



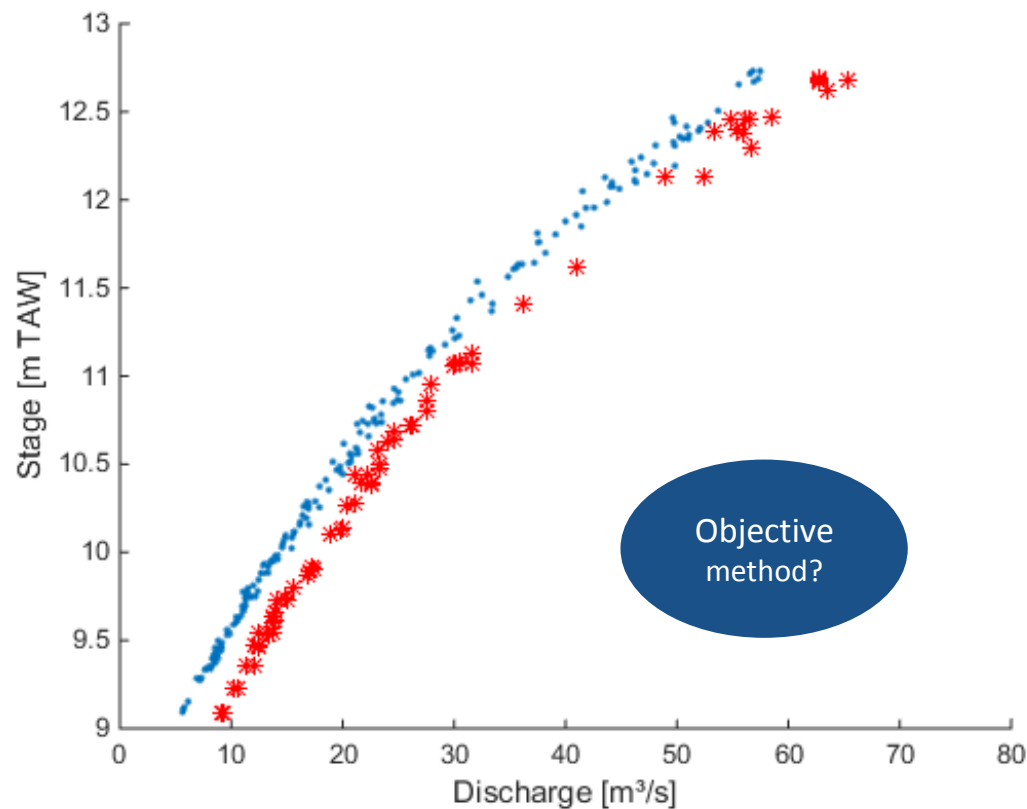
## → MEASUREMENTS AND OBSERVATIONS IN THE 21st CENTURY CONFERENCE

# Temporal consistency assessment in rating curve data using Bidirectional Reach (BReach)

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# Temporal consistency in rating curve data





# Bidirectional Reach (BReach)

1. Chronologically sorted h-Q data (index)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
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1. Parameter set ↗

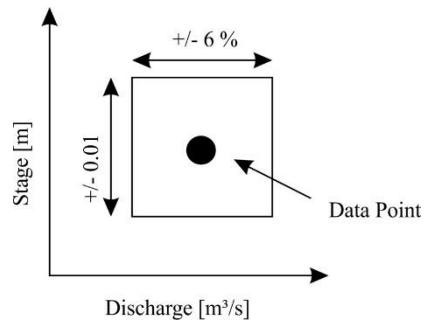
Rating curve model:  $Q \cong c(h - h_0)^n$

# Bidirectional Reach (BReach)

## 1. Chronologically sorted h-Q data (index)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
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1. Parameter set ↗



