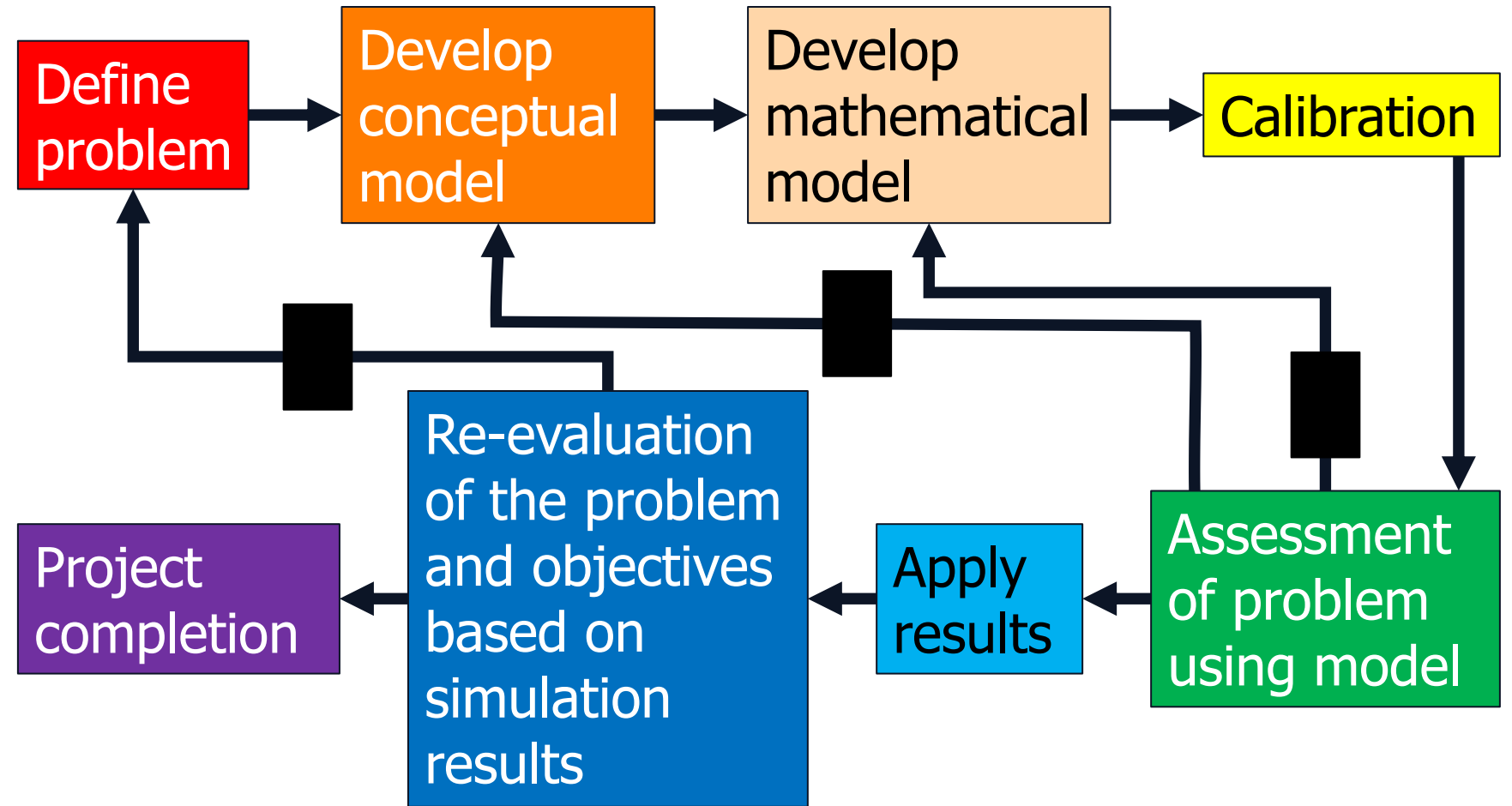


# Model Calibration Update

Stephen Hundt

# Context

# The modeling process



After Reilly (2001) TWRI 3,B8

# Last Time

# Last Time Trying It All

Observation Type	Approximate Number
Water Levels	10,000 's
Drain Flows	100's
Low Seepage	100's
Permeability	100's
Temperature Differences	
Vertical Head Difference	
Net Water Budget	
Preferred Parameters	--








- ✓ - Number of measurements at location
- ✓ - Spatial density
- ✗ - Temporal density
- ✗ - "Evenly" distributed
- ✗ - Systematic error
- ✗ - Cost/budget
- ✗ - Covers???

# Last Time

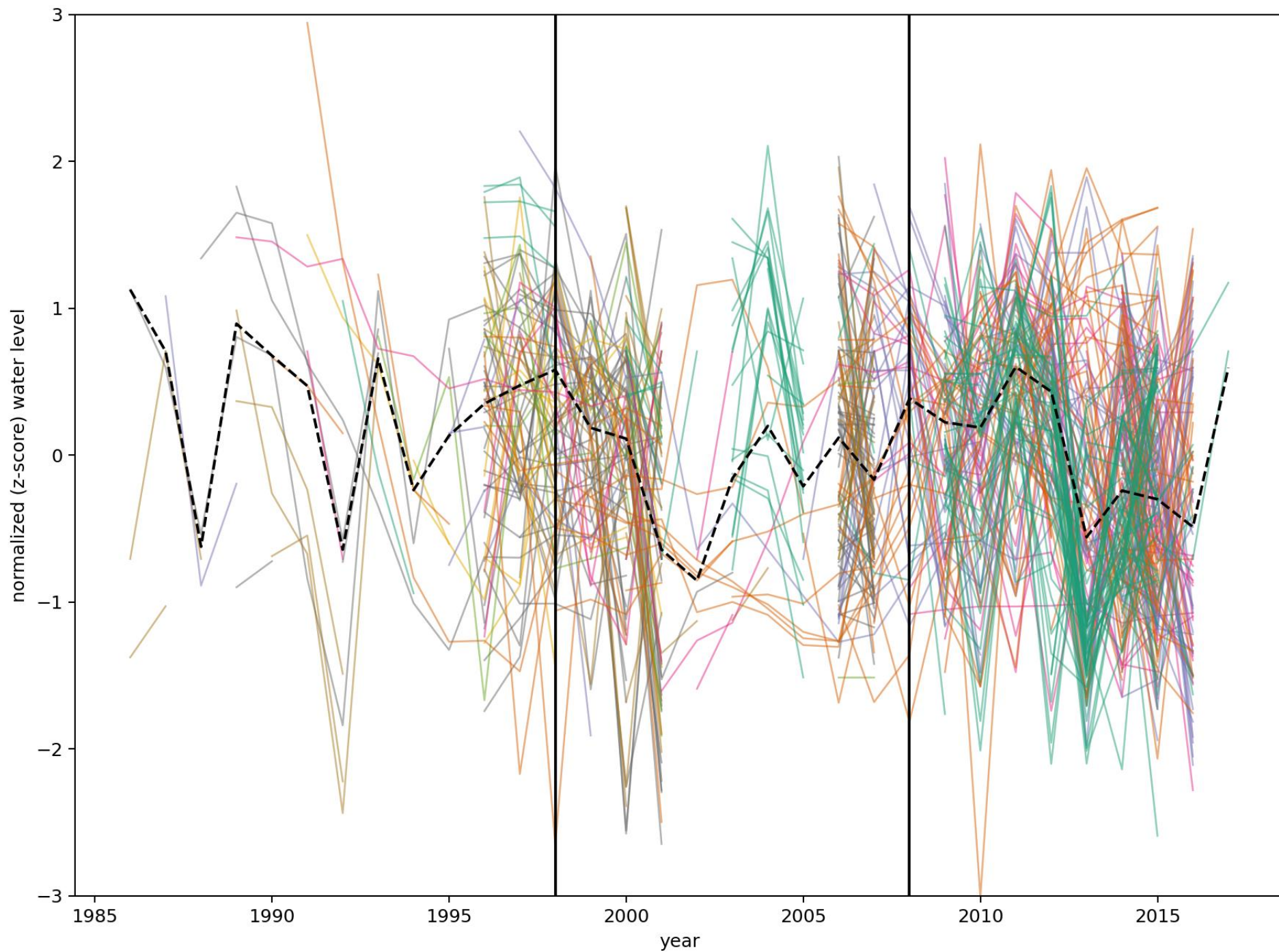
## Subset of targets

Observation Type	Approximate Number
Water Levels	<del>10,000 's</del>
Drain Flows	<del>100's</del>
Lowell Seepage	100's
River Seepage	100's
Temporal Differences	10,000
Vertical Water Level Differences	1,000's
Net Water Budget Values*	<10
Preferred Parameters*	--

