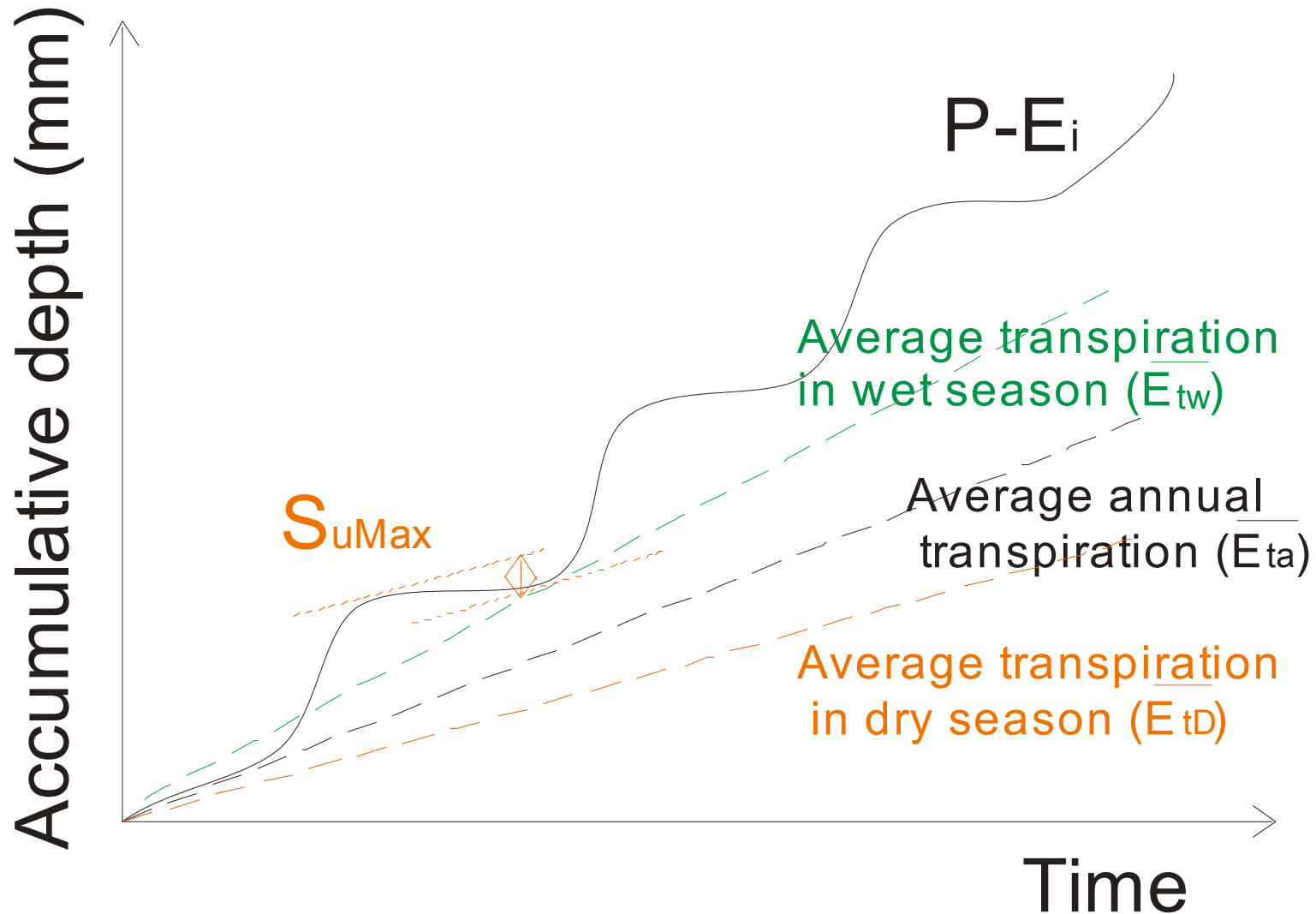
- Mass Curve Technique (Rippl, 1883)