2.  
Satisfactory  
model  
behavior

**acceptable results:** within 95 % uncertainty bounds

**degree of tolerance:** allowed % of nonacceptable results

# Bidirectional Reach (BReach)

1. Chronologically sorted h-Q data (index)



1. Parameter set ↗

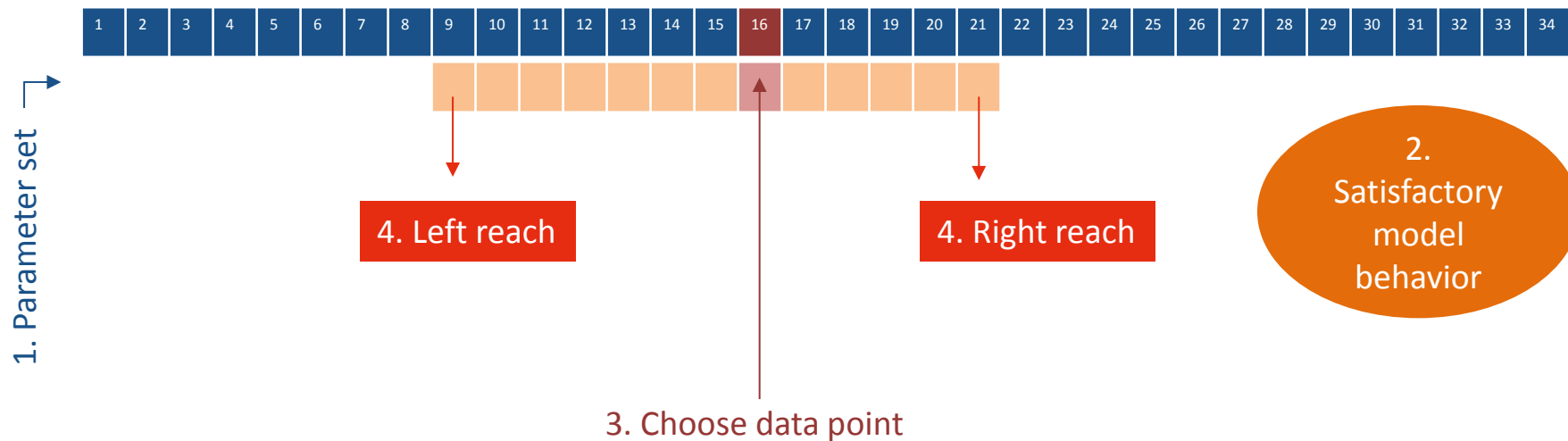
2.  
Satisfactory  
model  
behavior

3. Choose data point



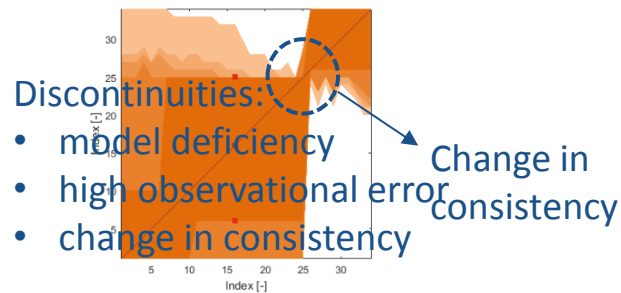
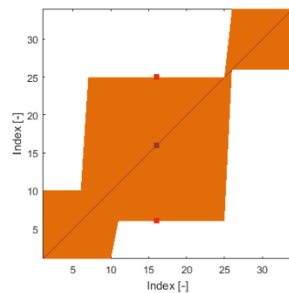
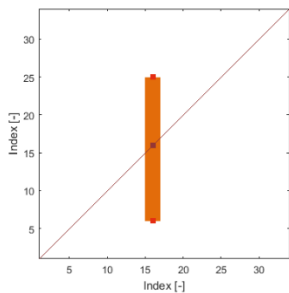
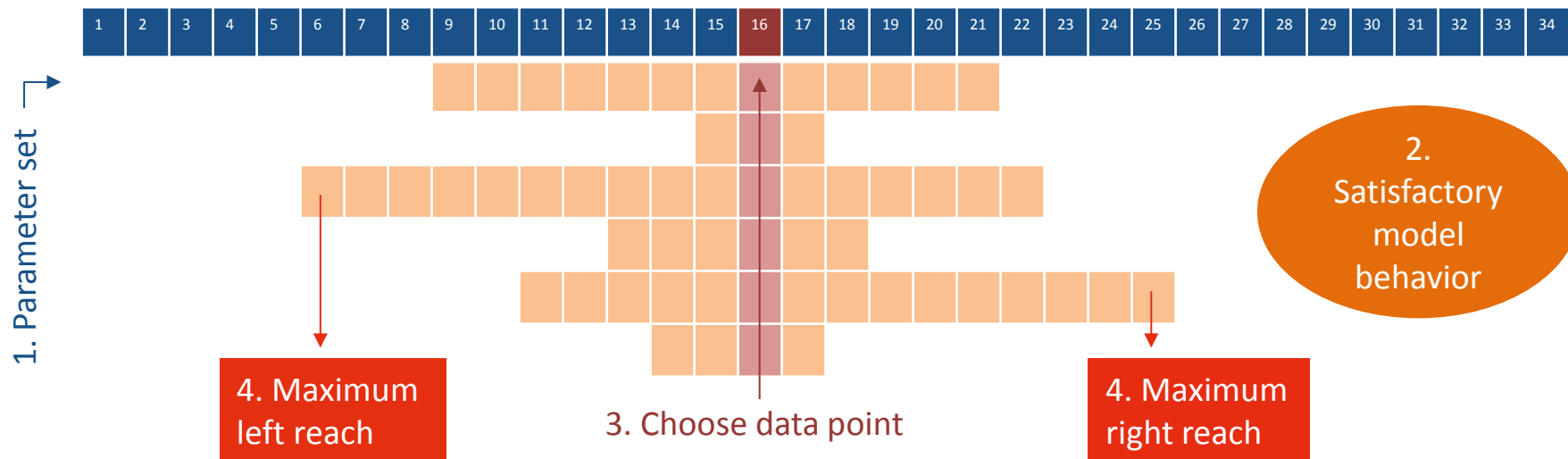
# Bidirectional Reach (BReach)