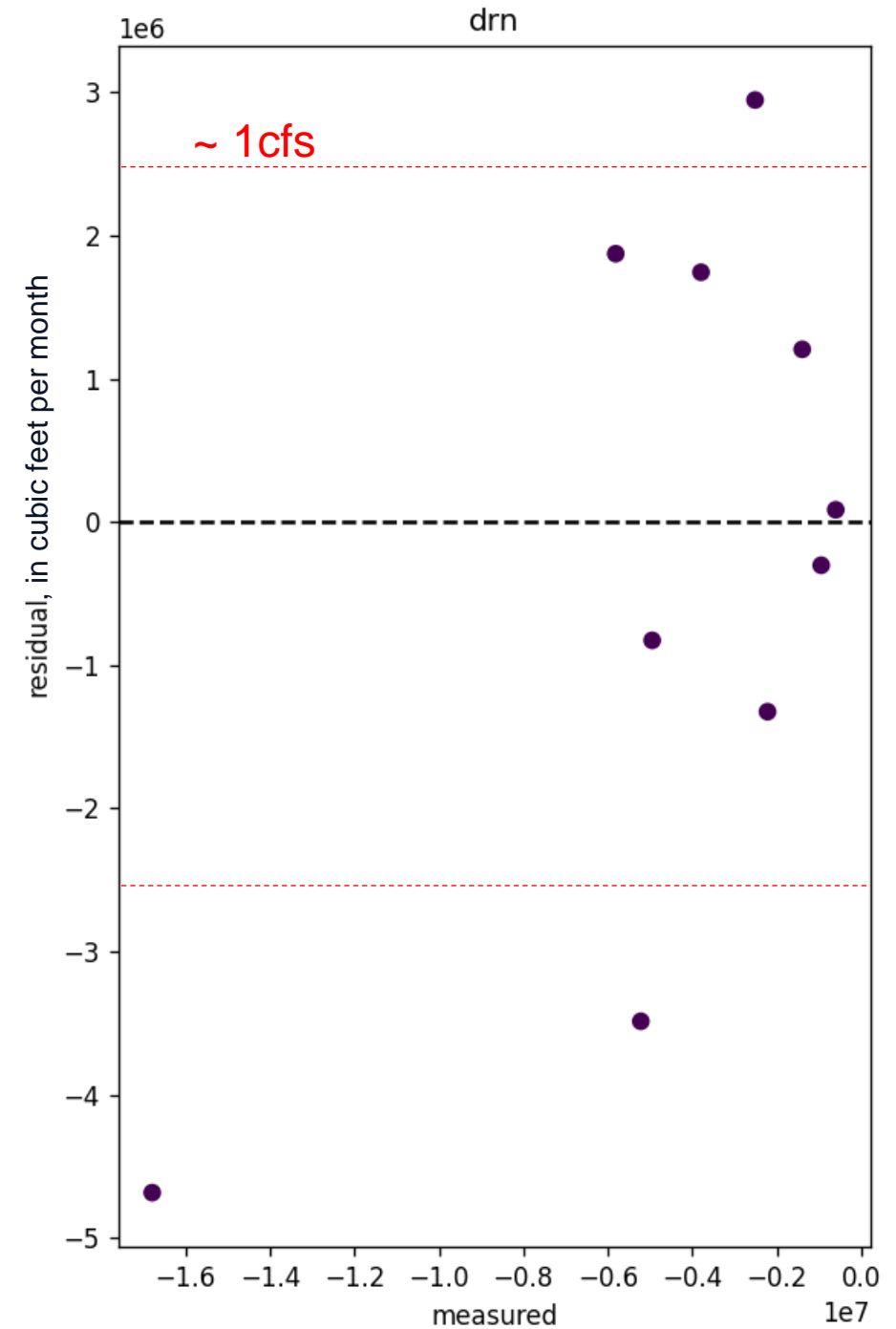
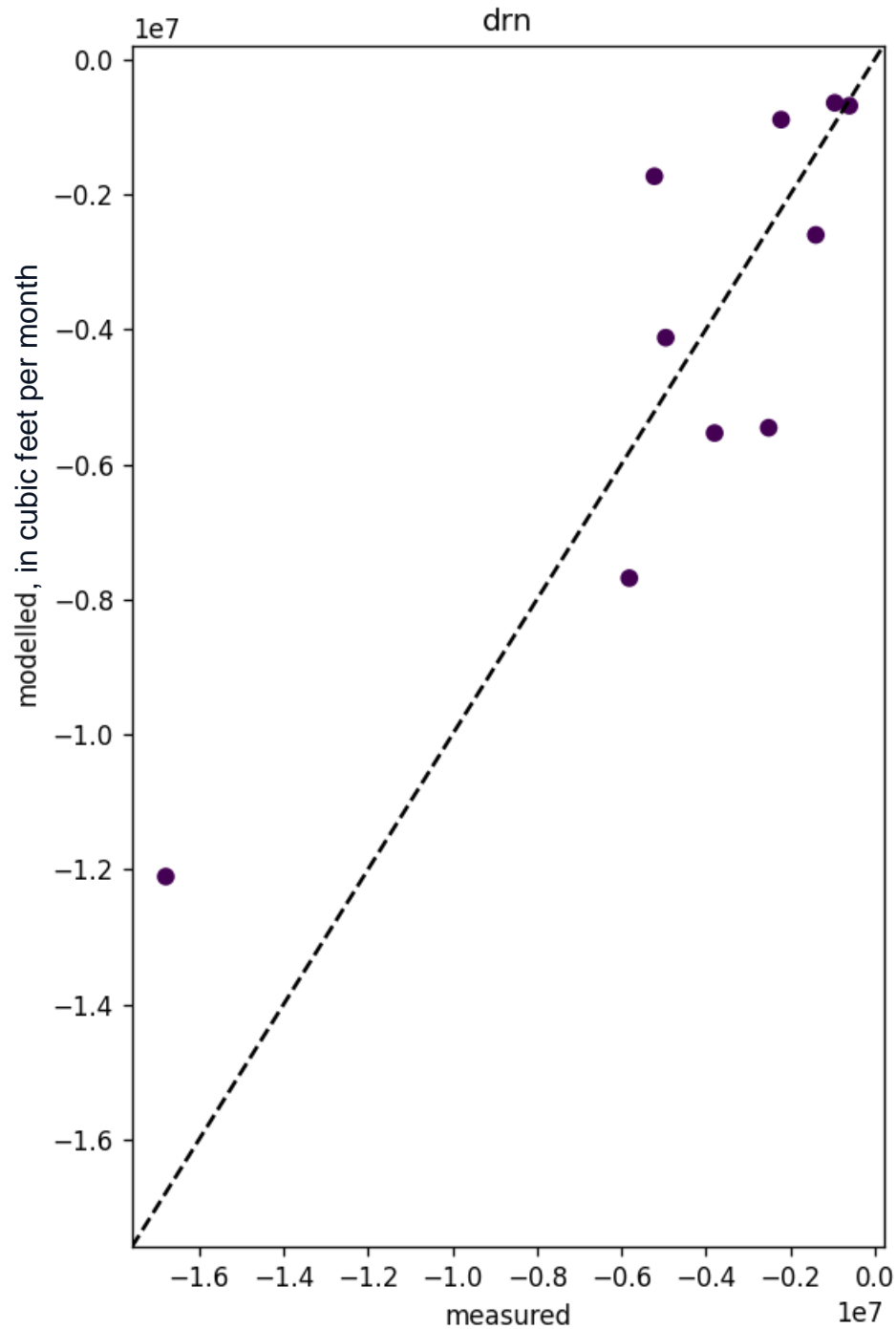
Simplified ->

-  - Number of measurements at location
-  - Spatial density
-  - Temporal density
-  - "Events"
-  - Structural error
-  - Overall budget
-  - Others???

# Last Time Pseudo-steady-state

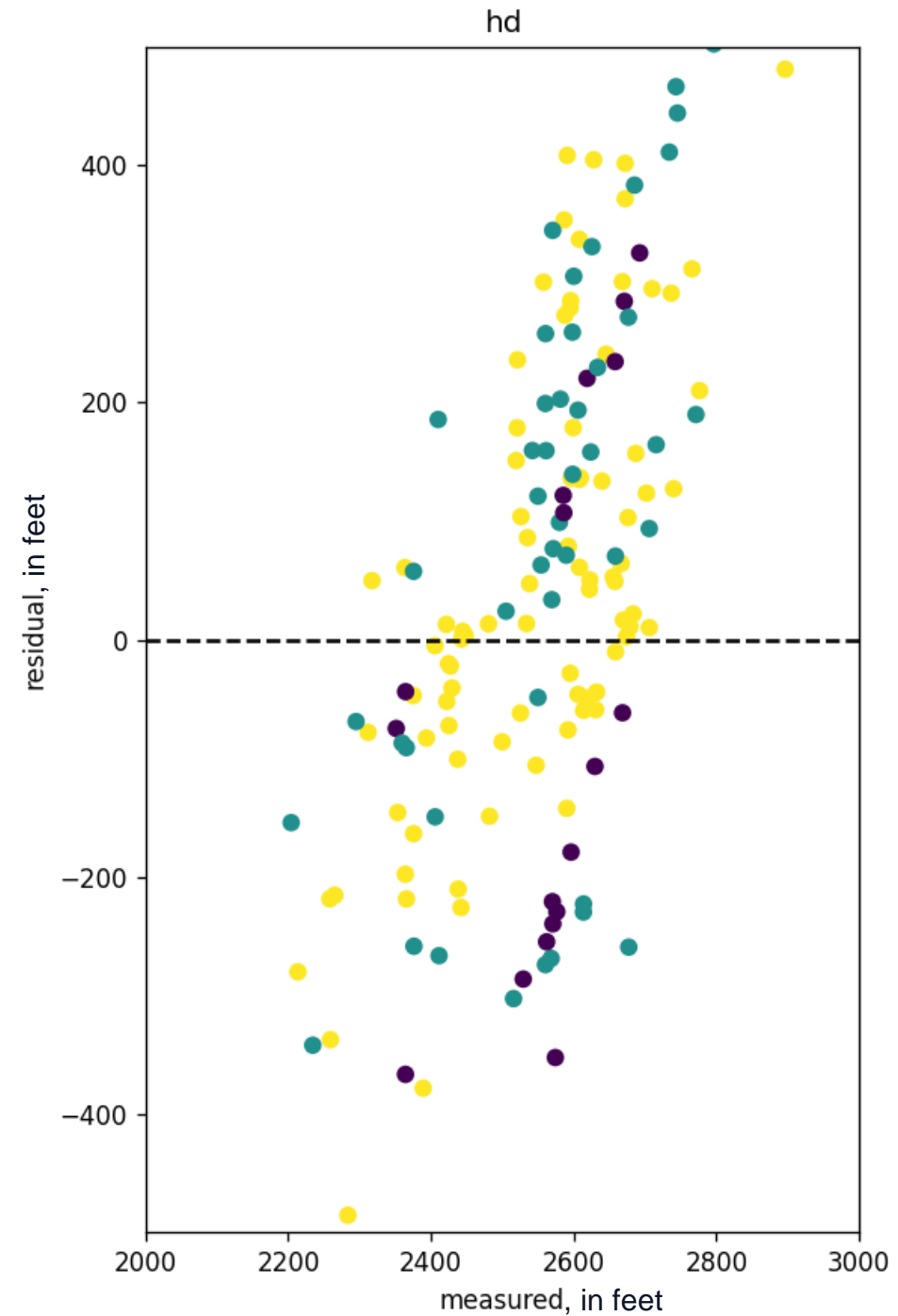
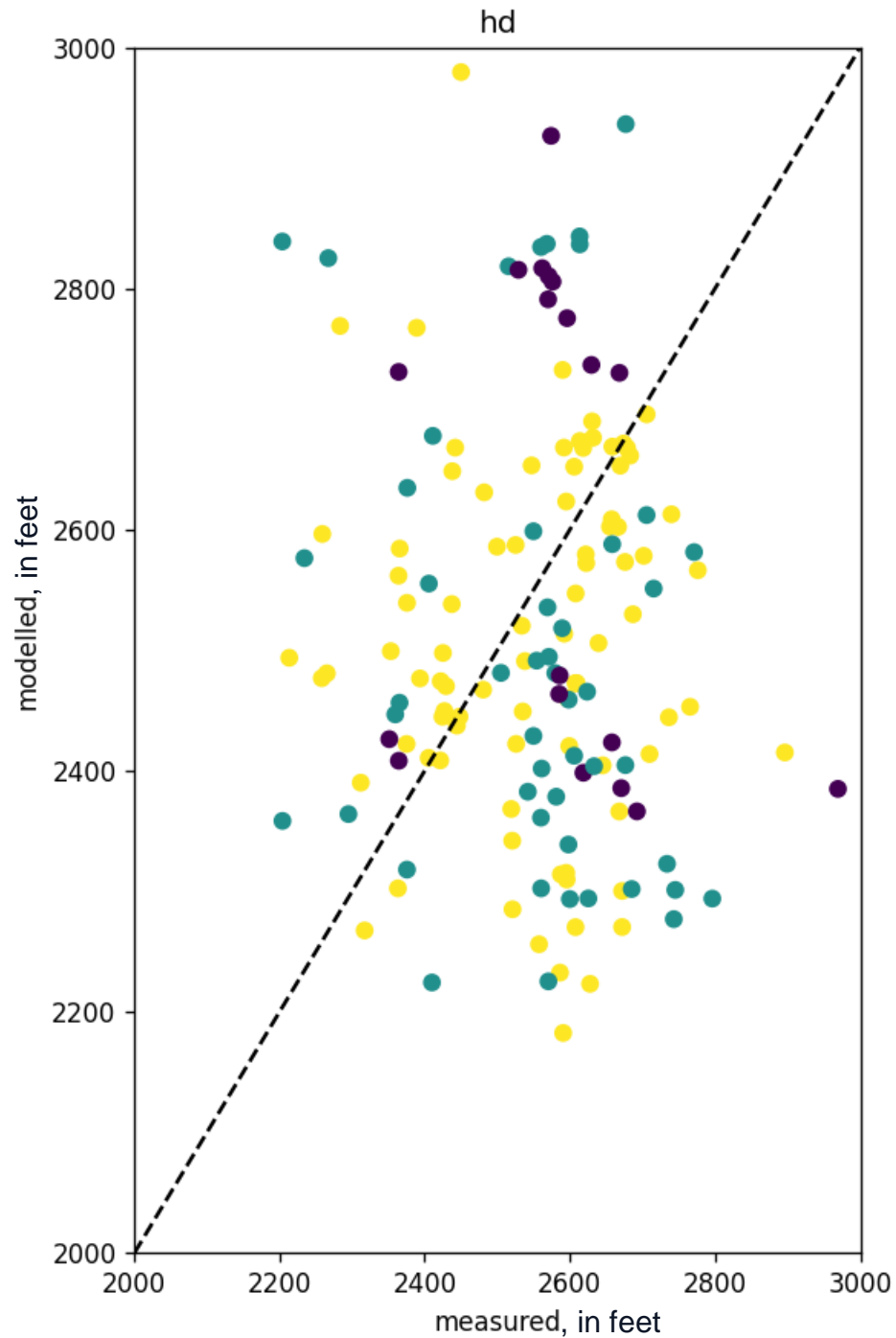