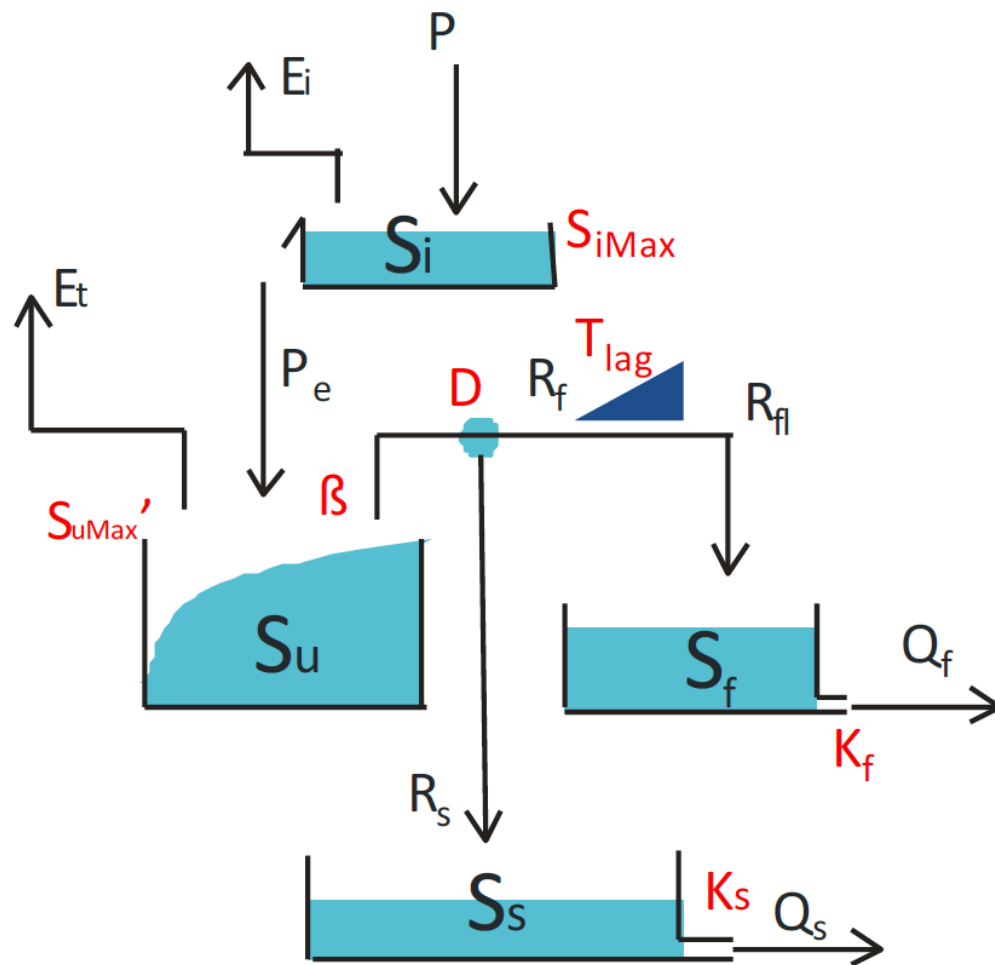
Are People Unique

In designing their storage this way?