1. Chronologically sorted h-Q data (index)



# Bidirectional Reach (BReach)

1. Chronologically sorted h-Q data (index)



# Bidirectional Reach (BReach)

## Methodology

- description
- validation:
  - measurements
  - synthetic data



## Water Resources Research

### RESEARCH ARTICLE

10.1002/2016WR018692

#### Key Points:

- A methodology is developed to identify (in)consistency in rating curve data
- The methodology is successfully validated with both measured and synthetic data series
- For all validation cases, the methodology turns out robust, showing little dependency of decisions

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## Identification of temporal consistency in rating curve data: Bidirectional Reach (BReach)

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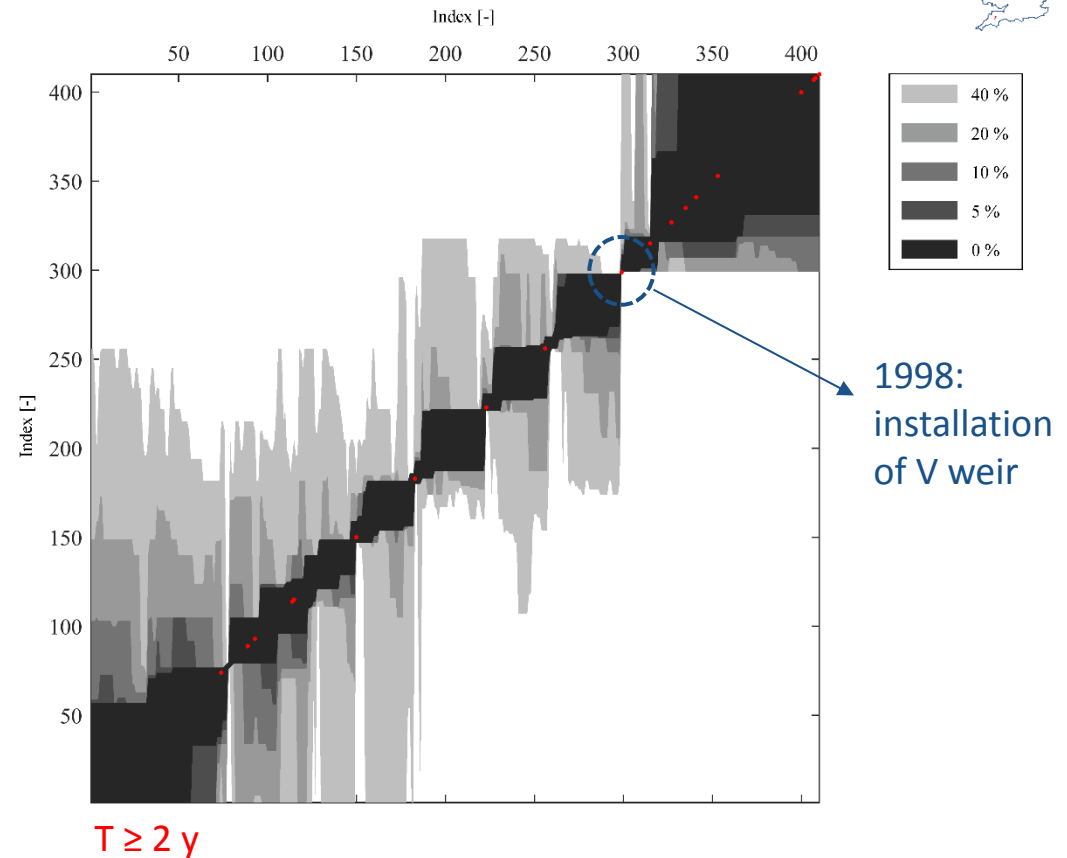
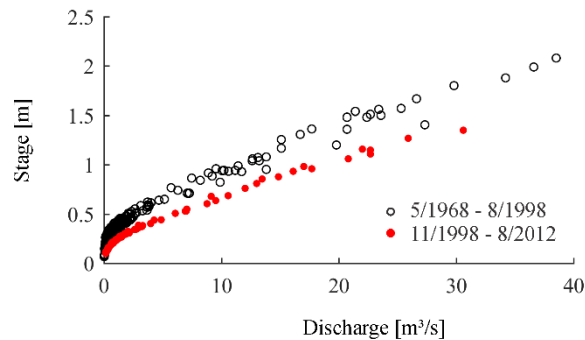
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**Abstract** In this paper, a methodology is developed to identify consistency of rating curve data based on a quality analysis of model results. This methodology, called Bidirectional Reach (BReach), evaluates results of a rating curve model with randomly sampled parameter sets in each observation. The combination of a parameter set and an observation is classified as nonacceptable if the deviation between the accompanying model result and the measurement exceeds observational uncertainty. Based on this classification, conditions for satisfactory behavior of a model in a sequence of observations are defined. Subsequently, a parameter set is evaluated in a data point by assessing the span for which it behaves satisfactory in the direction of the previous (or following) chronologically sorted observations. This is repeated for all sampled parameter sets and results are aggregated by indicating the endpoint of the largest span, called the maximum left (right) reach. This temporal reach should not be confused with a spatial reach (indicating a part of a river). The same procedure is followed for each data point and for different definitions of satisfactory behavior. Results of this analysis enable the detection of changes in data consistency. The methodology is validated with observed data and various synthetic stage-discharge data sets and proves to be a robust technique to investigate temporal consistency of rating curve data. It provides satisfying results despite of low data availability, errors in the estimated observational uncertainty, and a rating curve model that is known to cover only a limited part of the observations.