# Last Time Residual Summary



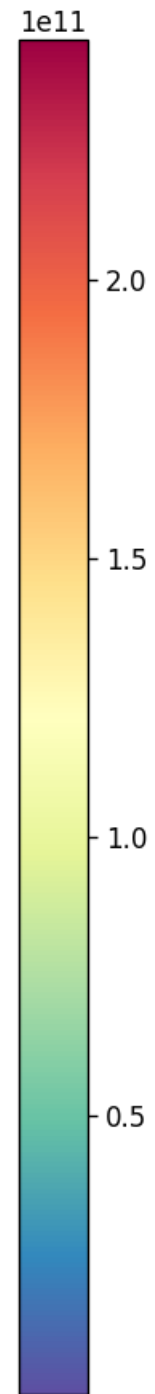
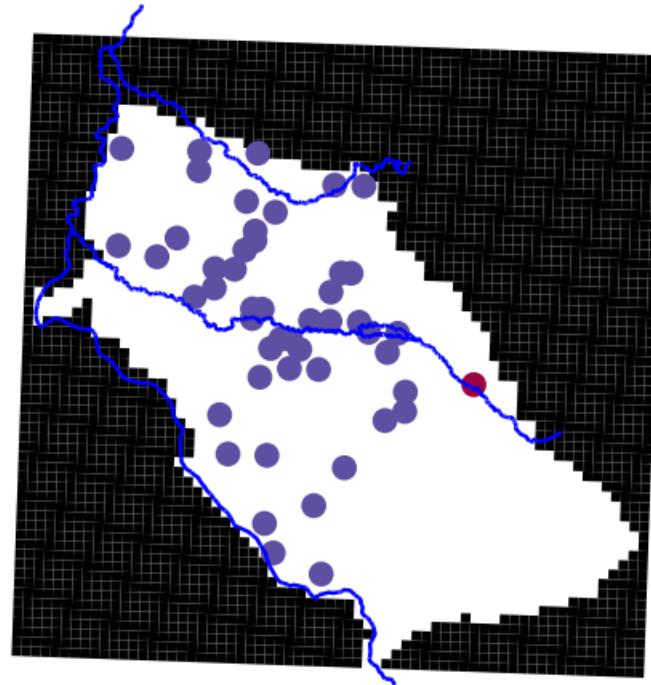


# Last Time Residual Summary

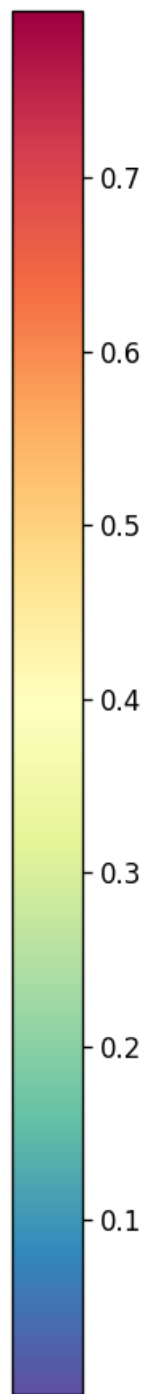
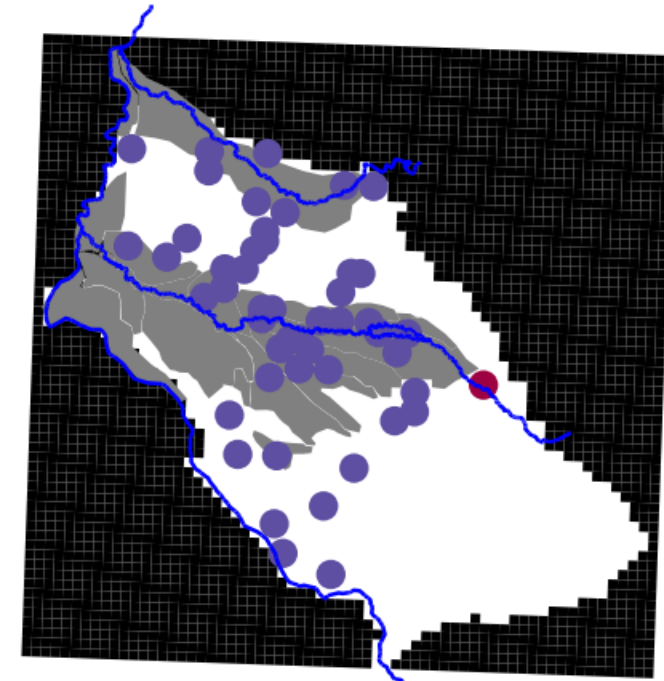


# Last Time Phi Proportion Maps

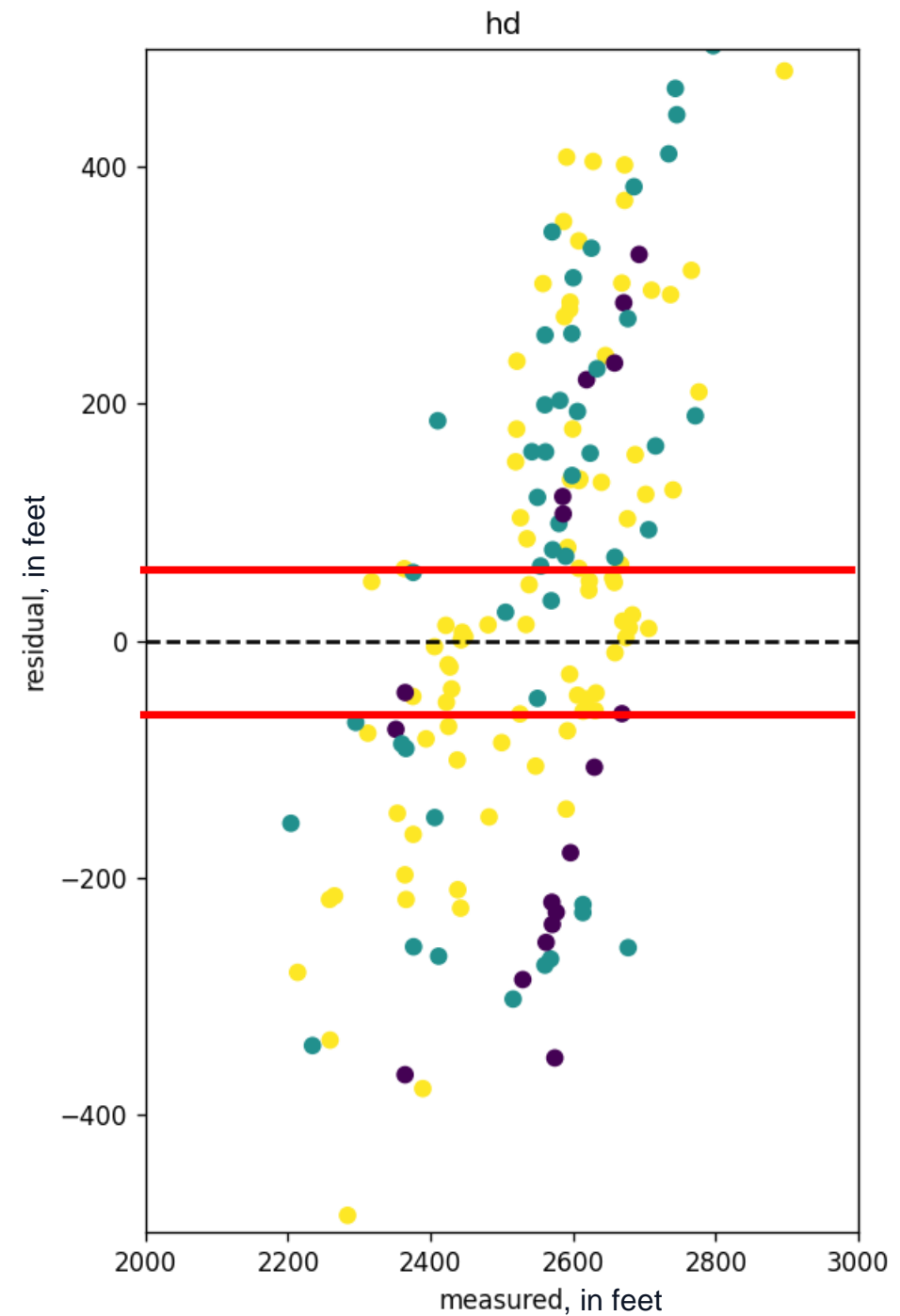
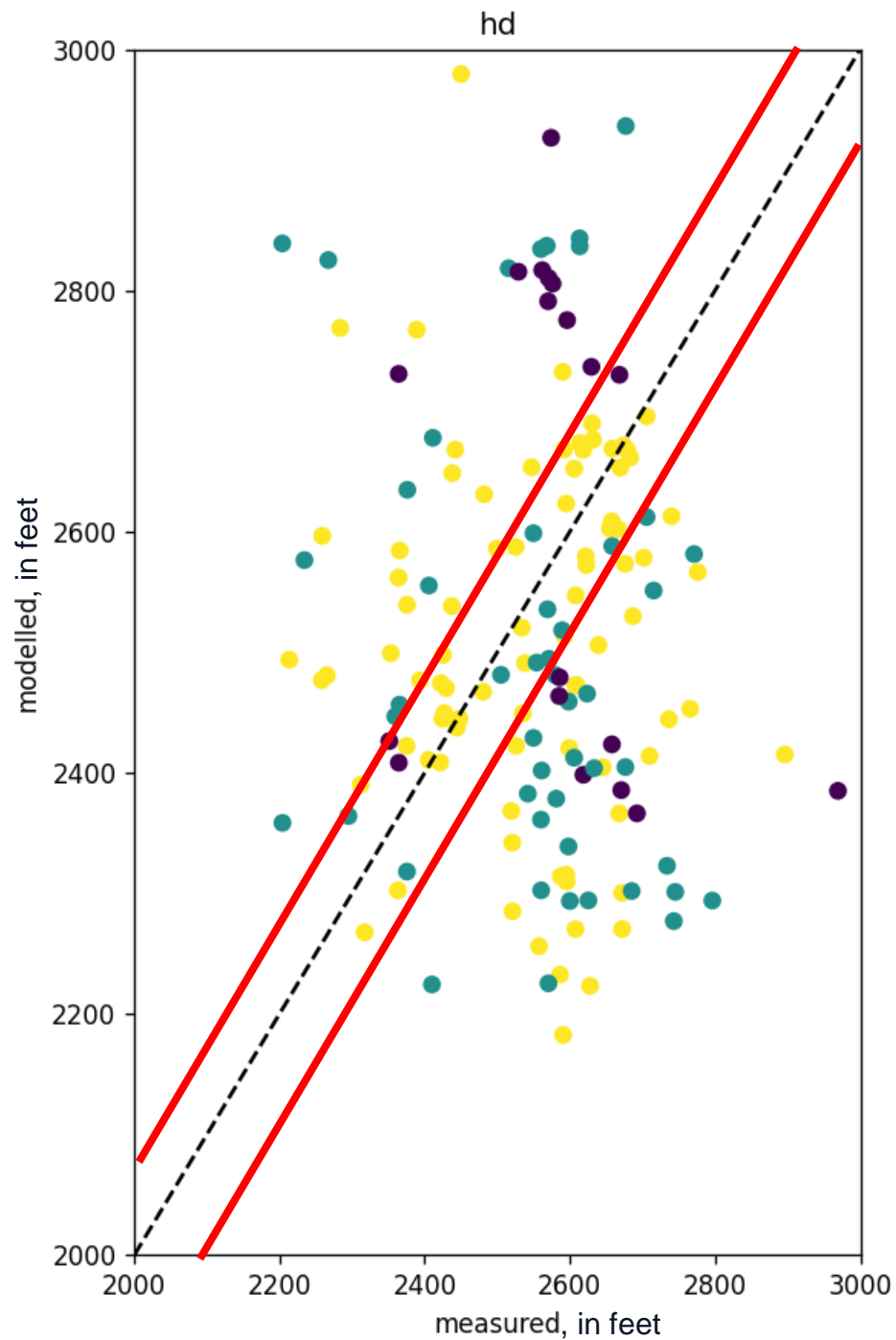
hd phi in layer 4