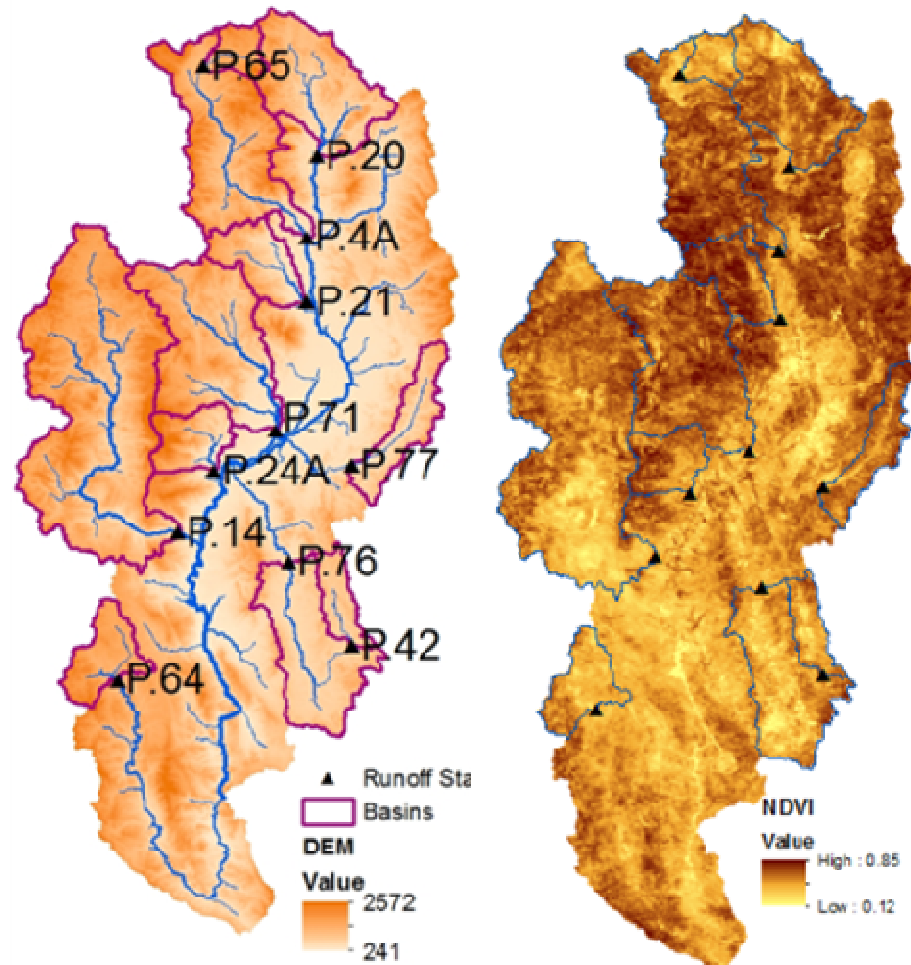
Root storage design



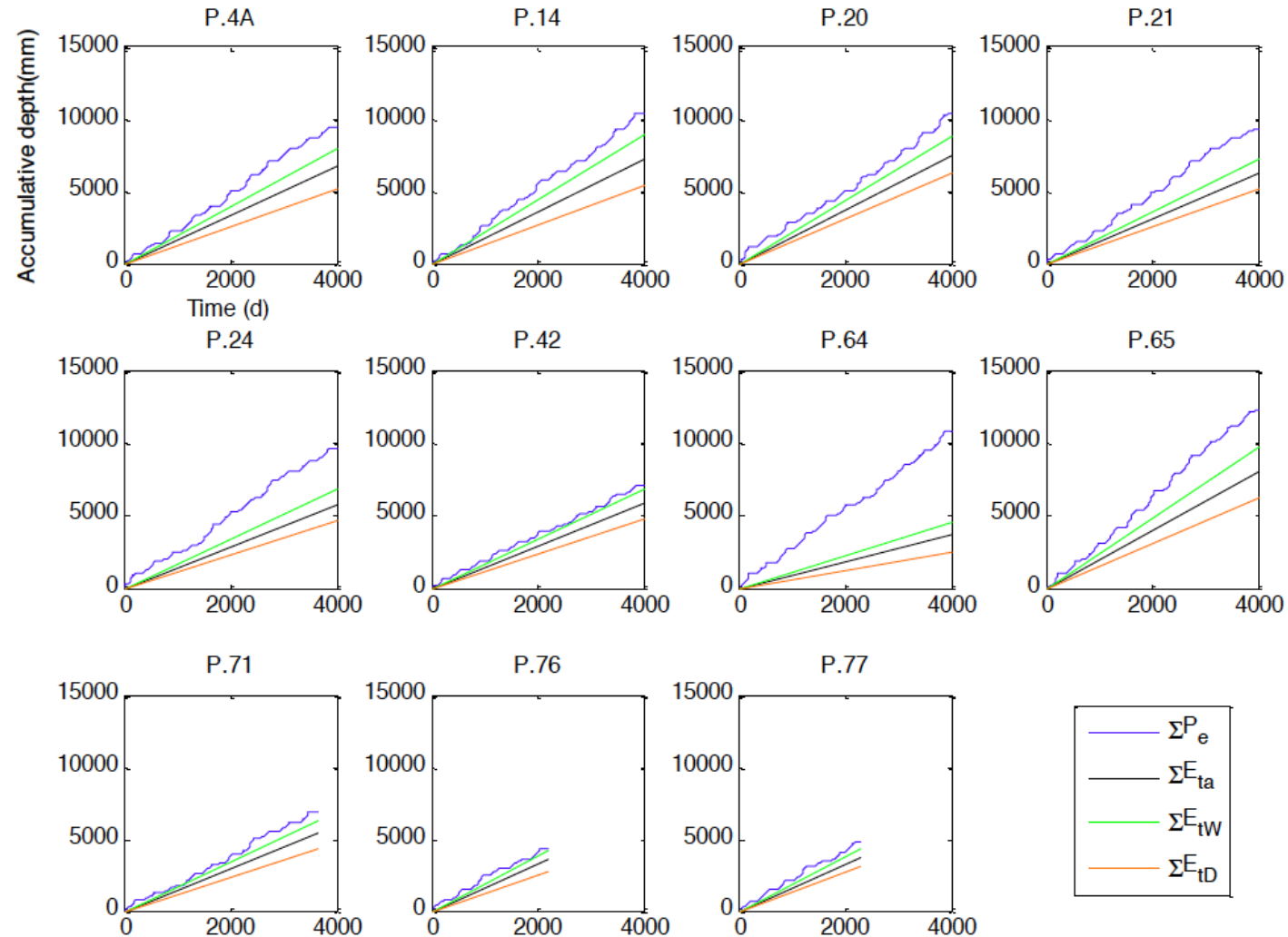
Root storage in Models