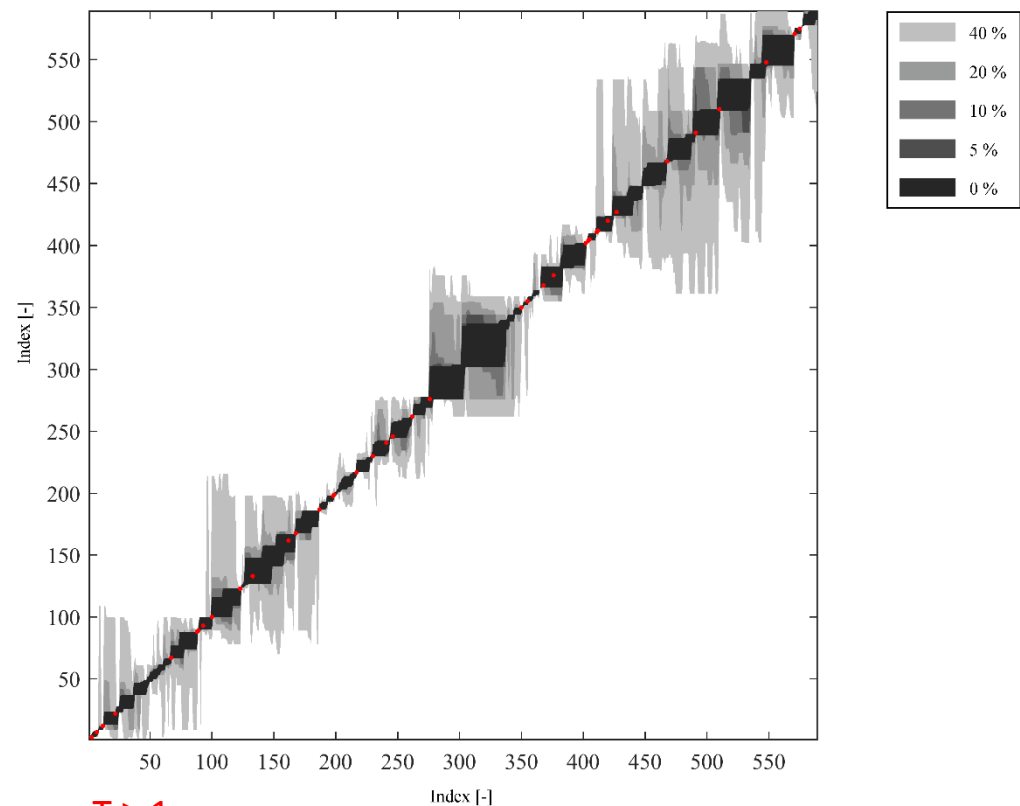
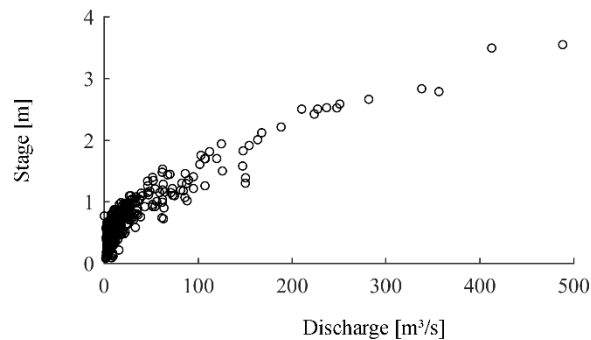
# BReach applied in the UK