hd in layer 4  
proportion of group phi



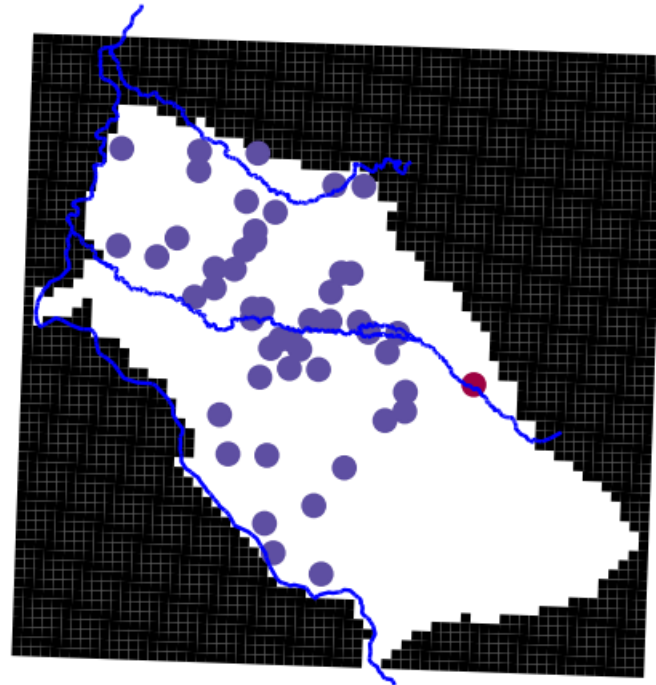
# Last Time Residual Summary



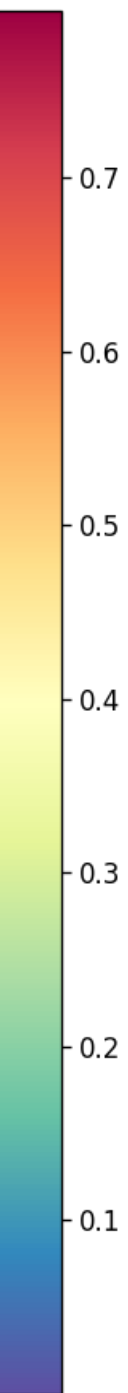
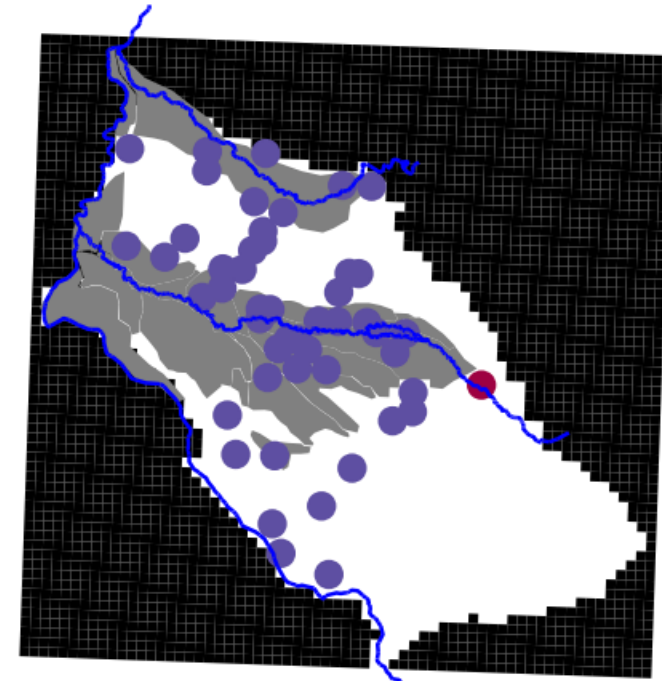
# Changes Since Last Time

# Changes Catching Errors

hd phi in layer 4

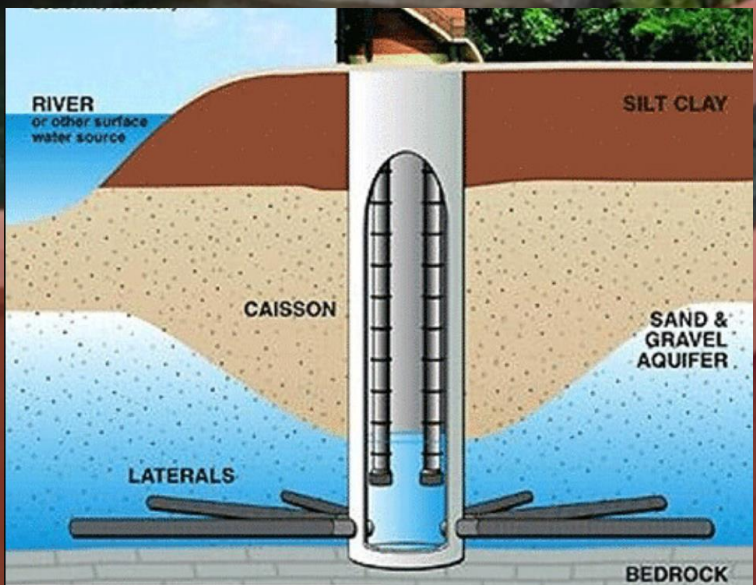


hd in layer 4  
proportion of group phi



# Changes

## Erroneous pumping



Courtesy of Ranney Collector Wells

# Changes

## Dumb Error in Lowell Seepage

Oops



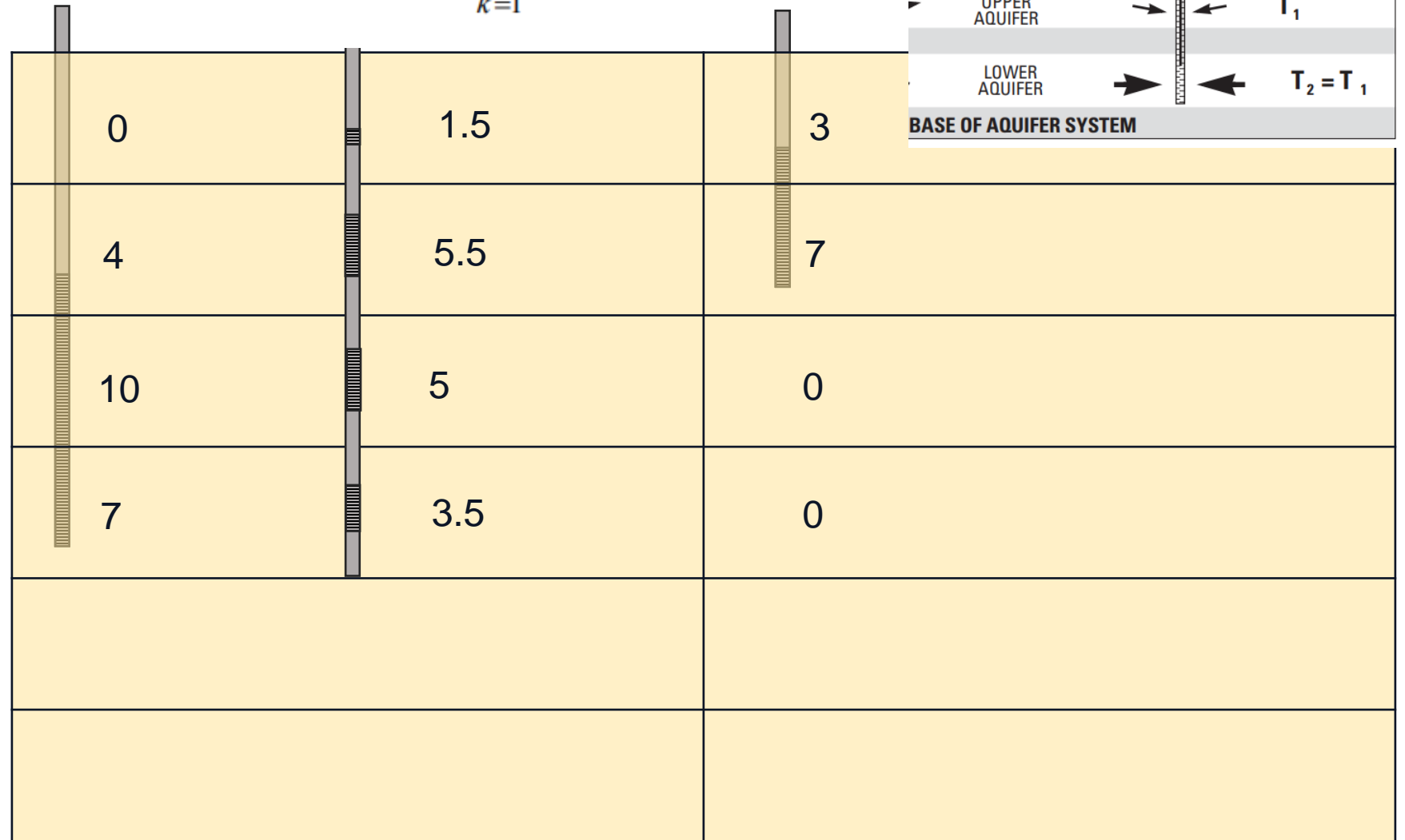
cubic feet per month  $\neq$  cubic feet per day

# Changes Multi-Layer Pumping Distribution

Still specified (not head-dependent), but changes with HK adjustments.

