

Applying tree-ring reconstructions in Reclamation water management models

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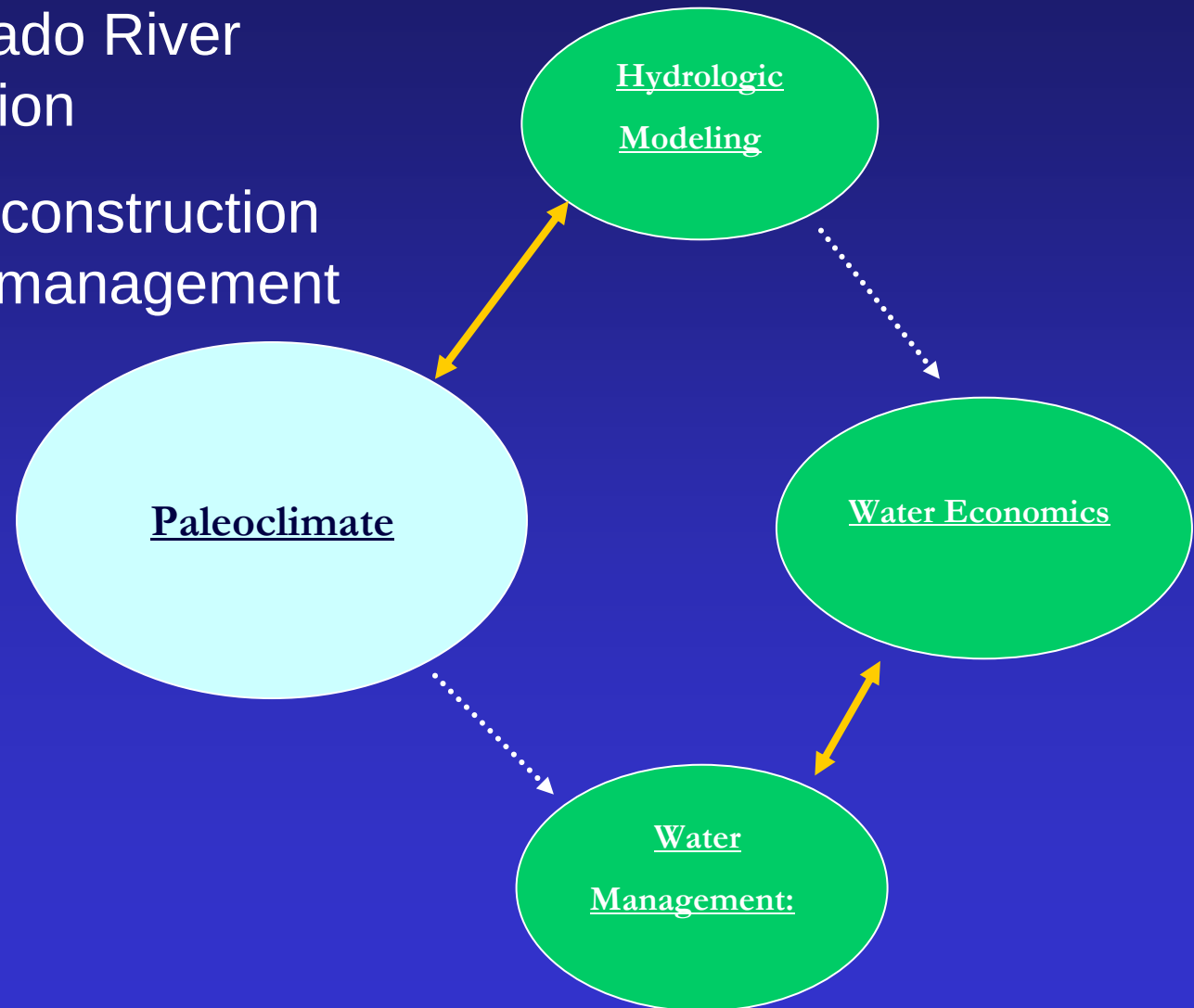
Tree-ring reconstructions of streamflow and climate and their
application to Colorado River Basin water management