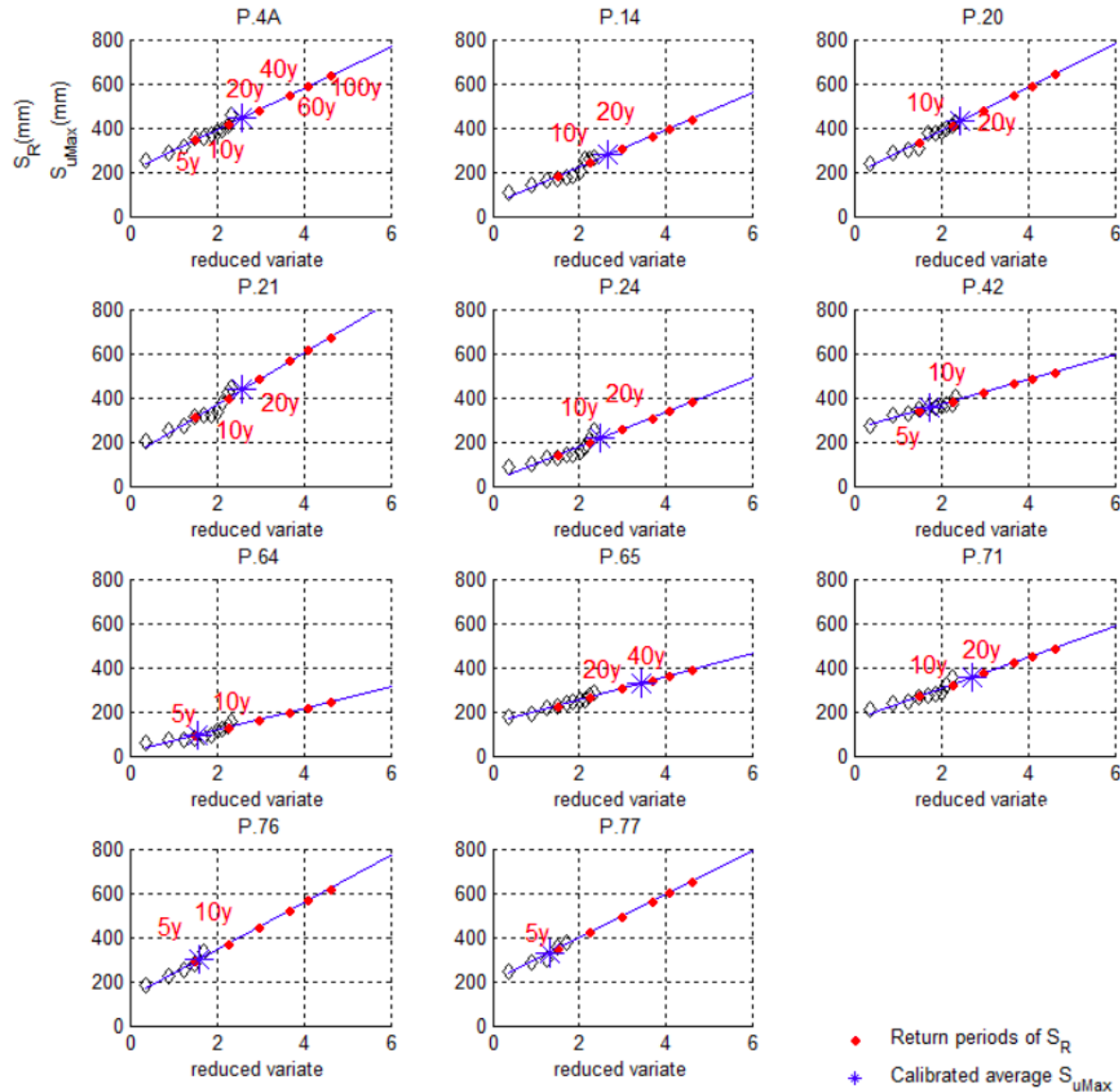
Upper Ping, Thailand



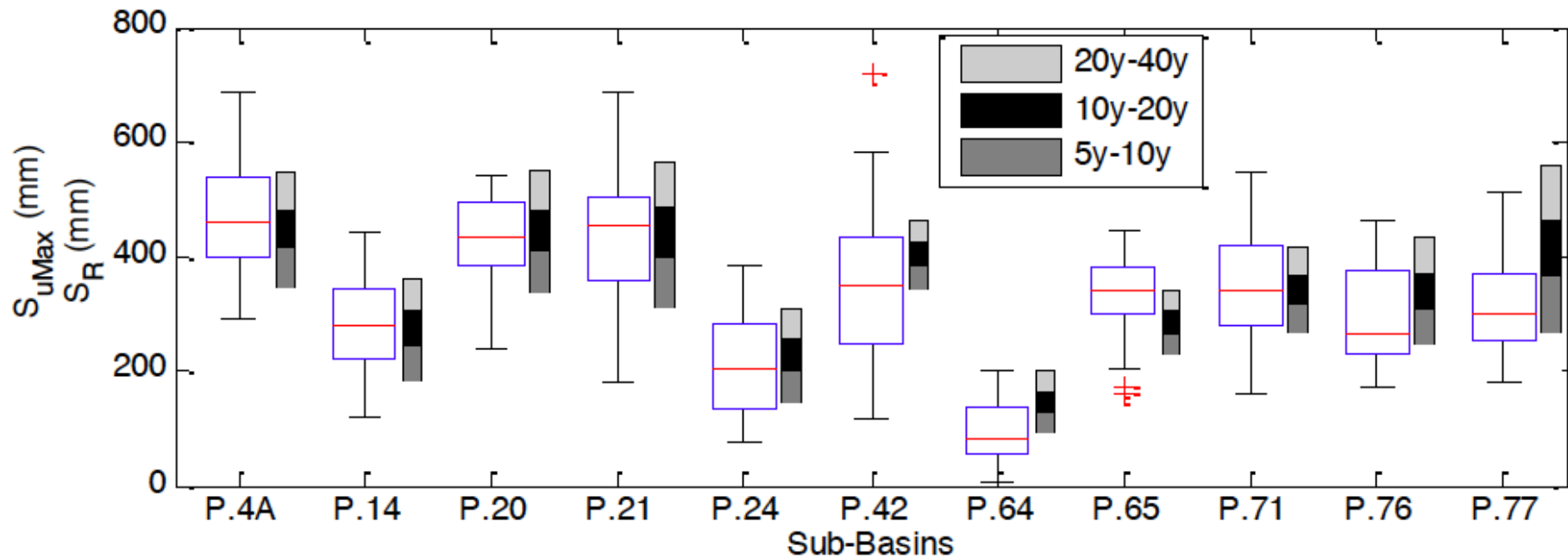
11 sub-catchments