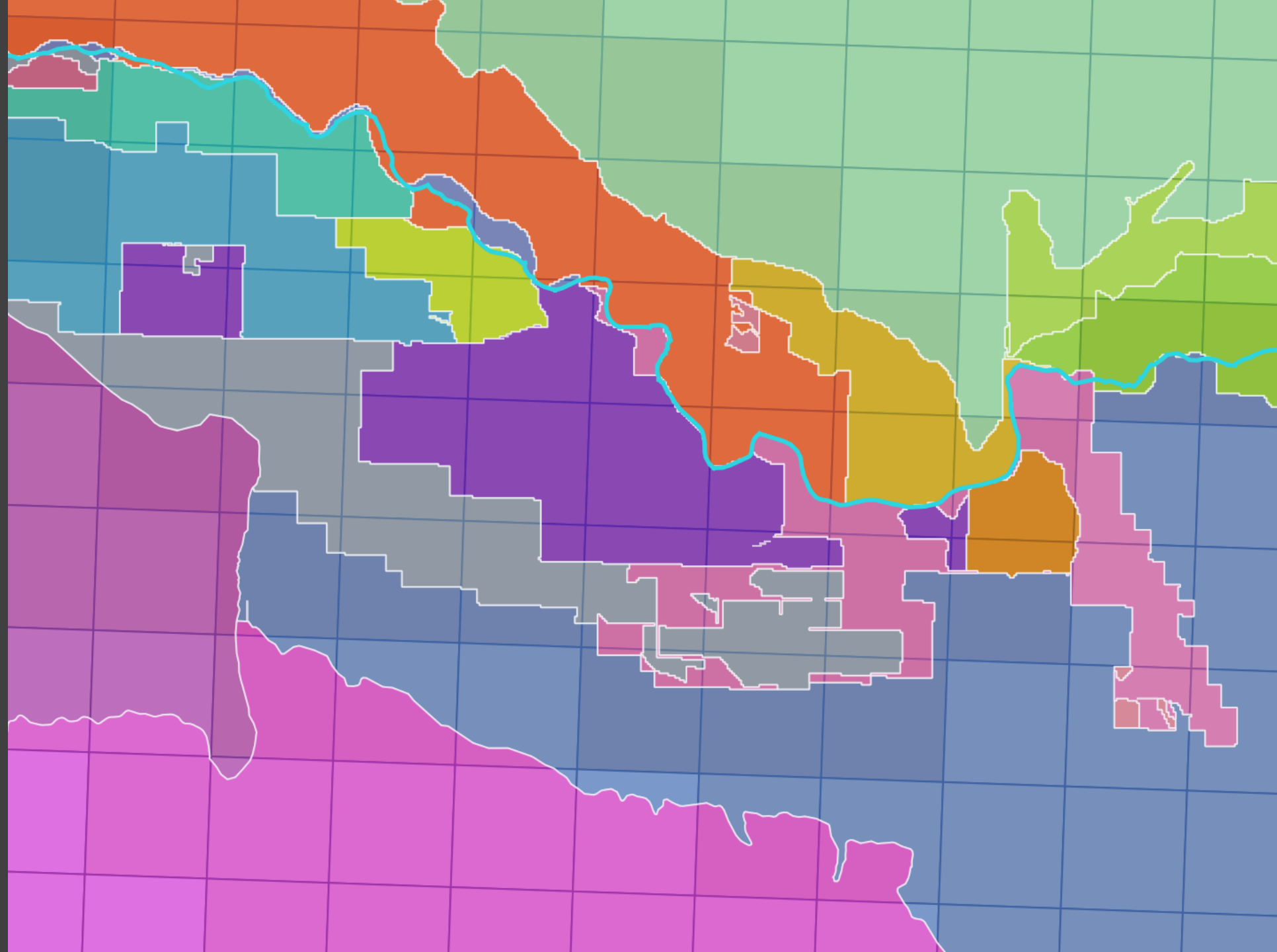
Proportional to transmissivity

$$Q_{j,i,k} = \frac{T_{j,i,k}}{\sum_{k=1}^{NL} T_{j,i,k}} Q_{TOT}$$

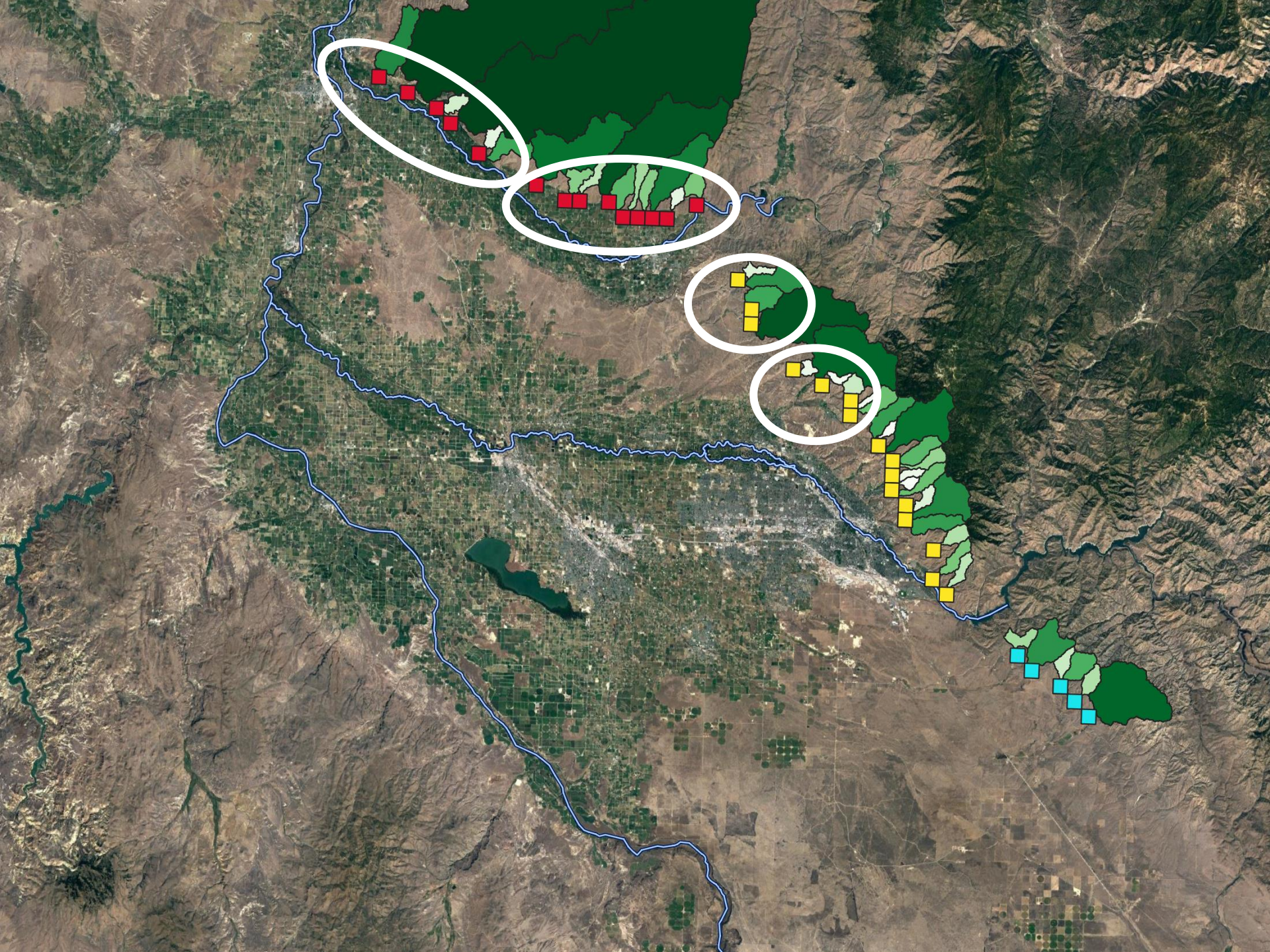




# Changes Group Smaller Irrigation Districts



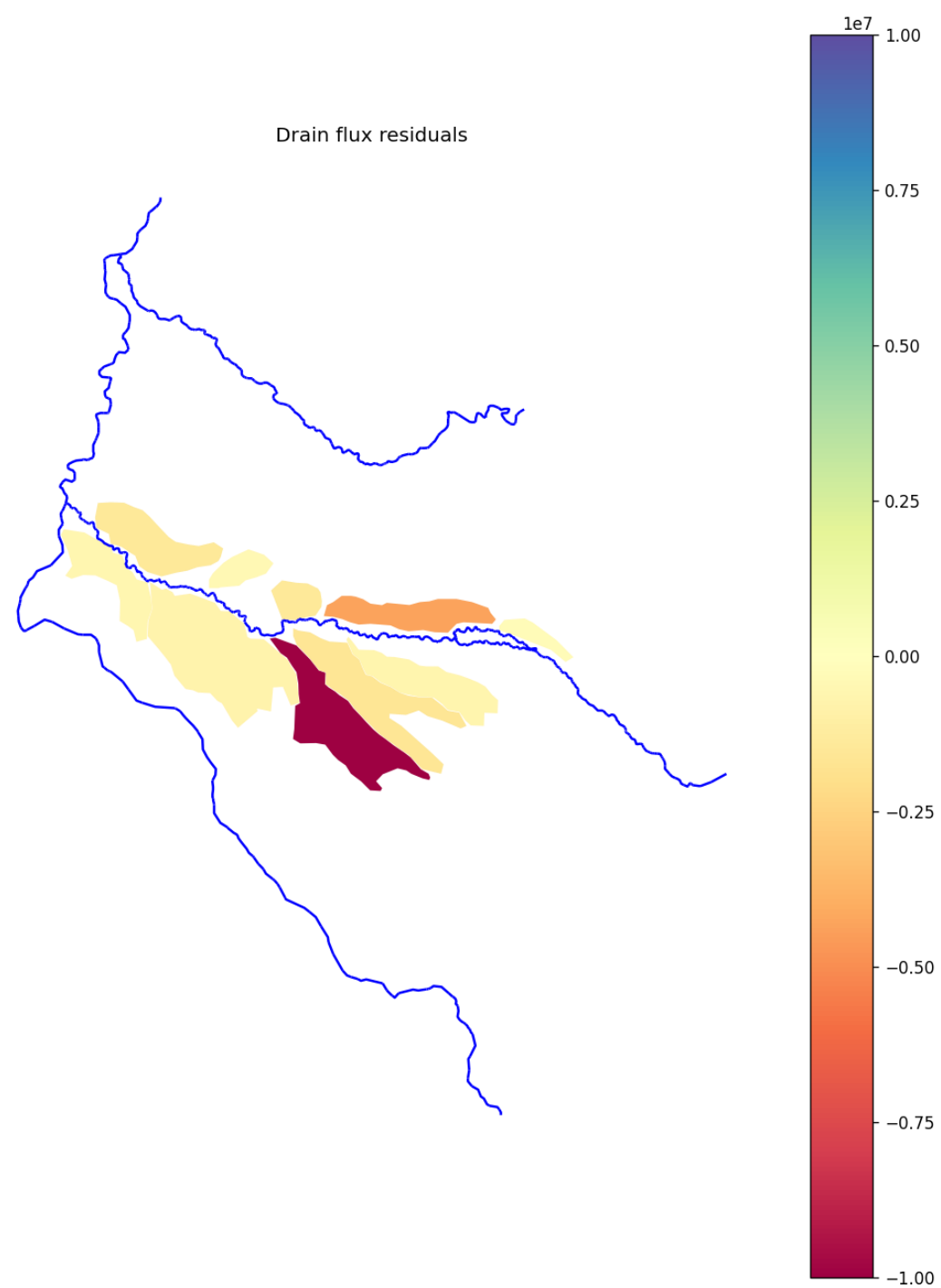
# Changes Tributary Adjustment Factors



# Changes Manual weight adjustments

(measurement error)

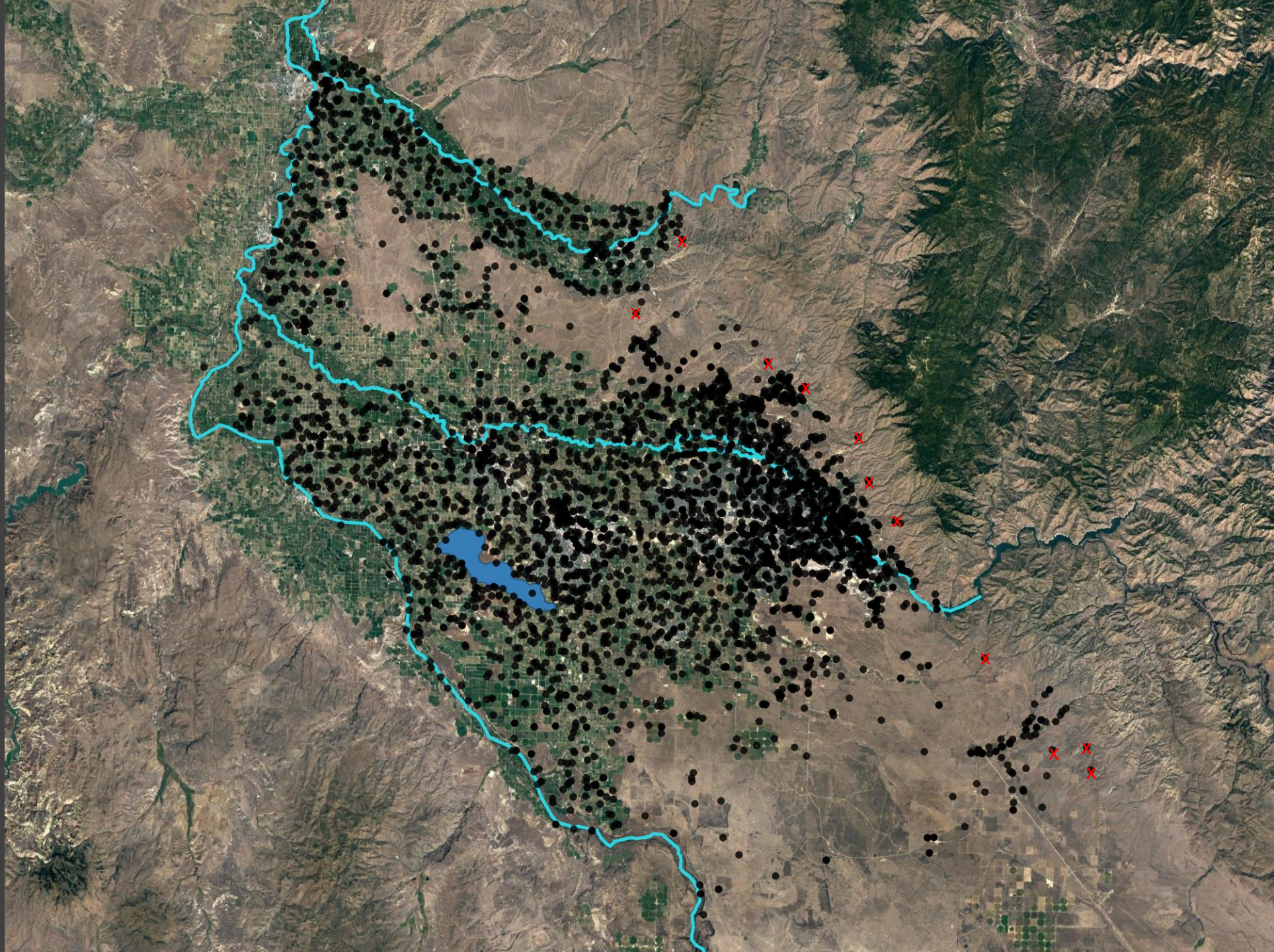
Indian Creek  
drain seepage ↓



# Changes Manual weight adjustments

(structural error)

