PREDICTING THE UNGAUGED BASIN
MODEL VALIDATION AND REALISM ASSESSMENT

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Q1: DO UNGAUGED BASINS *REALLY* EXIST?

The motivation of this study is the few available case studies are available that demonstrate how one can apply all the knowledge from the PUB decade to a "truly" ungauged basin.

Thanks to remote sensing, almost no place on the globe is truly ungauged. However, a lack of in-situ data makes it difficult to value these new data sources. Also, conventional calibration-validation methods cannot always be applied.

Variable	Source	Uncertainty
Catchment area	USGS 90 x 90m DEM	5%
Precipitation	NASA/JAXA TRMM 3B-42	7%
Landuse classification	MODIS 8-day composites	7%
NDVI	MODIS 8-day composites	7%
Evaporation		
Reference	Penman-Monteith	15%
Transpiration	Ref. evaporation and landuse transpiration coefficients	17%
Open water	Ref. evaporation and open water coefficient	15%
Interception + Soil evaporation	Fixed value from literature	50%

Table 1: *Overview of used data products in our ungauged basin modeling exercise.*

Q2: HOW DO YOU MODEL AN UNGAUGED BASIN?

1. DETERMINE YOUR GOAL

2. TRY TO MODEL IN A "SMART" WAY

EXAMPLE:
We coupled a FLEX-Topo rainfall-runoff model to an irrigation reservoir water depth model. In our case, additional information about the reservoir water depth was available.

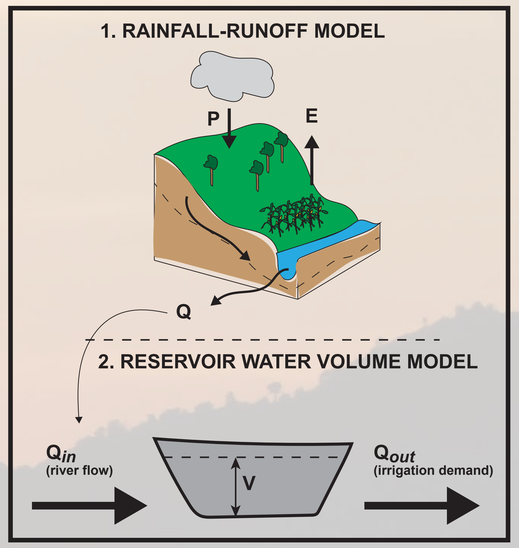


Fig. 1: *Schematization of our modeling approach*

Q3: DO YOU GET ANY INTERESTING RESULTS?

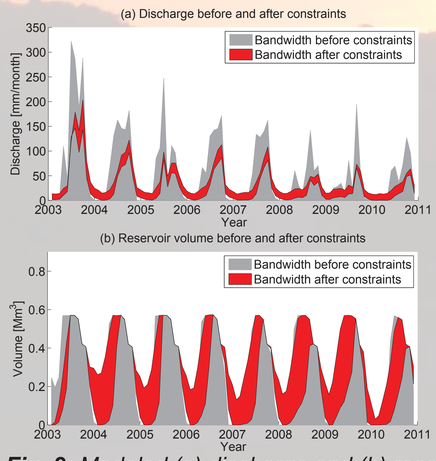


Fig. 2: *Modeled (a) discharge and (b) reservoir volume, before (gry) and after applying model parameter constraints (red).*

In ungauged basins, a lack of data will complicate conventional calibratino of your mode. Using additional and innovative data sources, one can try to contrain the model parameters.

EXAMPLE:
1. Using actual evaporation estimates derived from MODIS

2. Using the Mass Curve Technique (MCT), to constrain the maximum storage capacity of the unsaturated zone in the hillslope and wetland area.

3. Based on interviews we assumed that streamflow only occurred in the wet season (April - September), and that total streamflow should drop to 0 mm/month in the dry season.

Q4: HOW DO YOU CHECK WHETHER IT ALL MAKES SENSE?

This might be the most important question in the world of ungauged basins. Because how does one assess the realism of one's predictions when no data is available?

We used "soft data", from targeted fieldwork and interviews to check the realism of our model. We found that:

1. Modeled reservoir volume in the dry season corresponded to reality.

2. Topographical classification in wetlands and hillslope matched reality.

3. Relative magnitude of the variations of the unsaturated zones in the wetland and hillslope matched reality.

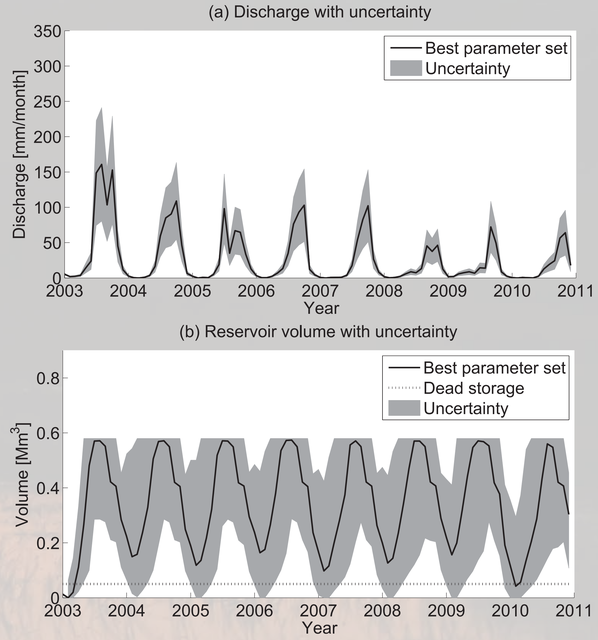
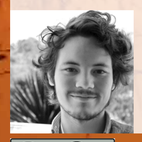


Fig. 3: *Final modeled (a) discharge and (b) reservoir volume, including estimated uncertainty.*

van Emmerik, T., Mulder, G., Eilander, D., Piet, M. and Savenije, H.:
Predicting the ungauged basin: model validation and realism assessment.
Front. Earth Sci. 3:62. [doi: 10.3389/feart.2015.00062], 2015.



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