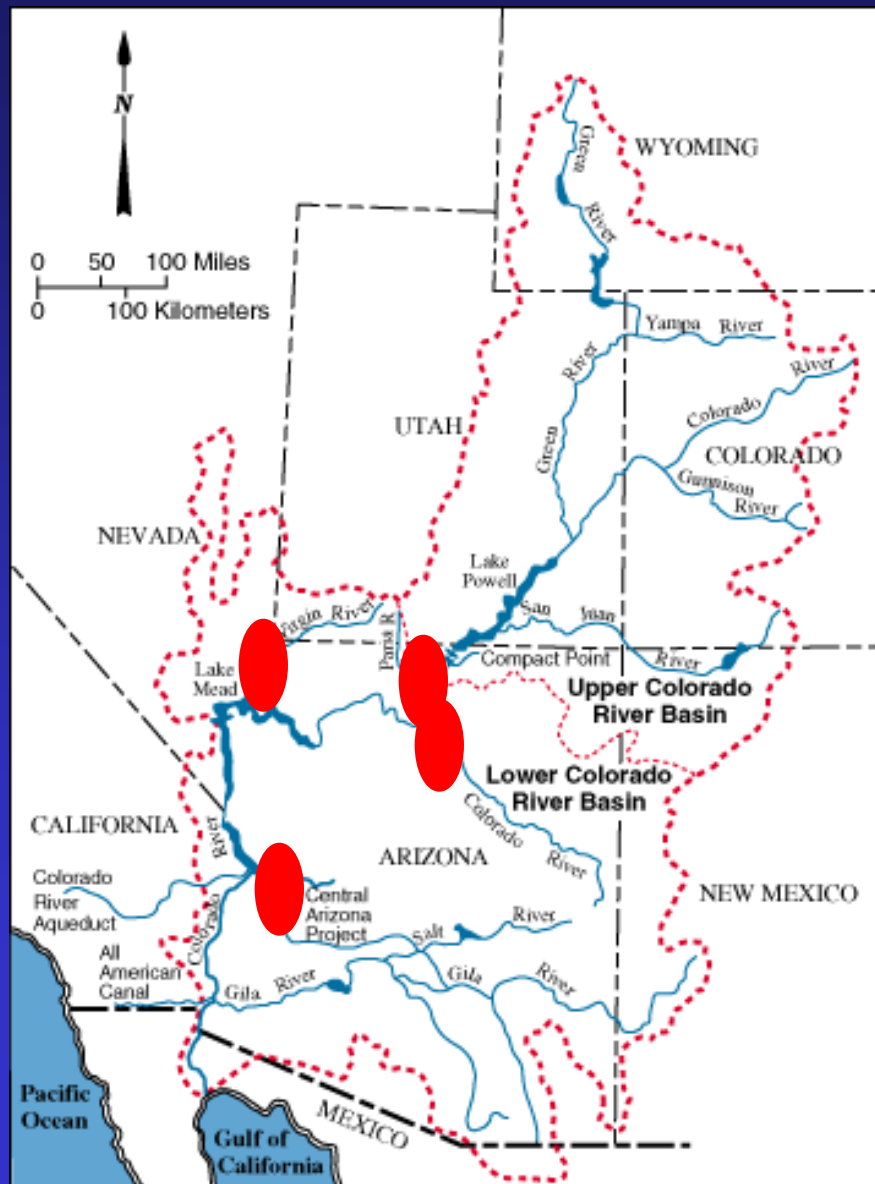
November 13, 2008

Bureau of Reclamation
Boulder City, Nevada

Reconstruction→Management

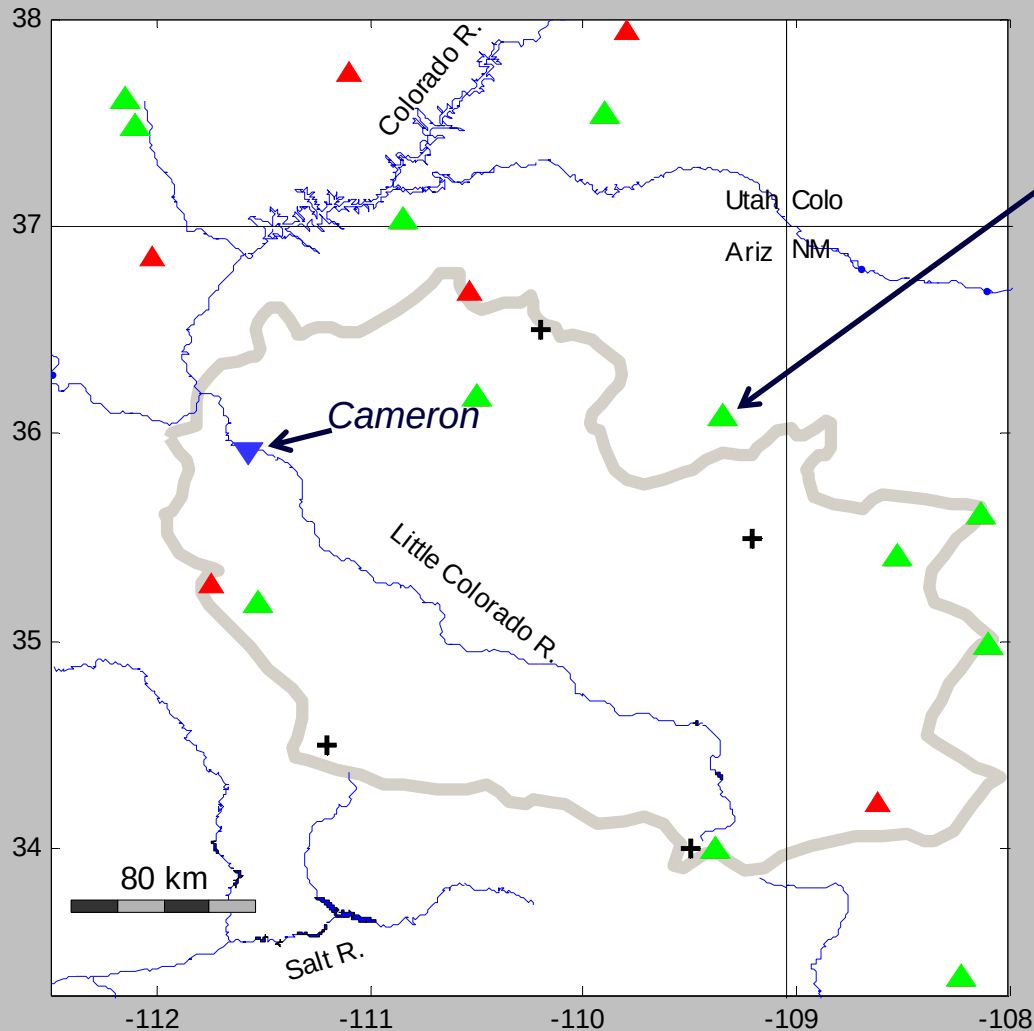
1. Little Colorado River reconstruction
2. Tailoring reconstruction as input to management model





Little Colorado:
One of 4 tributaries
relevant to model

Basin and Data



Tree-ring sites

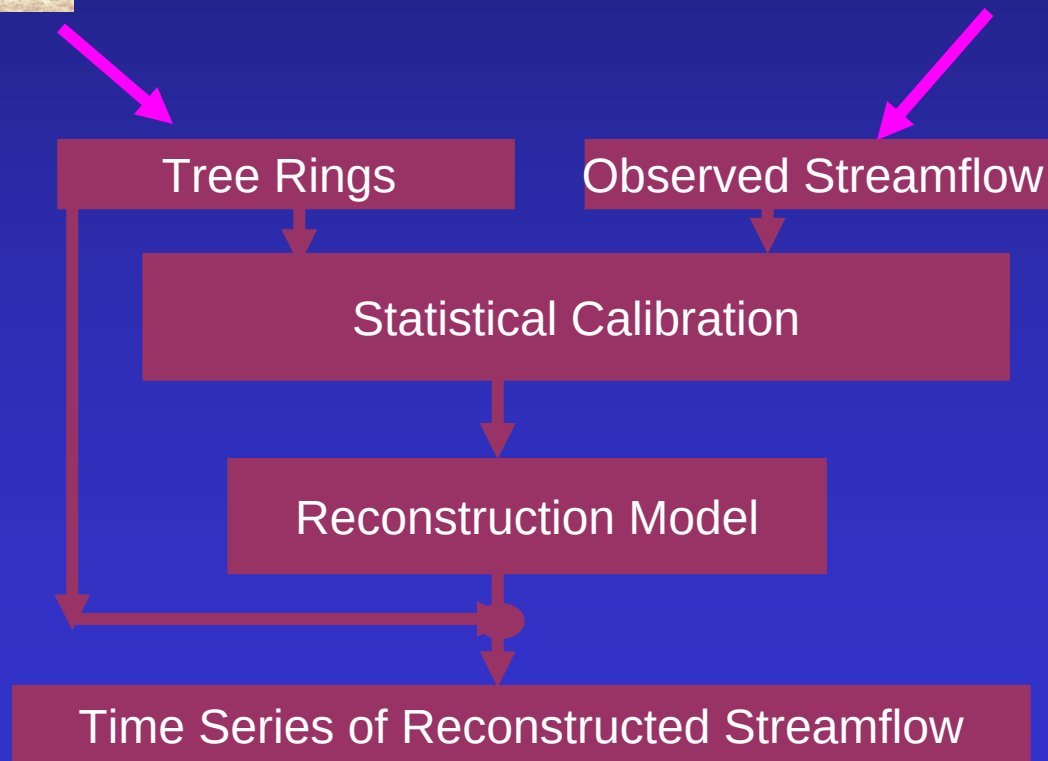
Accepted = green (13)

Rejected = Red (6)