Many foothill and  
some SE wells ↓ ↓ ↓



# Changes

## Add back observation groups

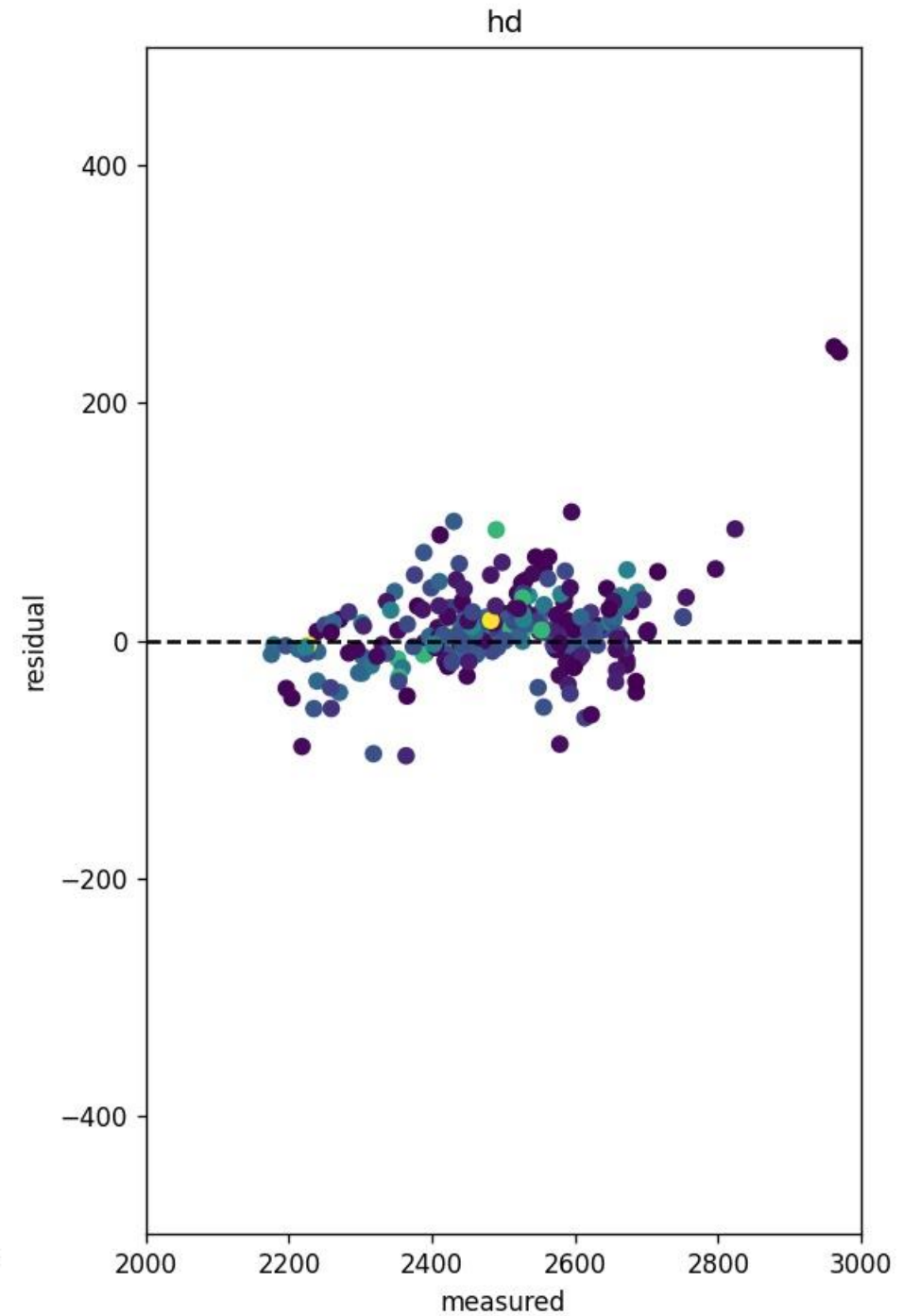
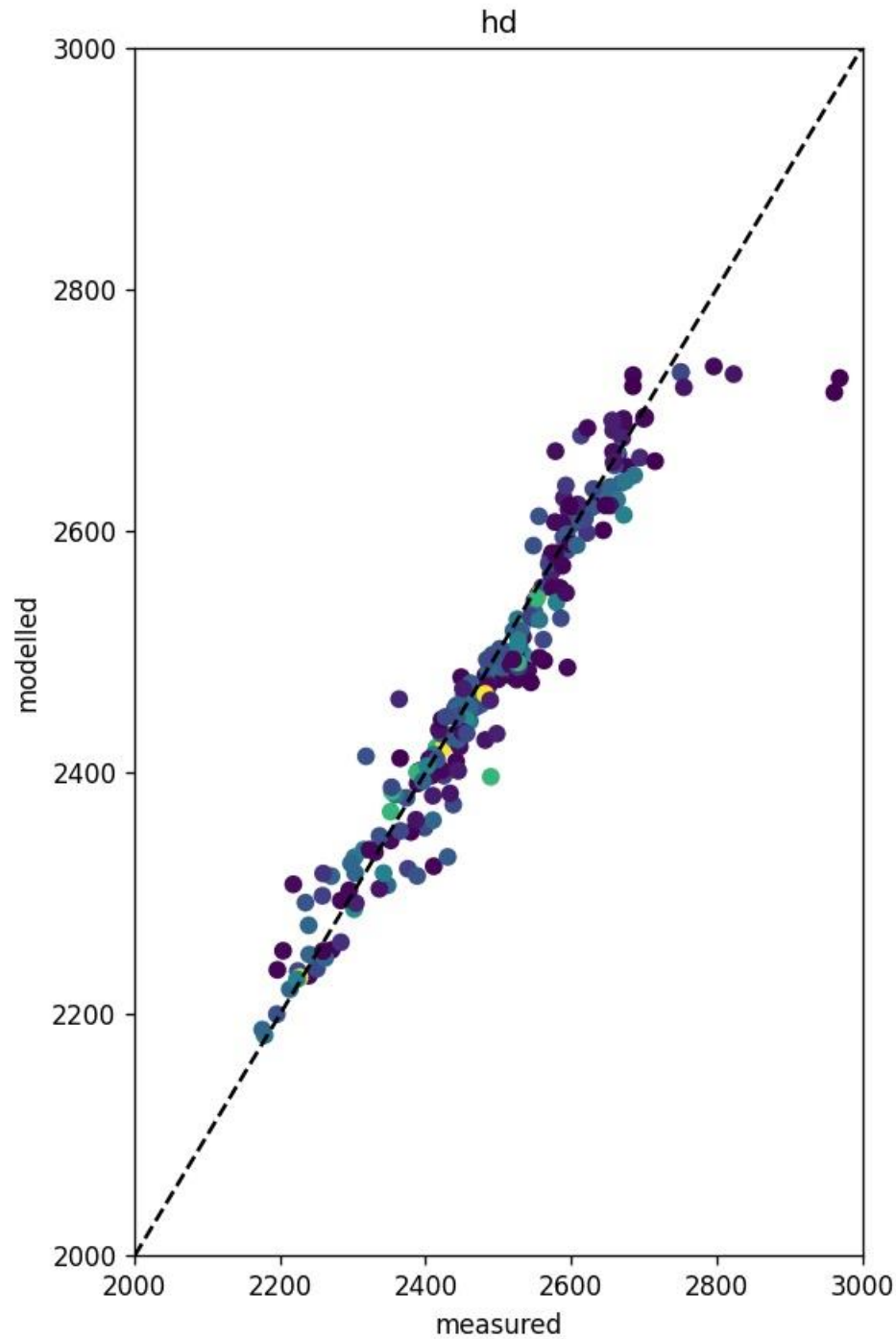
Observation Type	
✓	Water Levels
✓	Drain Flows
✓	Lowell Seepage
✓	River Seepage
✗	Temporal Differences
✓	Vertical Water Level Differences
✗	Net Water Budget Values*
✓	Preferred Parameters (simplified)

Weighting Schemes	
✓	Measurement error
~	~ Equalize group phi
✗	# Measurements at location
✓	Spatial density
✗	Temporal density
✗	"Events"
✓	Structural error
✗	Overall budget
✗	Others???