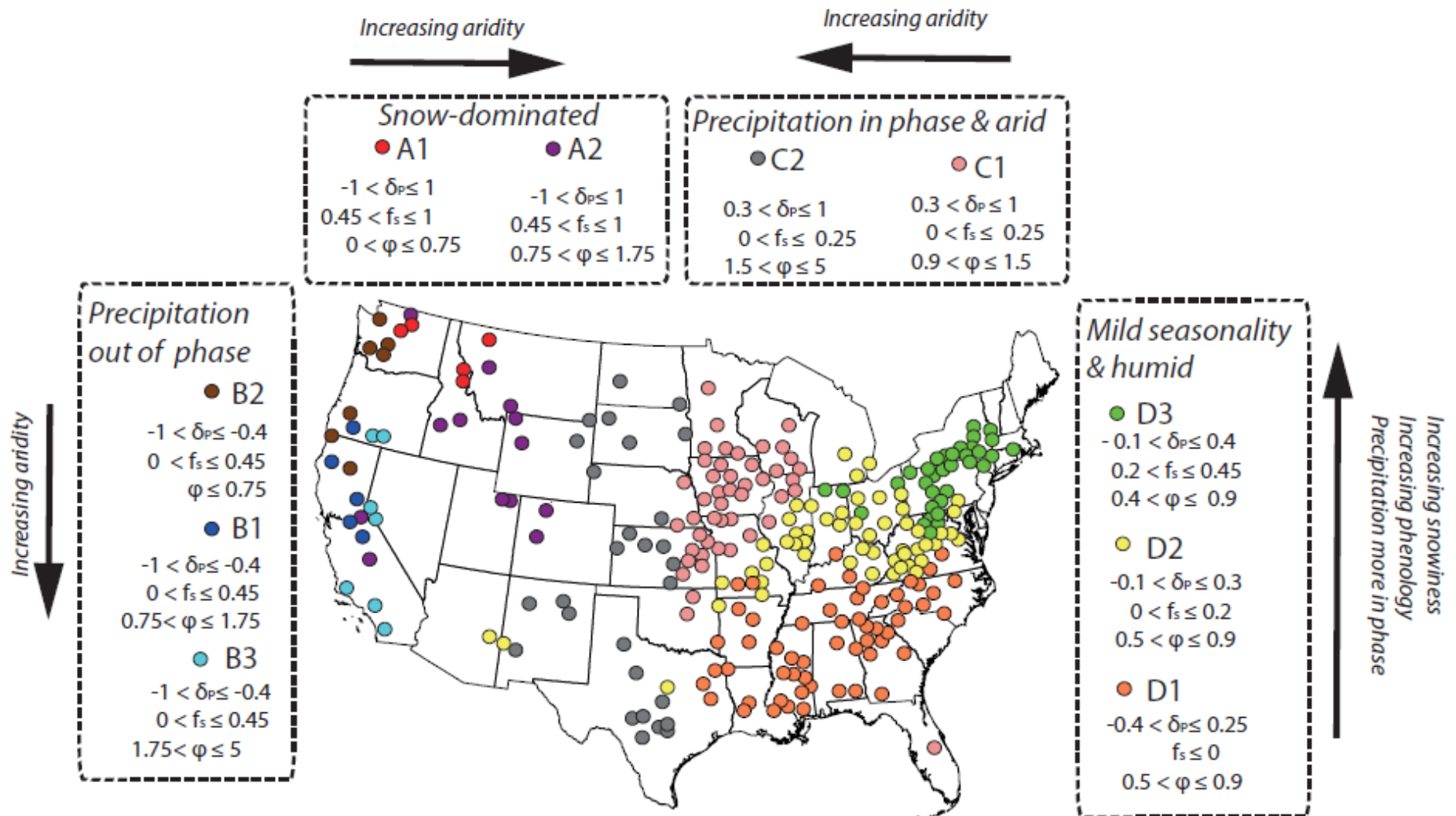
Gumbel extremes



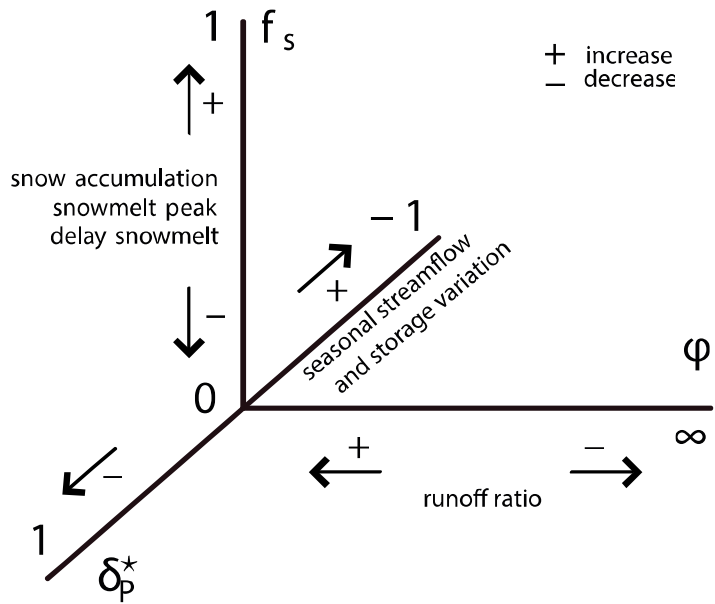
Comparing design storage with calibrated storage