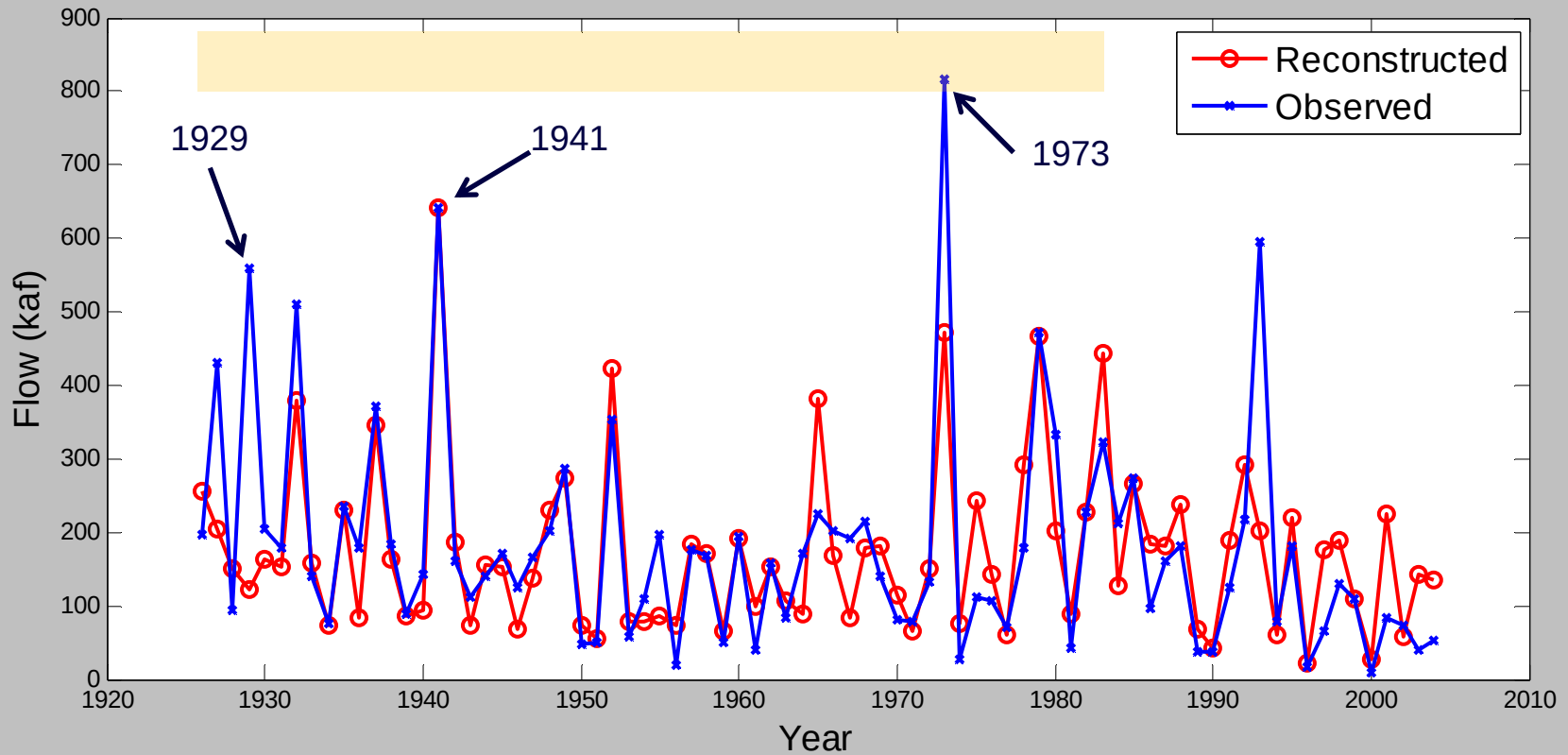
2005



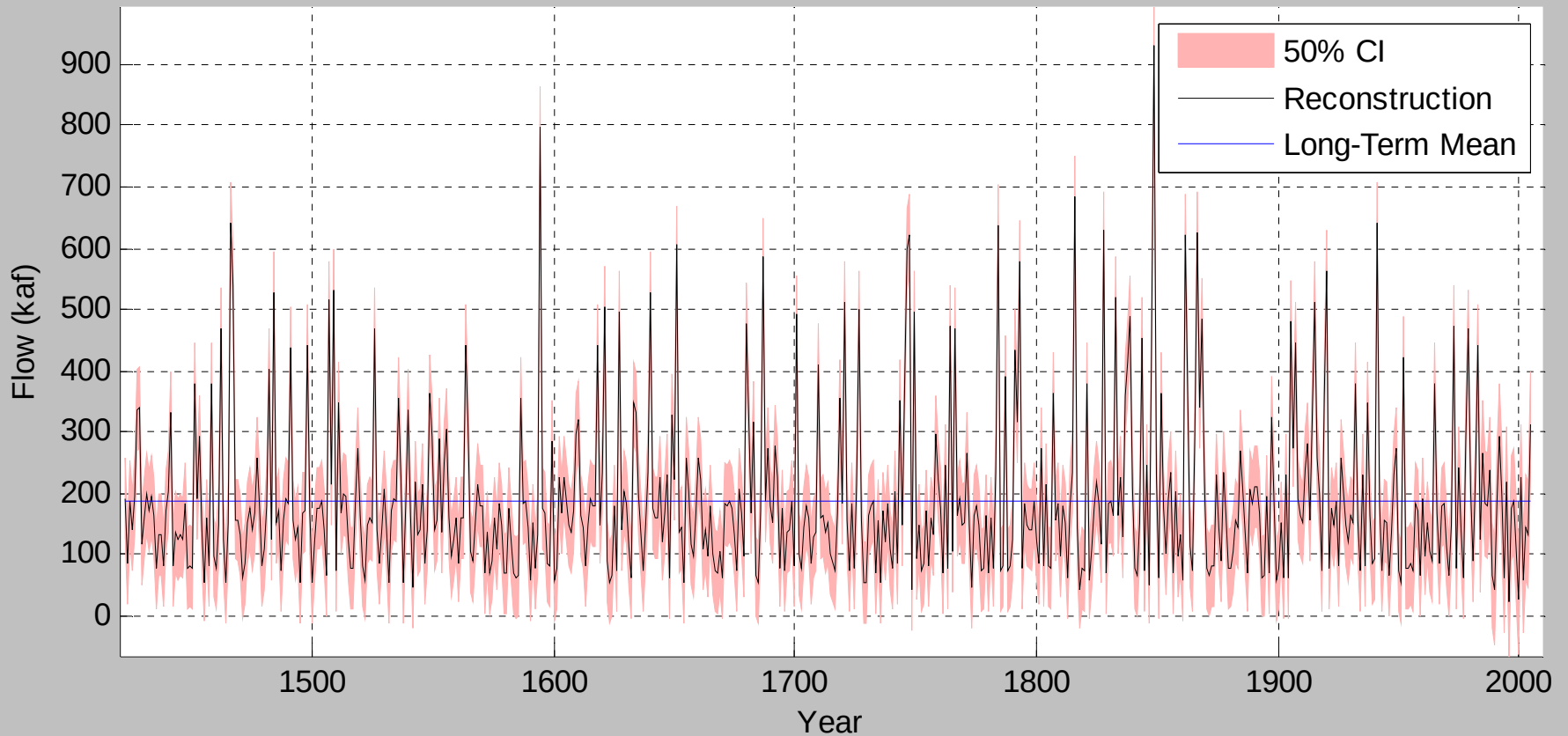
Tree-Ring Reconstruction Modeling



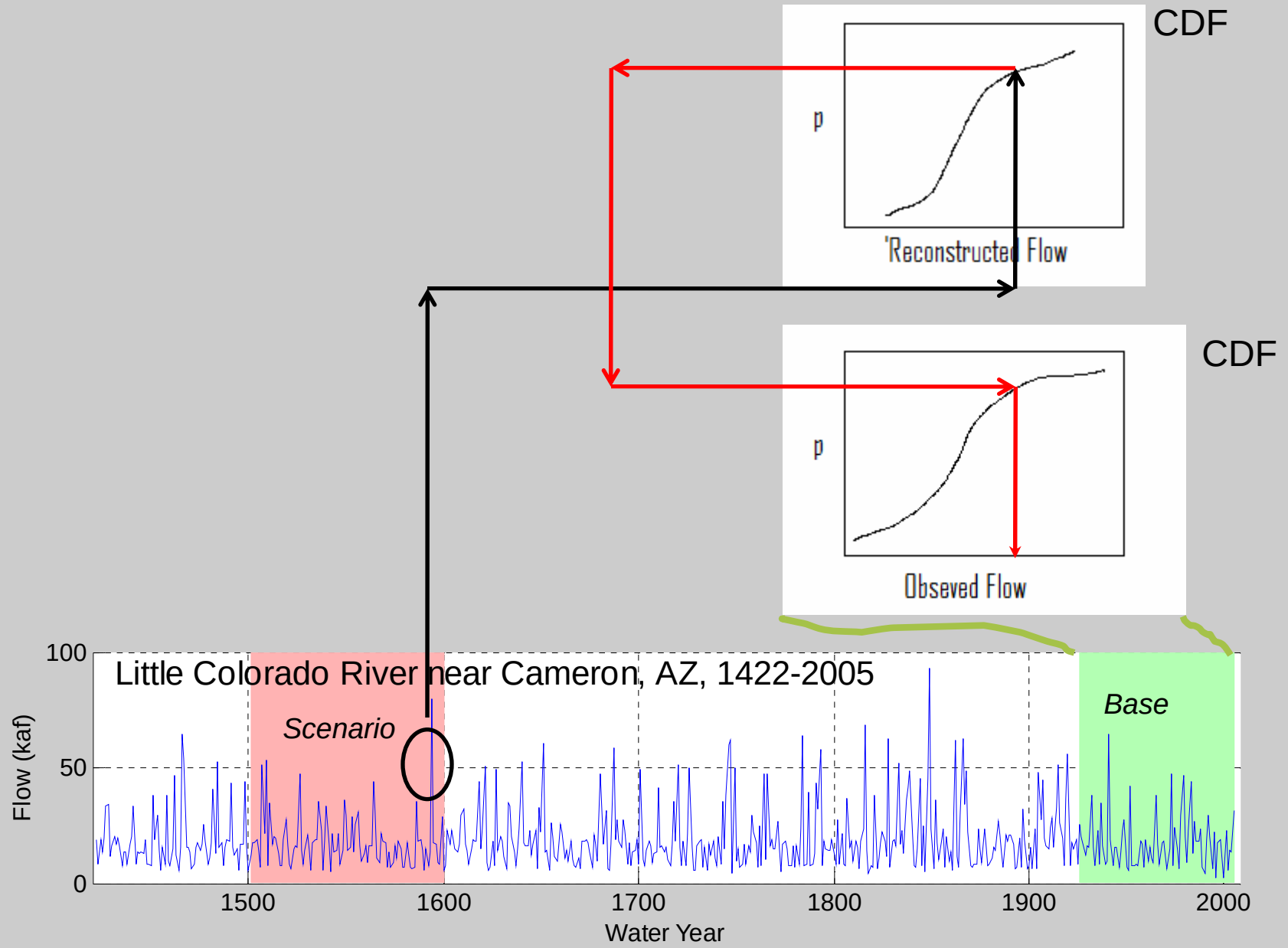
Reconstruction Tracks Observations



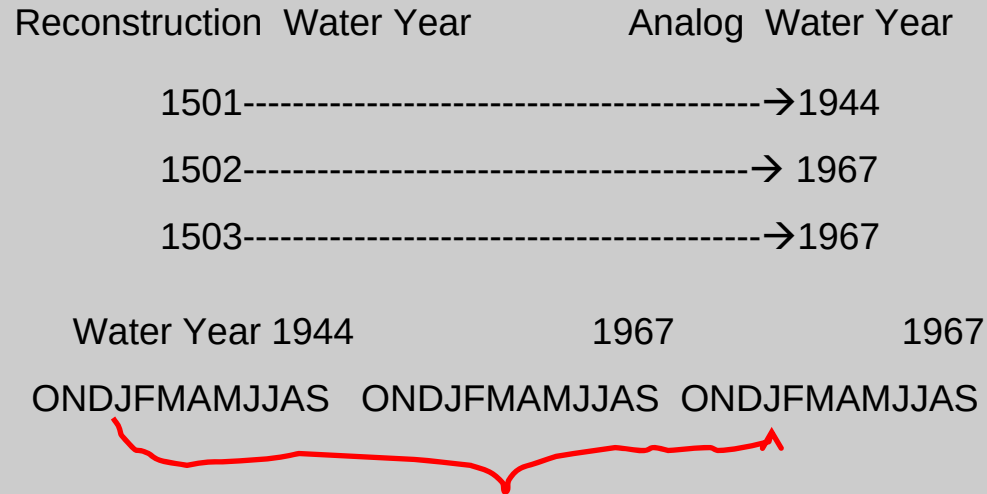
Reconstructed Flows



Identifying Analog Year



Analog Years to 24-Month Sequences of Model-Input Flow



Observed monthly flows for these 24 months are the input sequence for reconstruction year 1503

Using Tree Ring Data in Hydrological Management models

How can we use
tree-ring data to
estimate uncertainty?