# Steady-State Troubleshooting Done

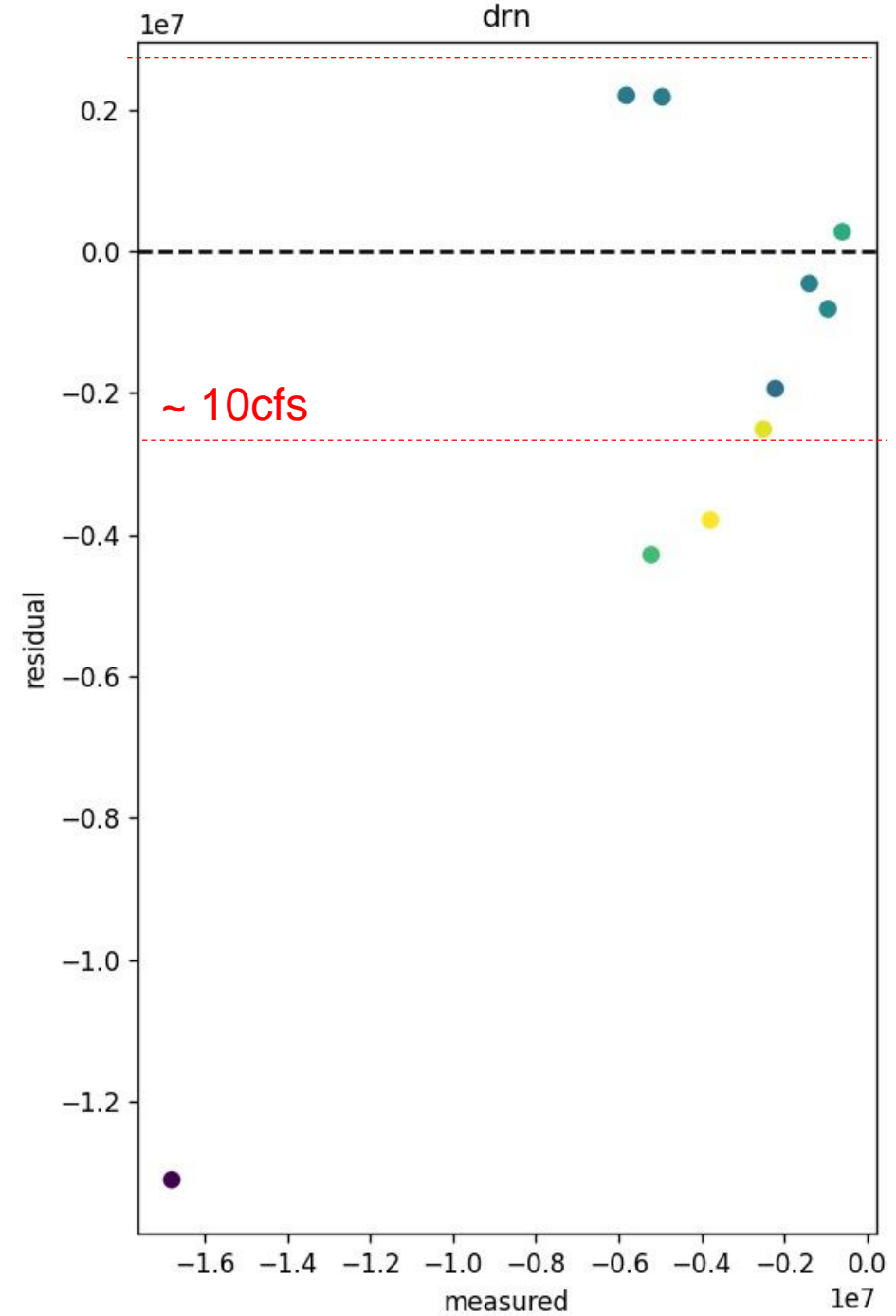
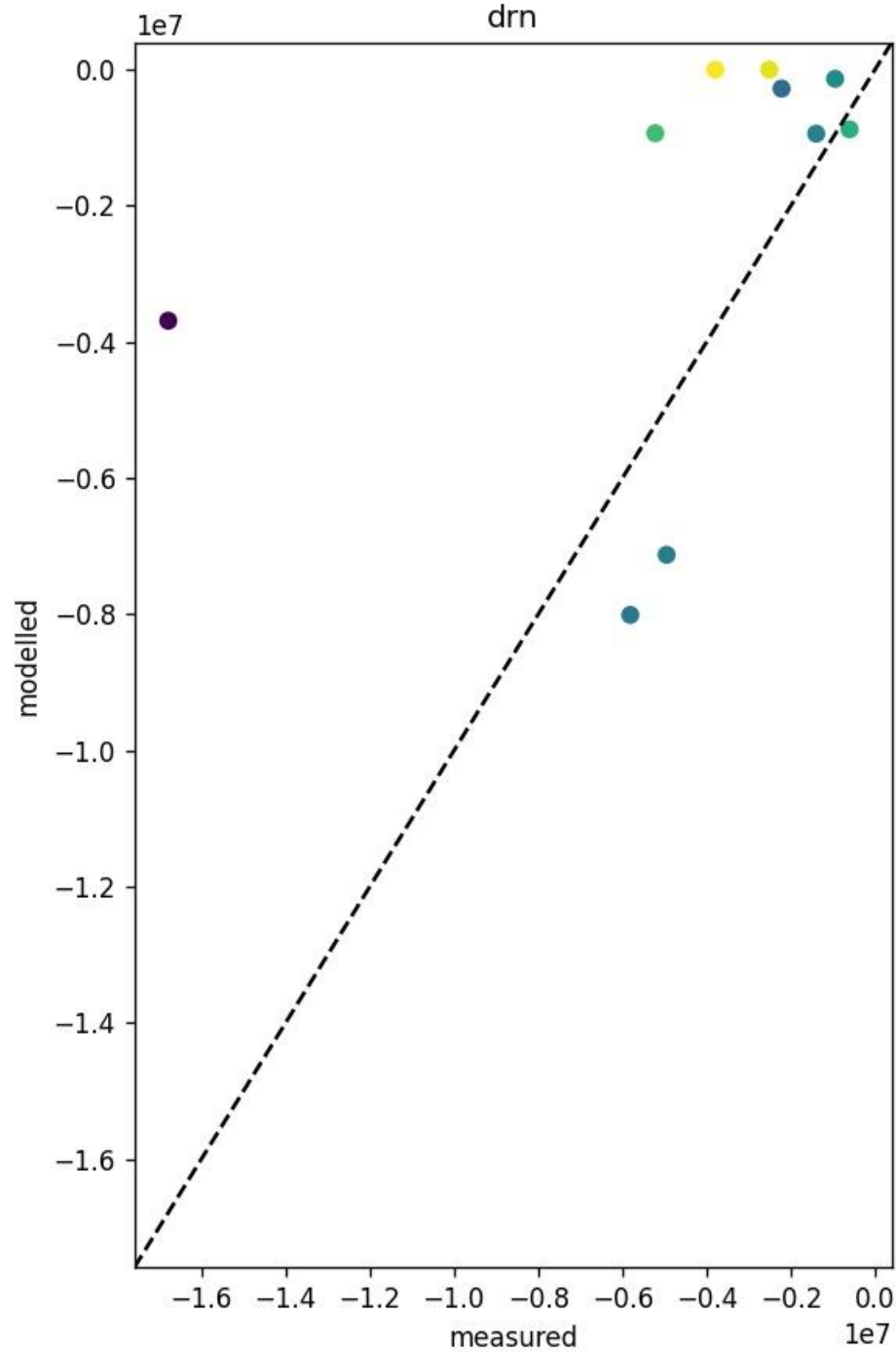
# Pseudo Steady-State

## Overall residuals: heads



# Pseudo Steady-State

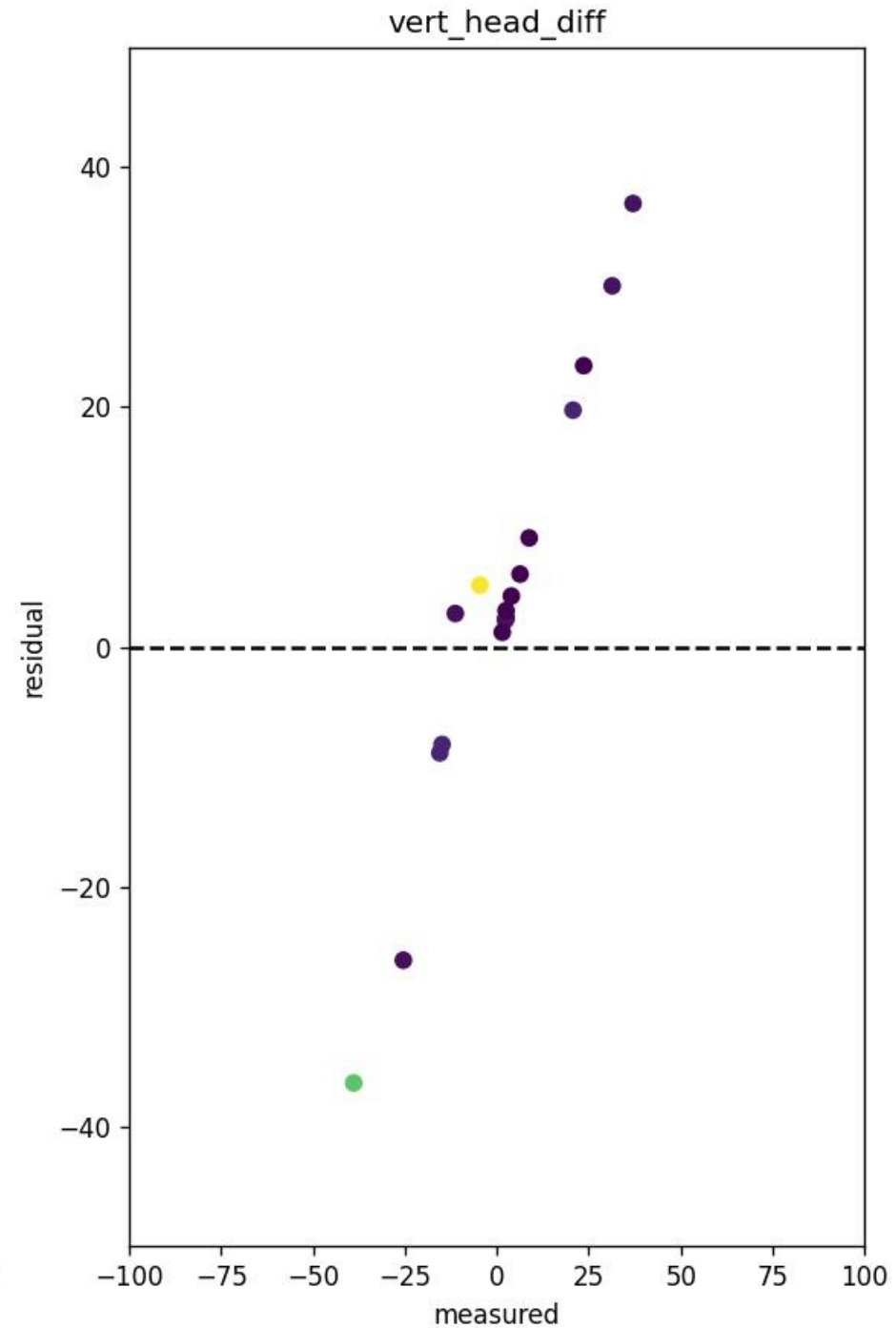
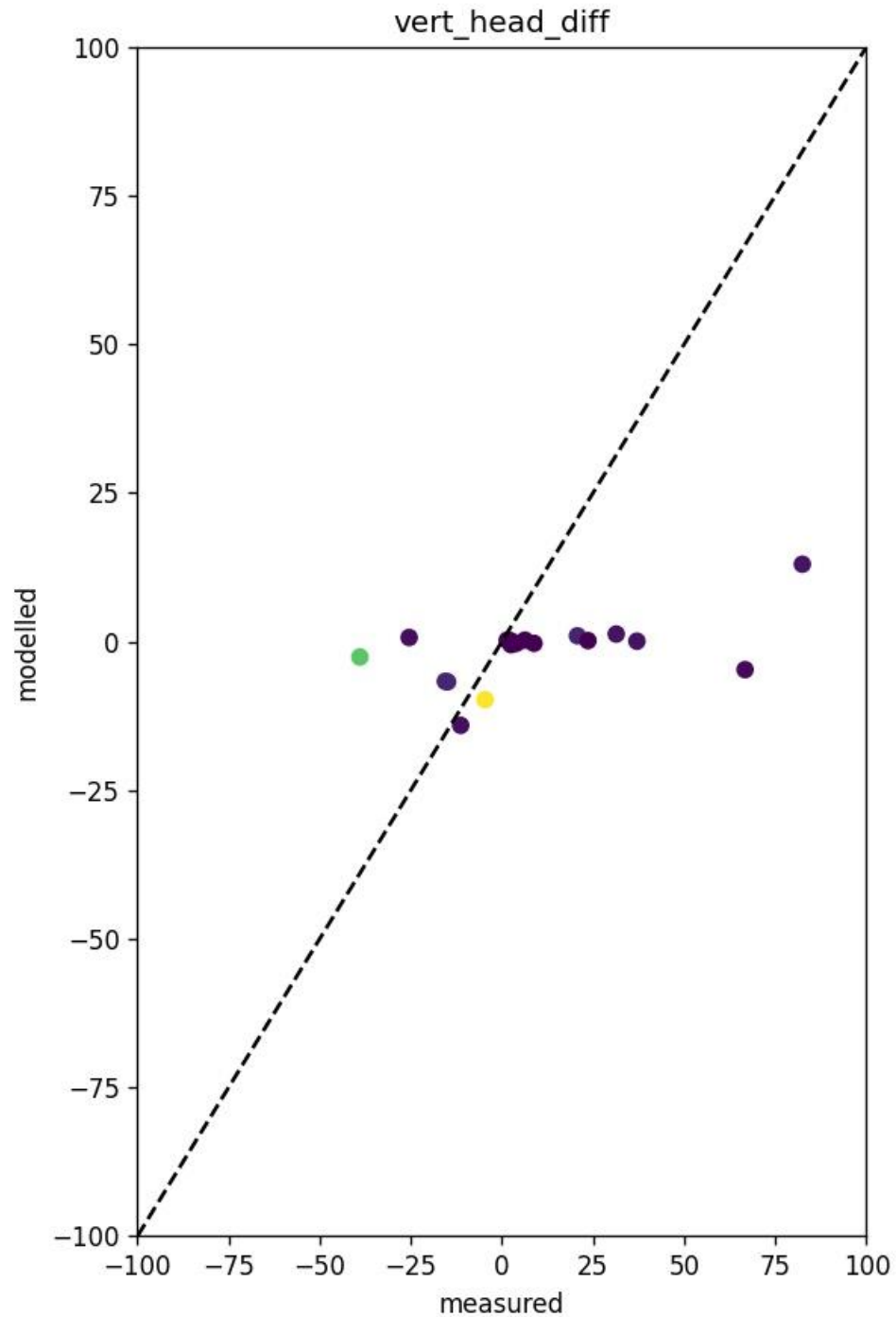
## Overall residuals: drains