## River Taw at Taw Bridge



# BReach applied in New Zealand

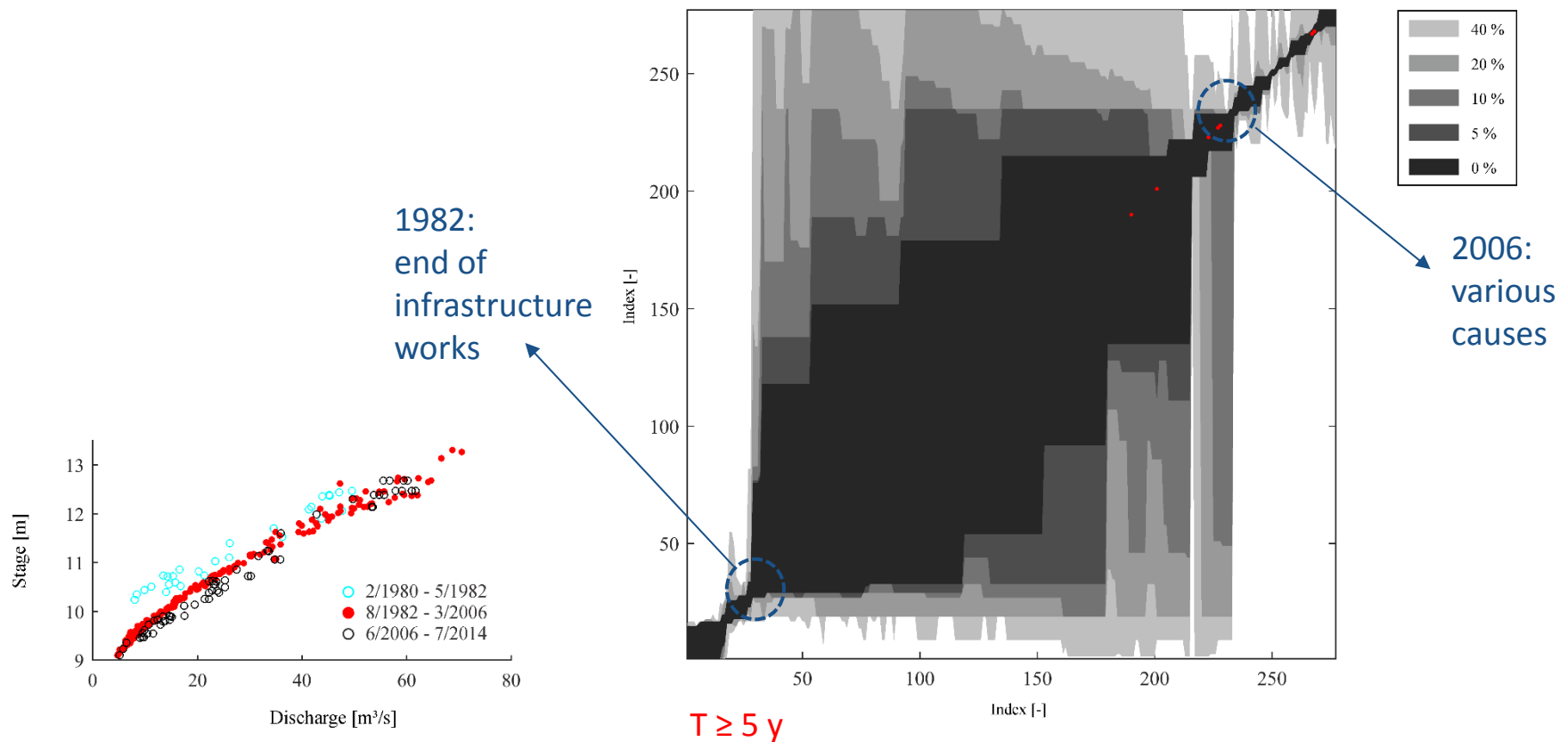
## River Pohangina at Mais



$T \geq 1 \text{ y}$

# BReach applied in Belgium

## River Demer at Aarschot

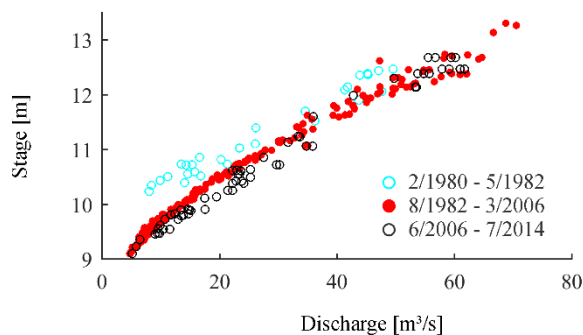




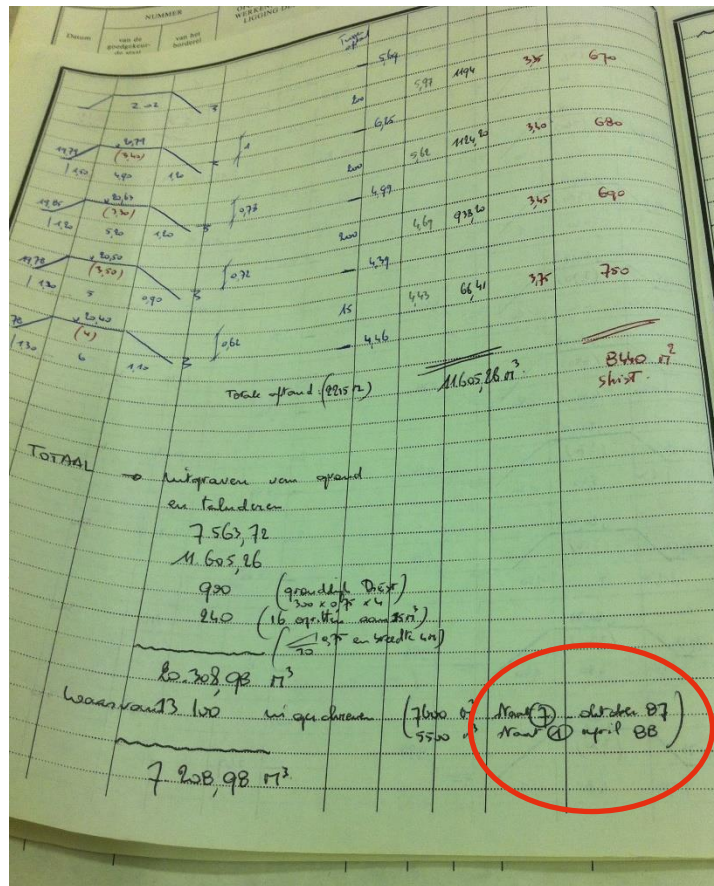
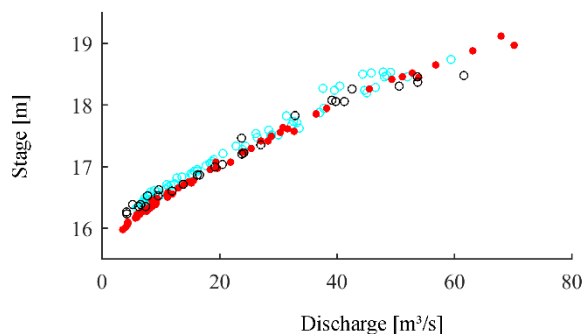
# BReach applied in Belgium



## River Demer at Aarschot



## River Demer at Zichem



# Conclusions

Bidirectional Reach (**BReach**) methodology :

- **(in)consistency** in rating curve data
- **robust** methodology
- **validated** with synthetic and measured data

**Preliminary analysis!**