2005
1



1.44

32.6

Using Tree Ring Data in Hydrological Management models

Little CO R.

Using Tree Ring Data in Hydrological Management models

Little CO R.
24Month Study

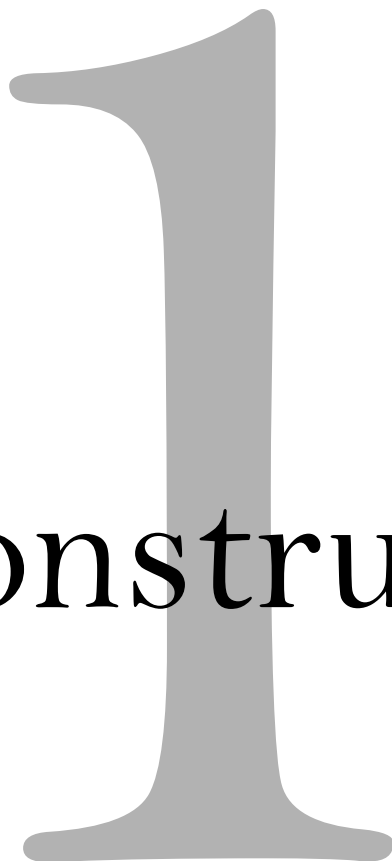
[January 2007]

4 input points

$\pm$ Lake Mead Elev.

perfect

reconstruction



A large, light gray number '2' is positioned in the background, centered vertically and horizontally. It has a thick, slightly irregular stroke, giving it a hand-drawn or stylized appearance.

perfect

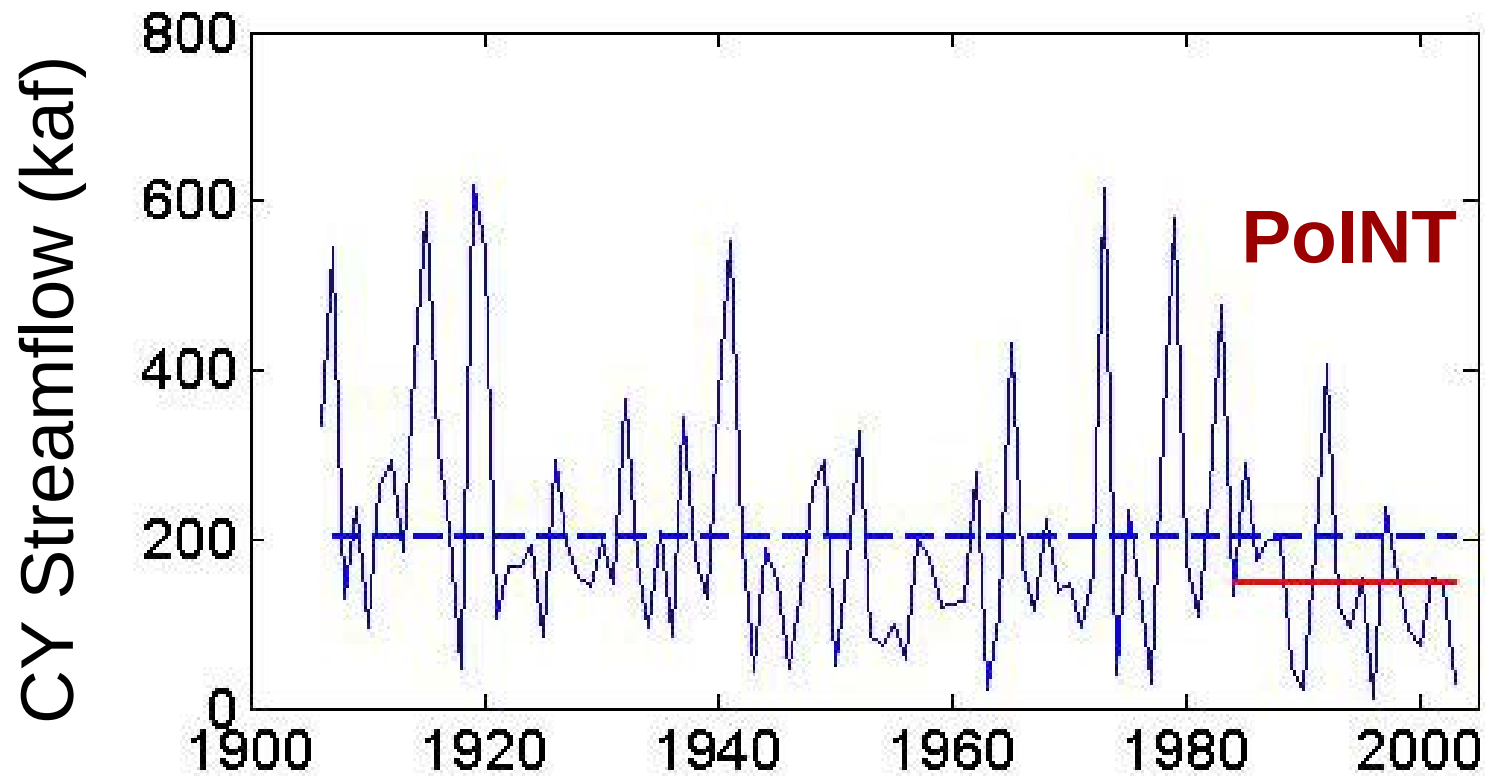
representation

A large, light gray, stylized number '3' is positioned in the background, centered vertically and horizontally. It has a thick, rounded, and slightly irregular appearance, resembling a calligraphic or hand-drawn style.

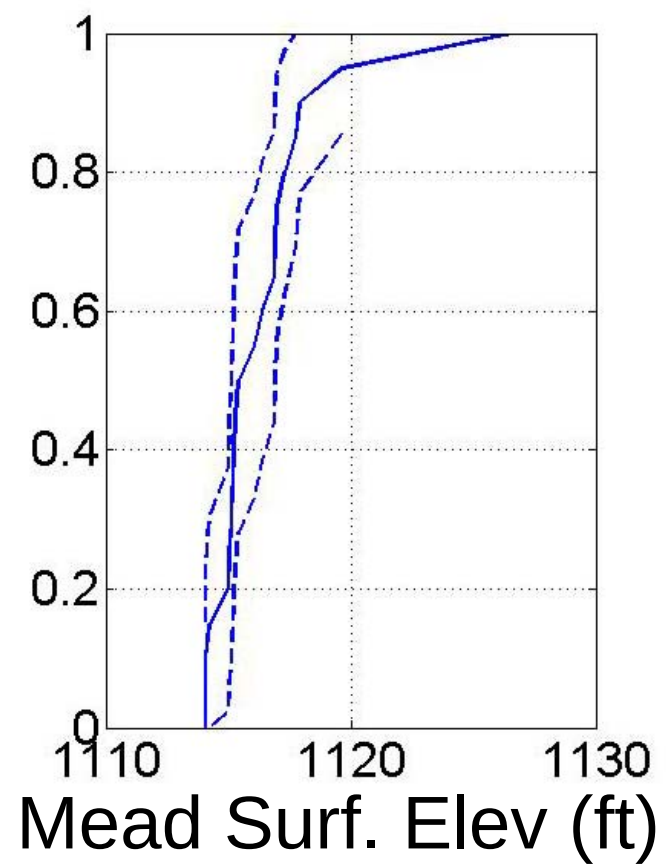
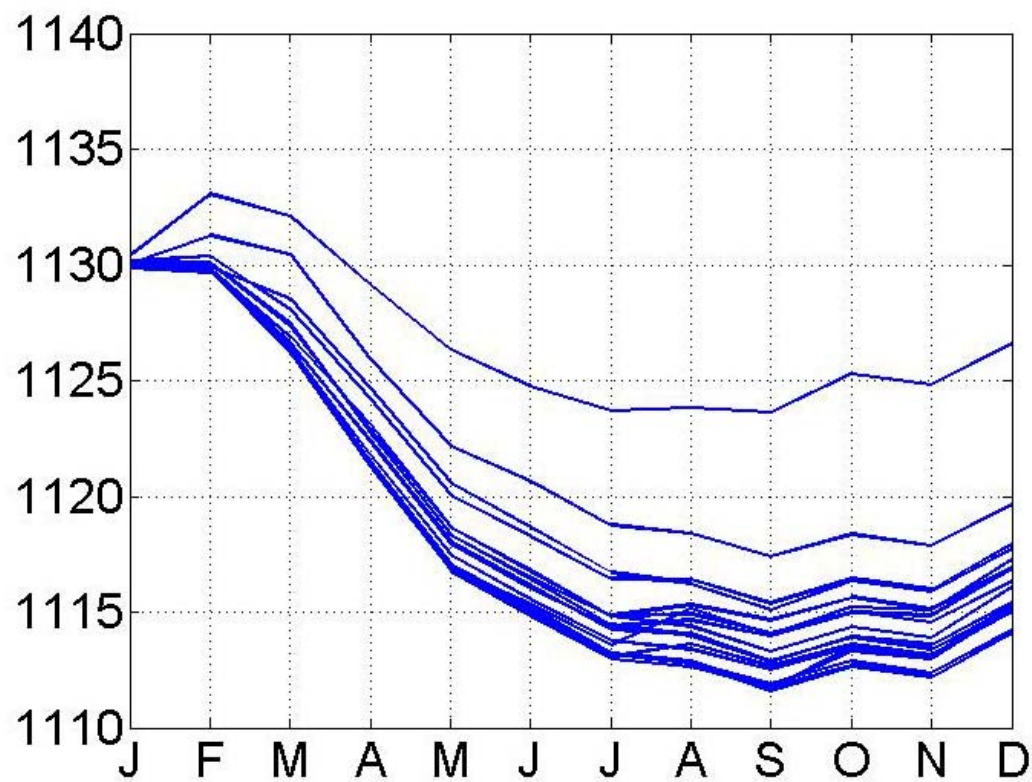
perfect