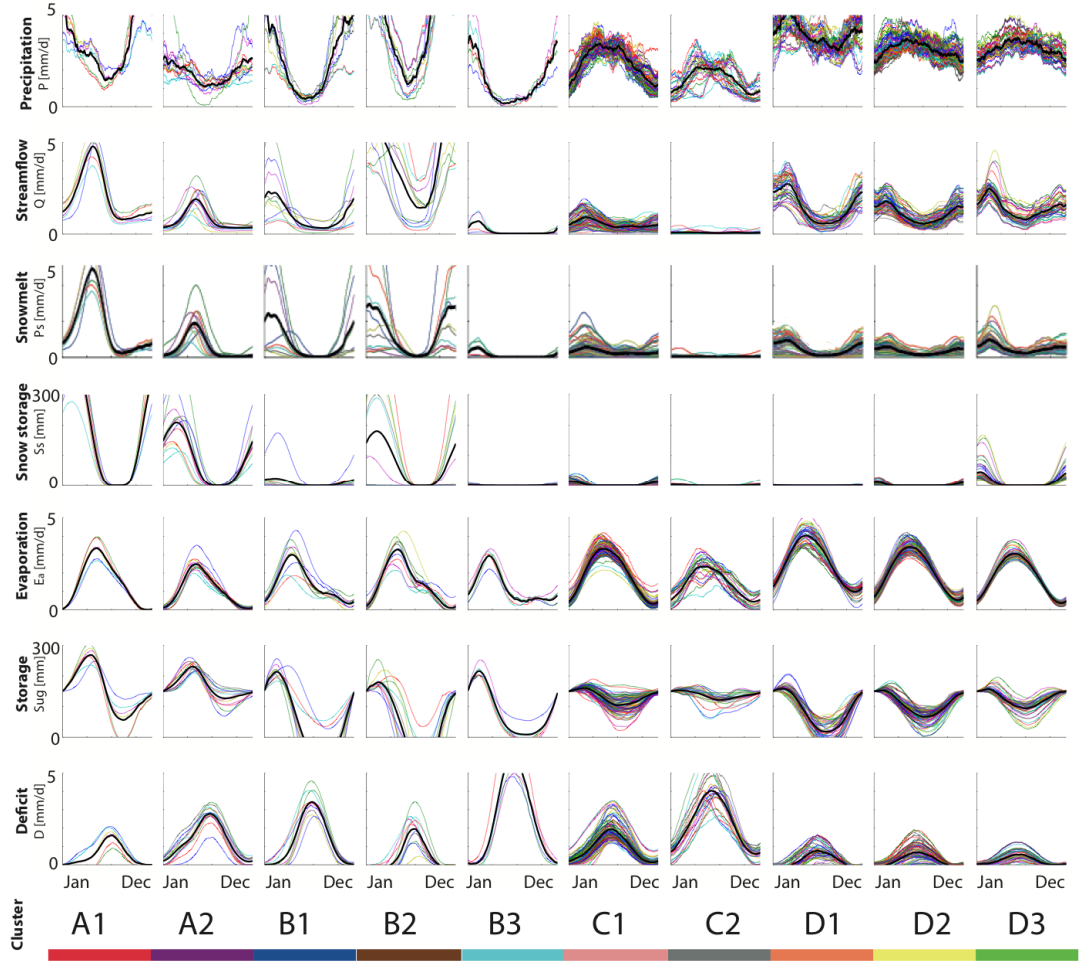
Validation in Mopex Data Set



Classification

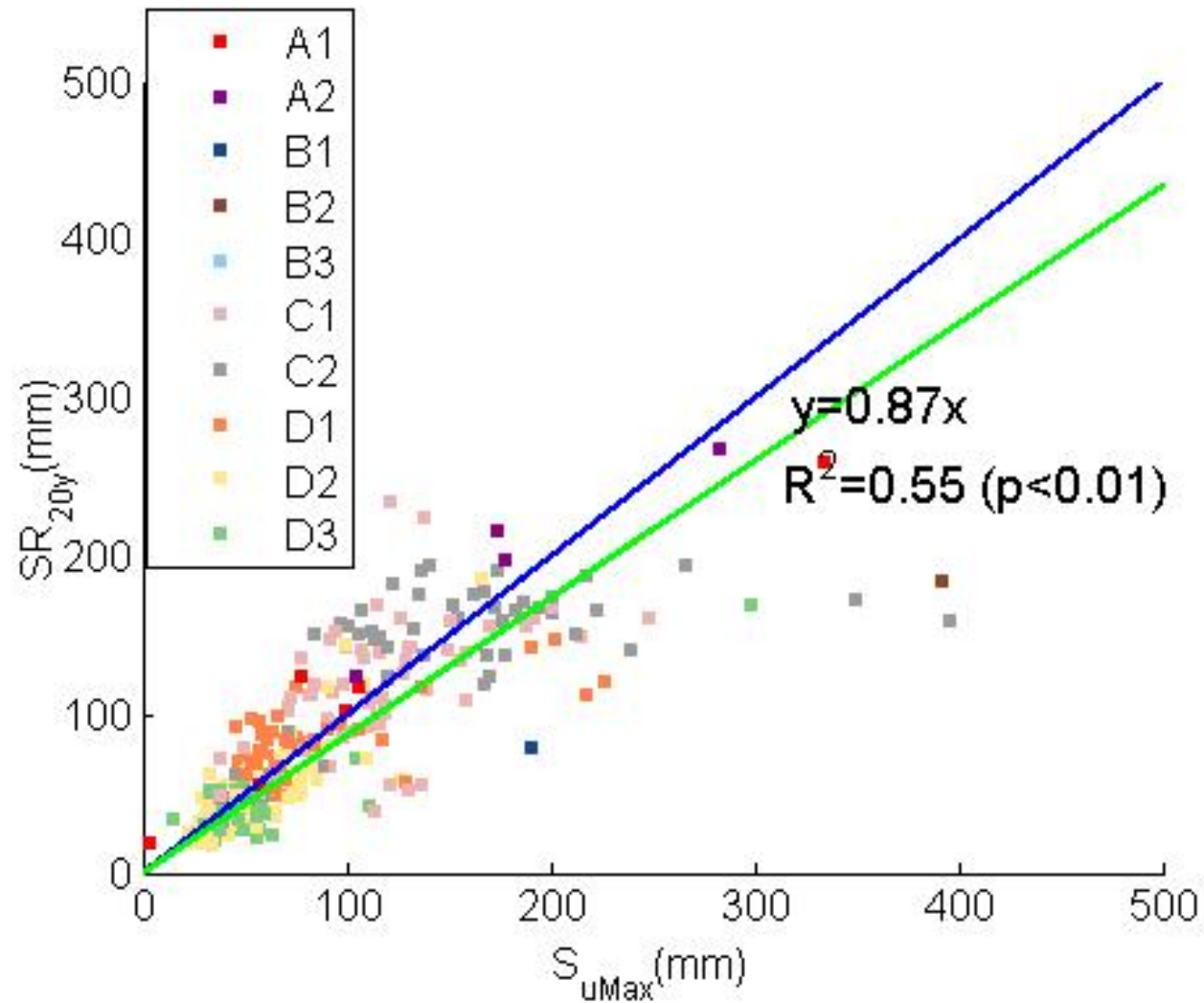


1. Seasonality
2. Aridity
3. Snowiness