disaggregation

1. compute **mean** from **q-mapped data** for **period of interest**



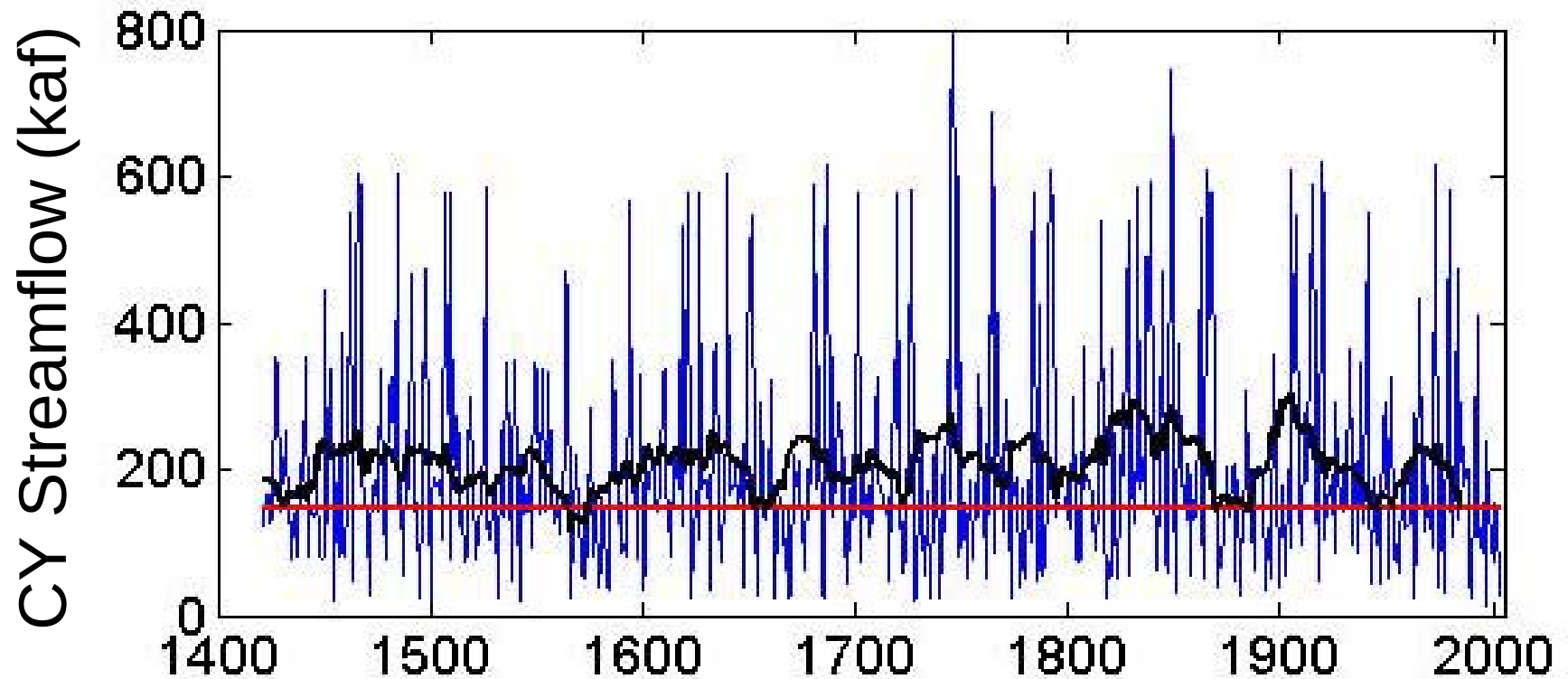
Mead Surface Elevation (ft)



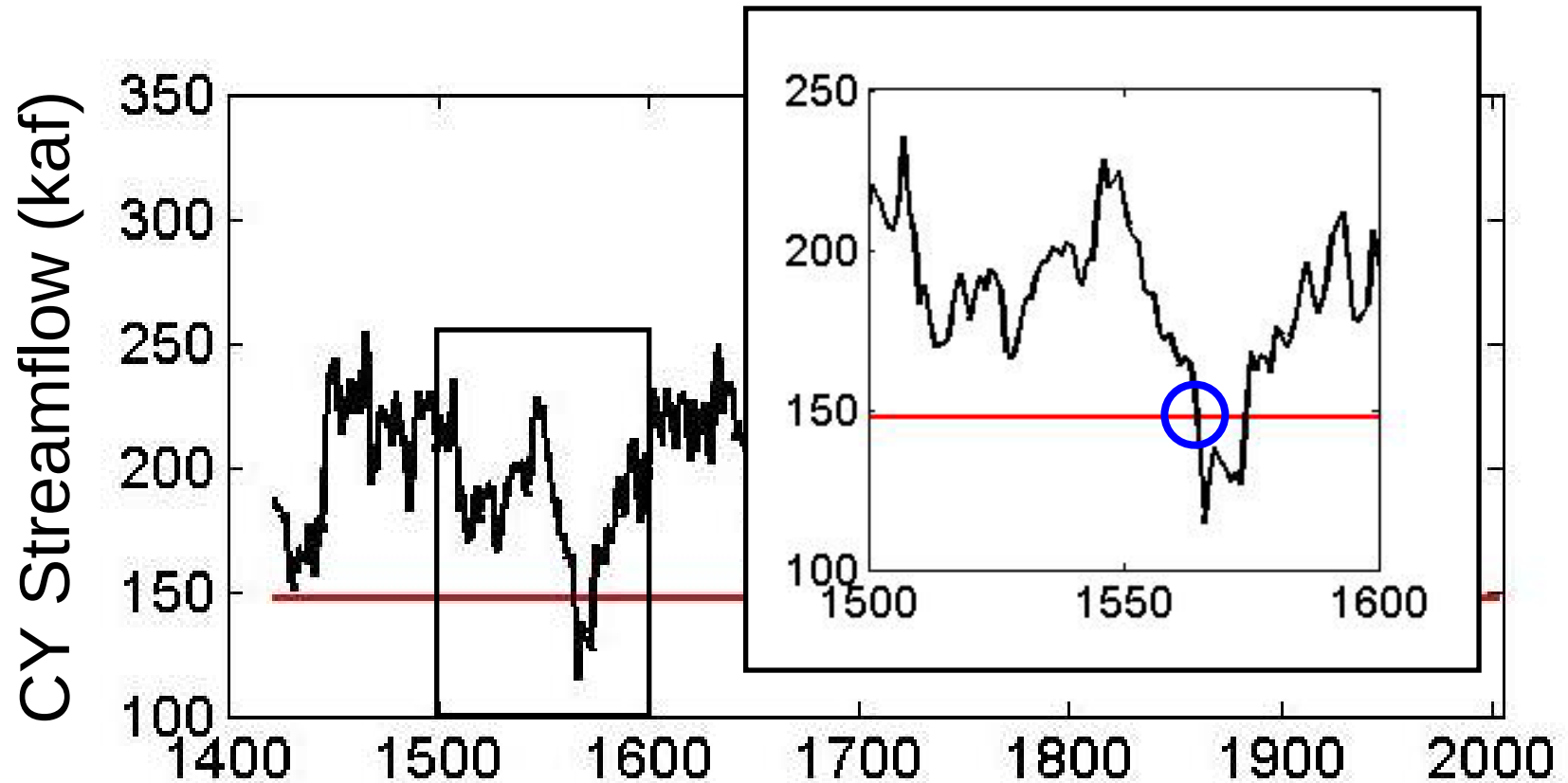
historical analogs



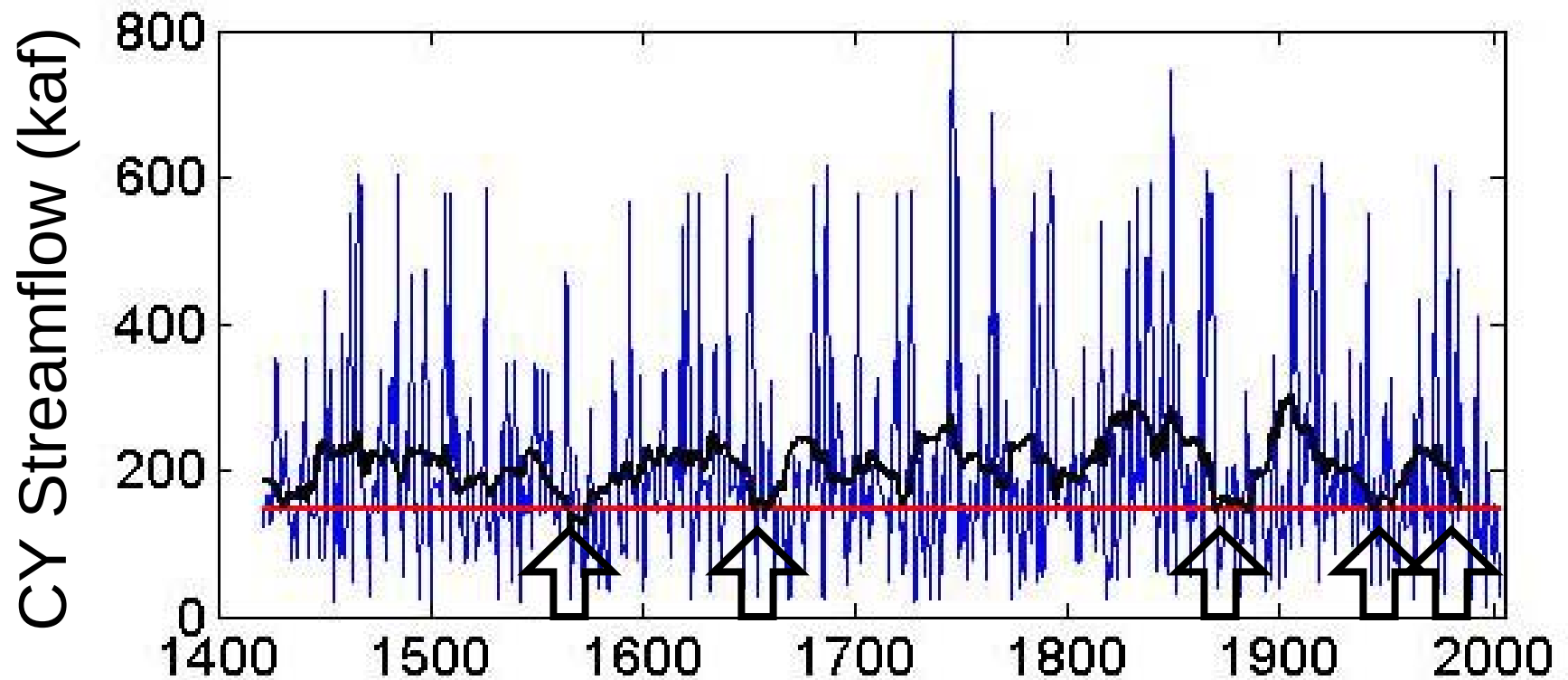
2. compute **n-yr** running mean for **q-mapped** data
3. identify **historical analogs**



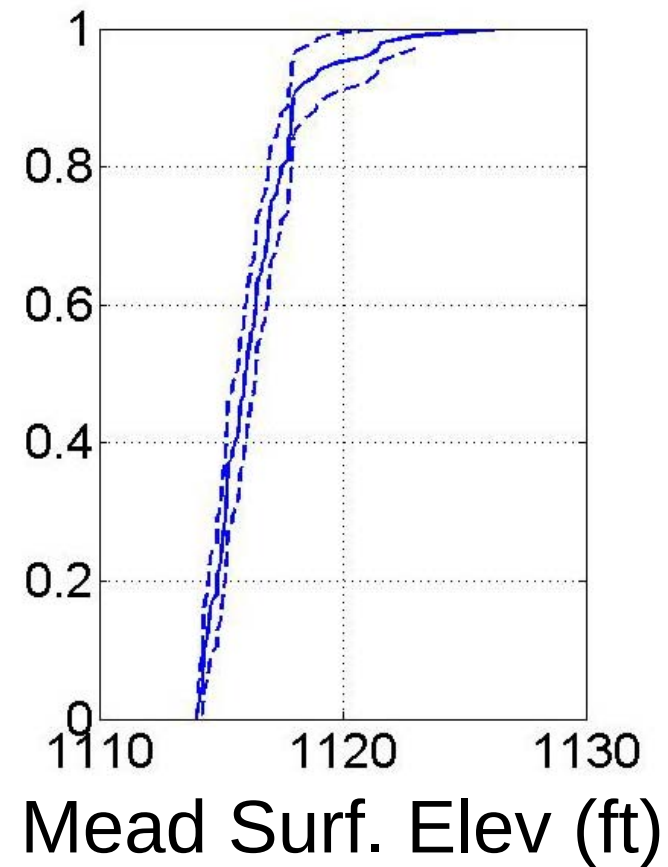
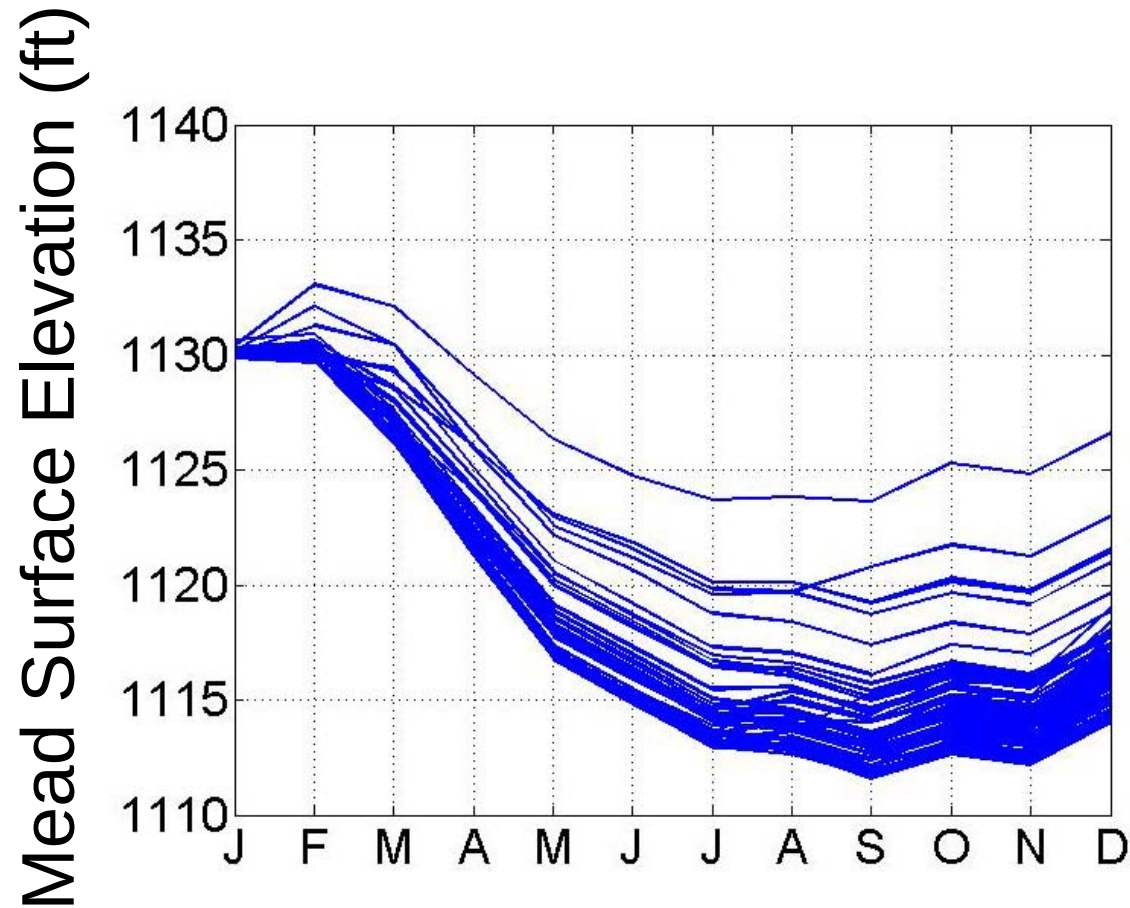
2. compute **n-yr** running mean for **q-mapped** data
3. identify **historical analogs**