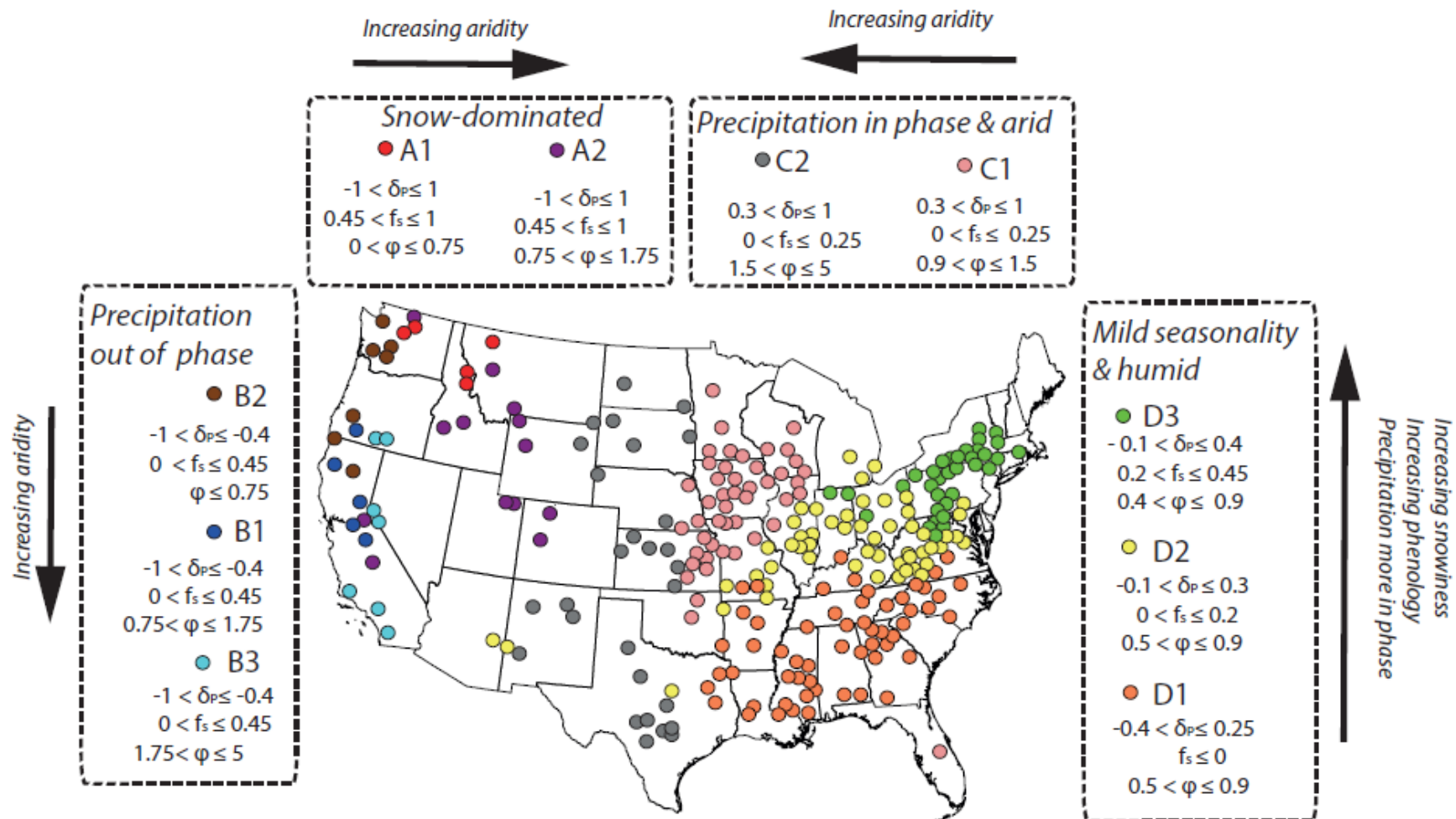


Berghuijs et al., 2014, WRR (under review)

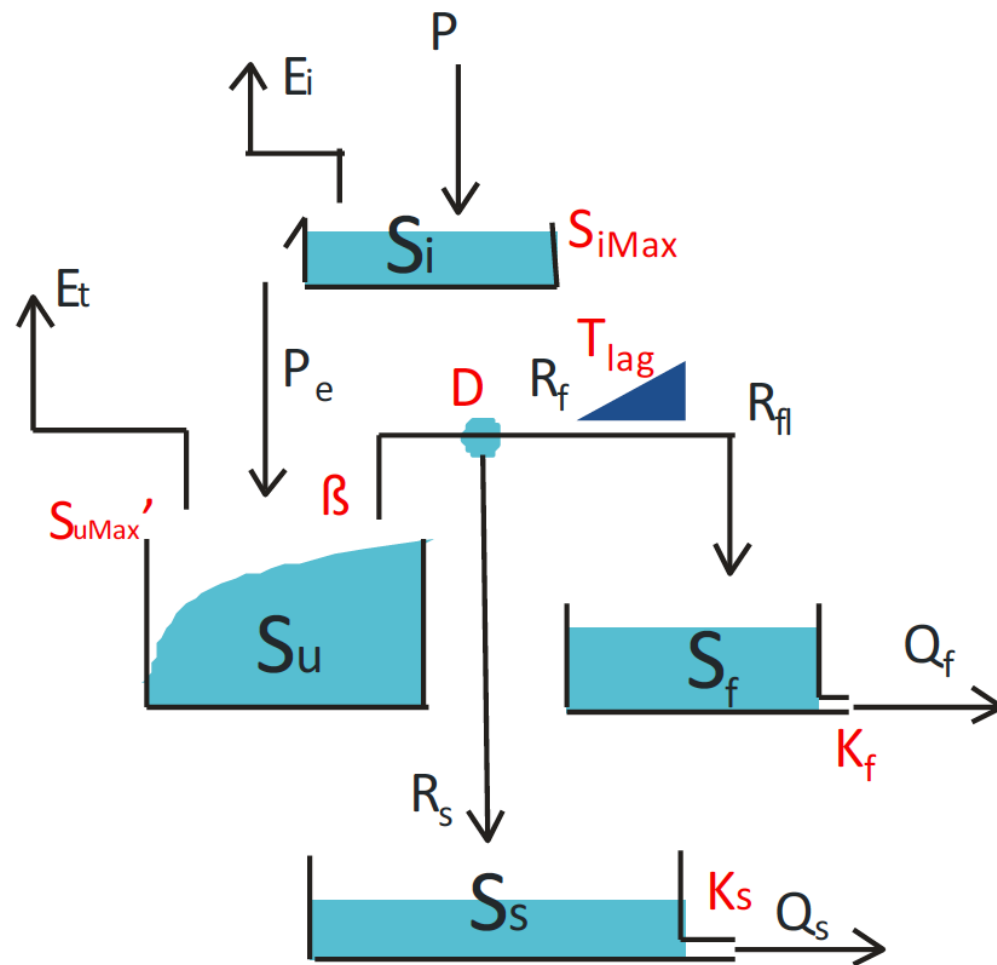
20 year memory comparison



Outliers in C2 (arid areas)



Models are alive !



**Root zone storage is the
result of
co-evolution**

**Root zone storage is
essentially the result of
an ecosystem
interacting with the
climate**