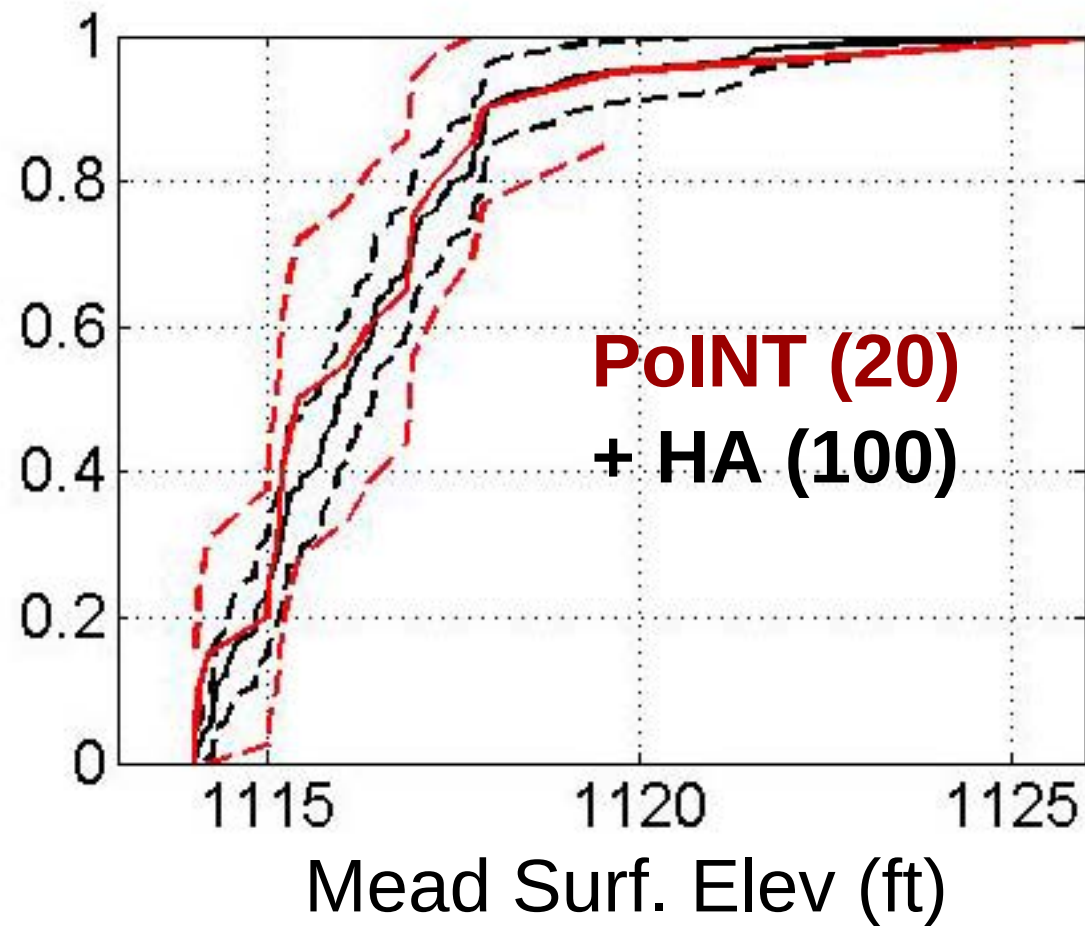
2. compute **n-yr** running mean for **q-mapped** data
3. identify **historical analogs**



4. extract data and **run model**



5. evaluate results



perfect reconstruction

perfect representation

perfect disaggregation

reconstruction

* representation

* disaggregation

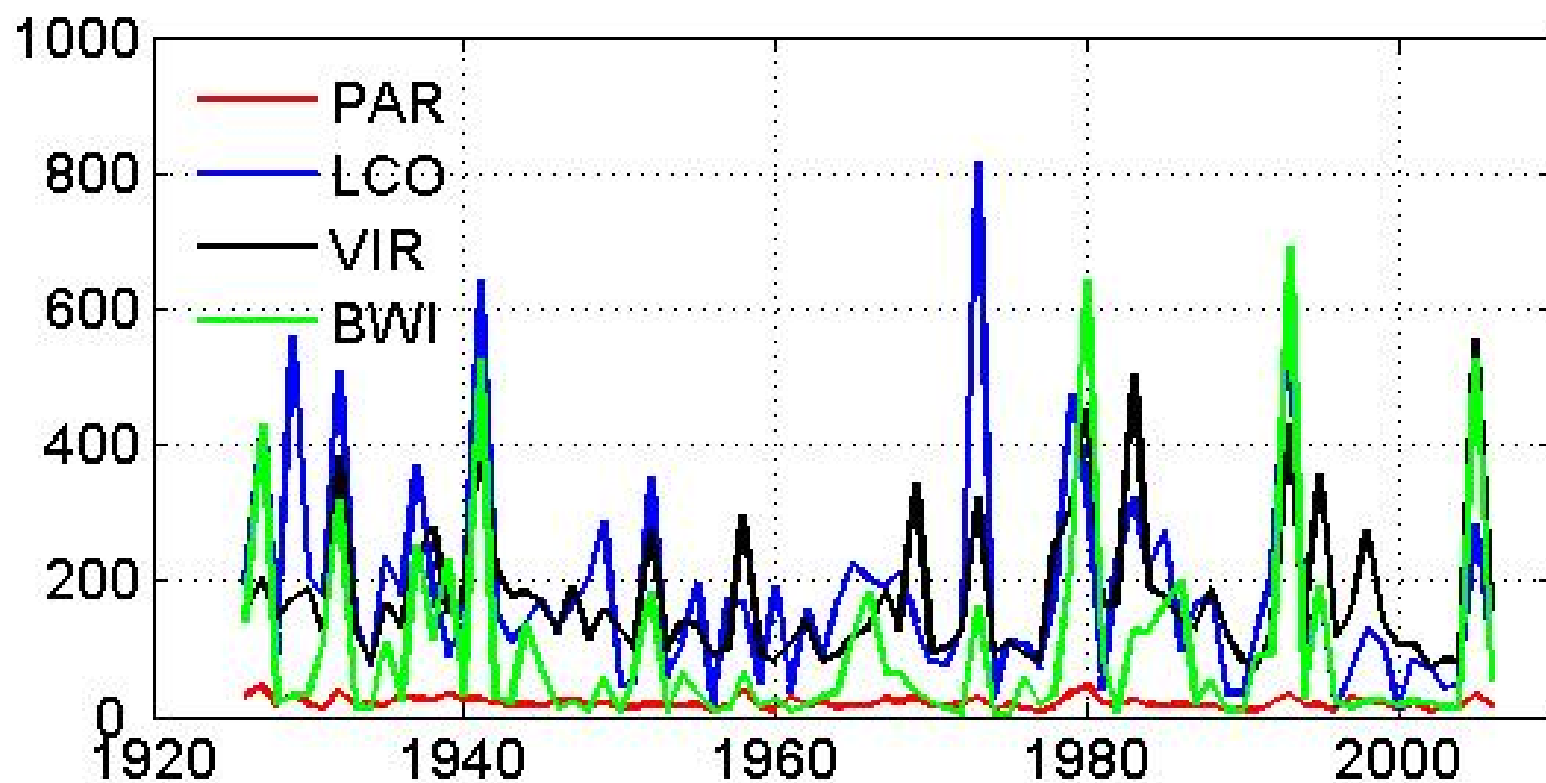
1.



Gaged Flows *

* not adjusted for anthropogenic influence

WY Streamflow (kaf)

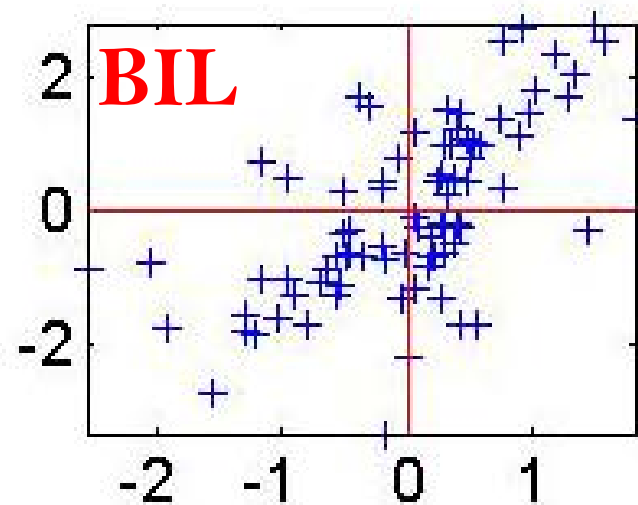
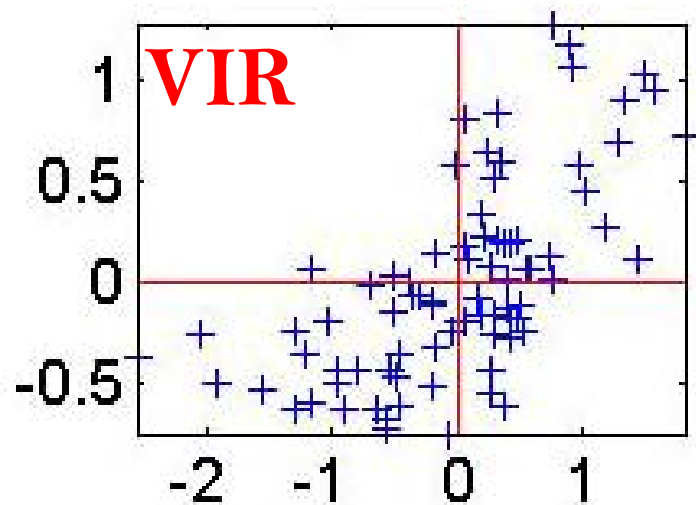
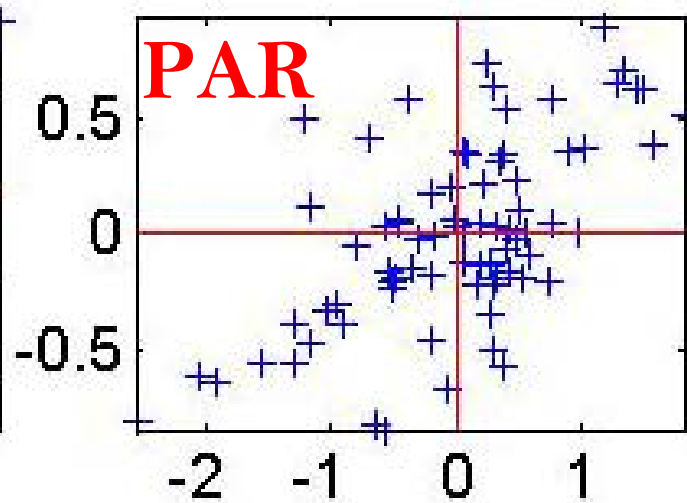
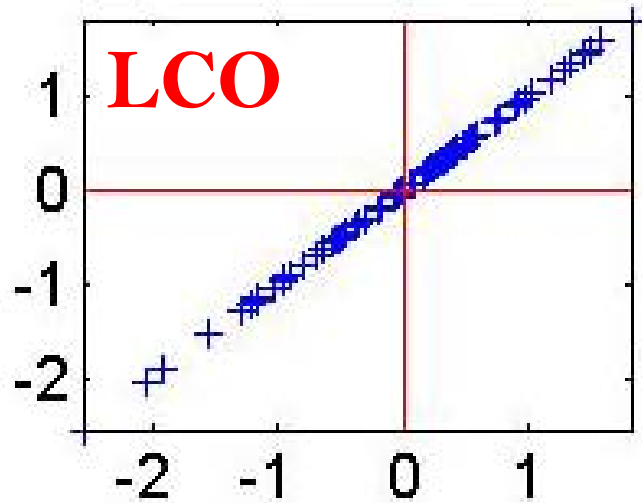


Tributary “X”

+	LH	HH
0		
-	LL	HL

- 0 +

Little Colorado



$$r^2 \quad \text{PAR} \quad 0.52$$

VIR

0.61

BIL

0.61

How can we reduce
this uncertainty?



Custom Collections

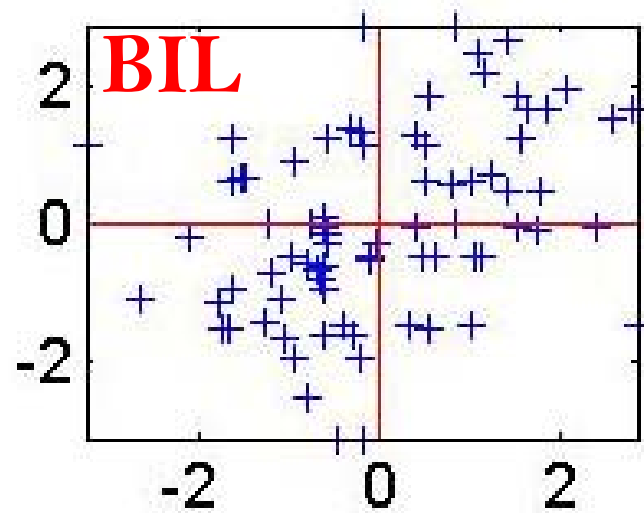
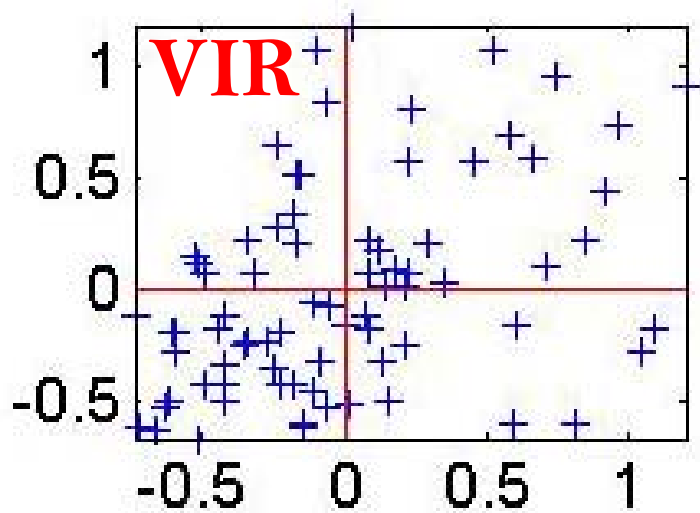
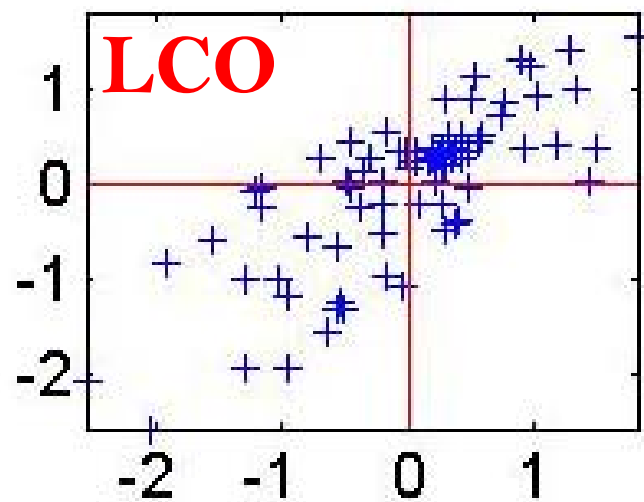
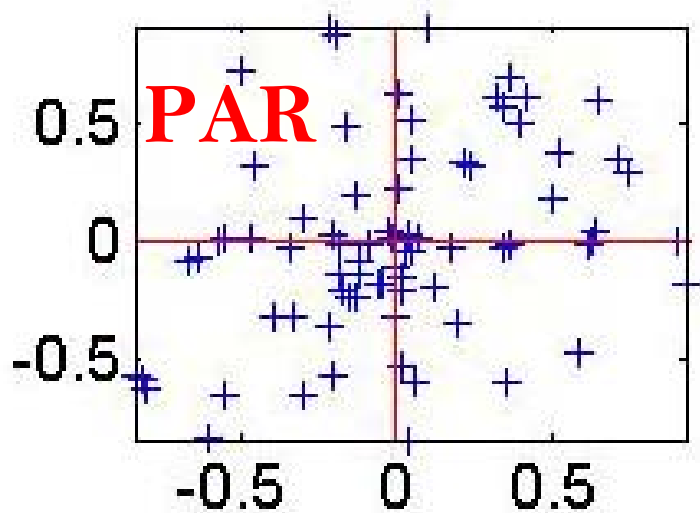
2.



Natural Flows

+	LH	HH
0		
-	LL	HL

- 0 +
Q-mapped Data



PAR

0.26

LCO

0.78

VIR

0.40

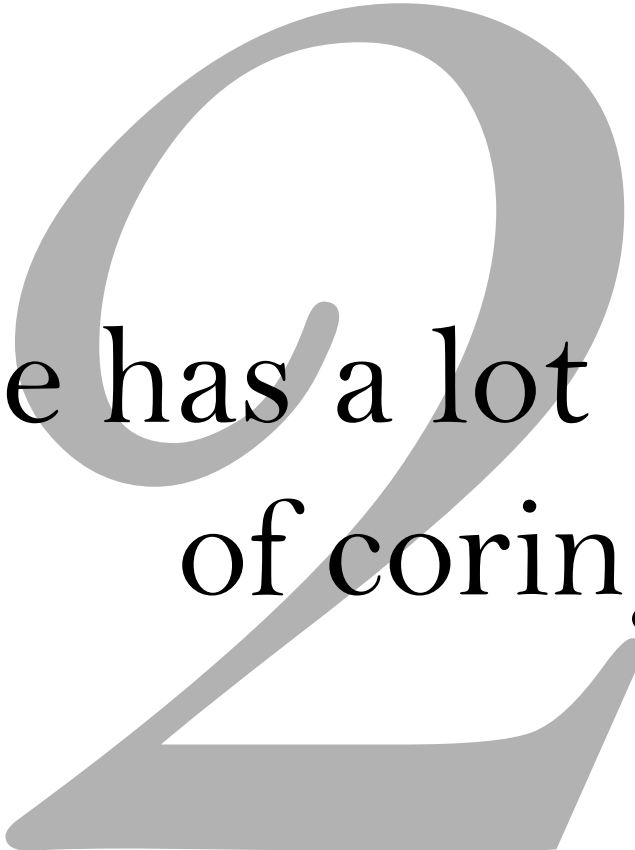
BIL

0.36





improved precision in
uncertainty estimates

A large, light gray, stylized number '2' is positioned in the background, centered behind the text.

dave has a lot
of coring to do!

“?”