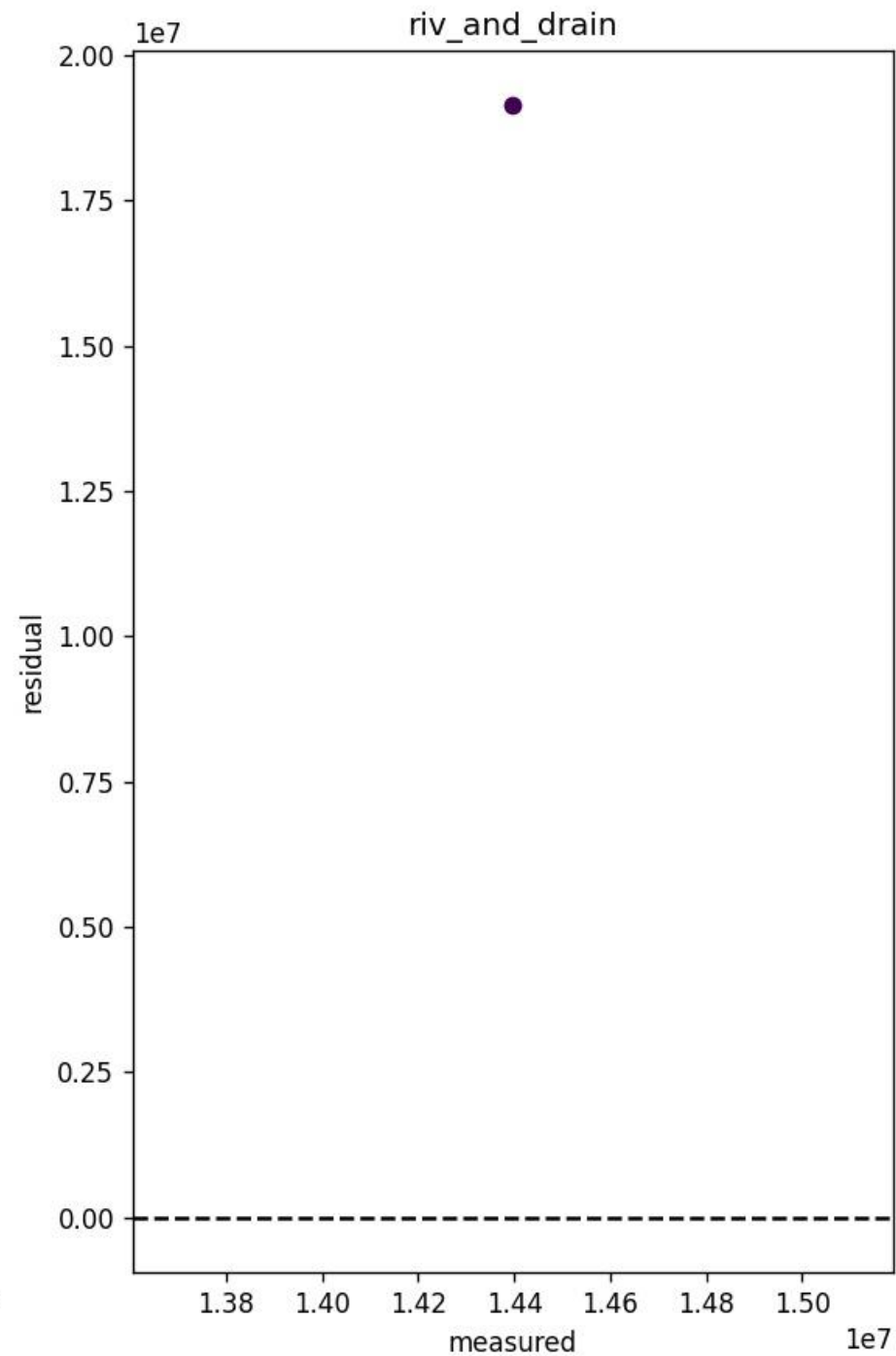
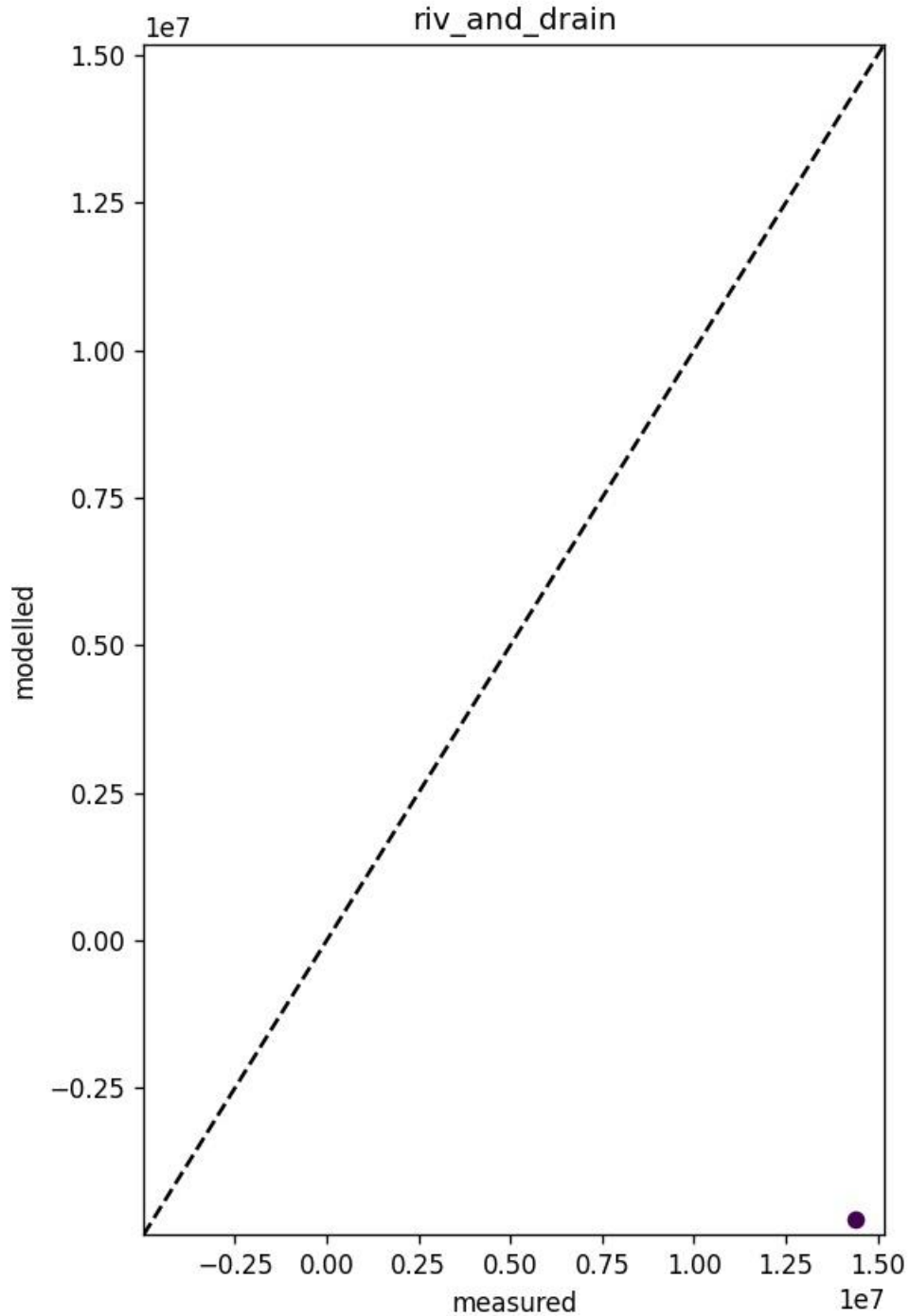
# Pseudo Steady-State

Overall residuals:  
vertical differences



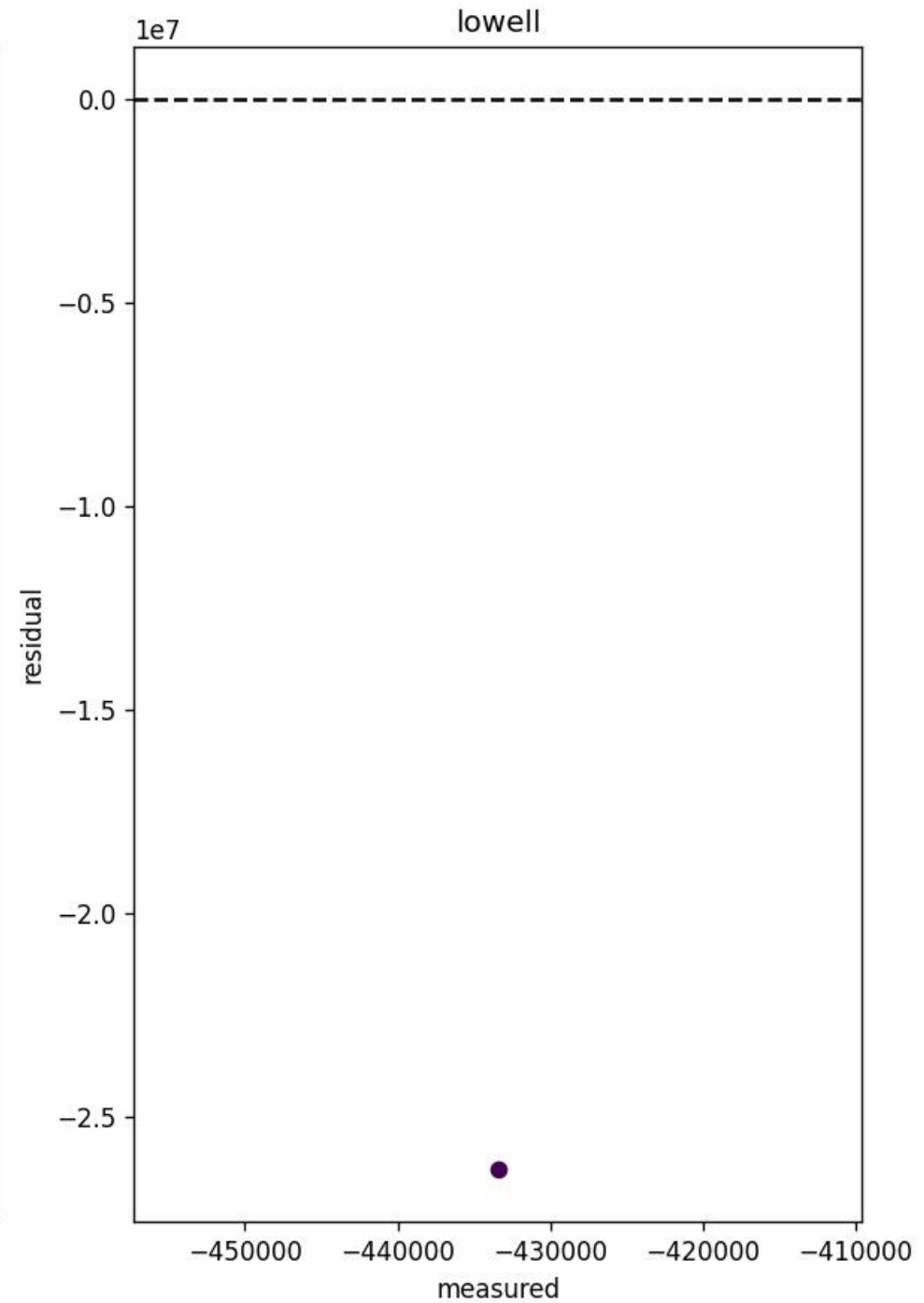
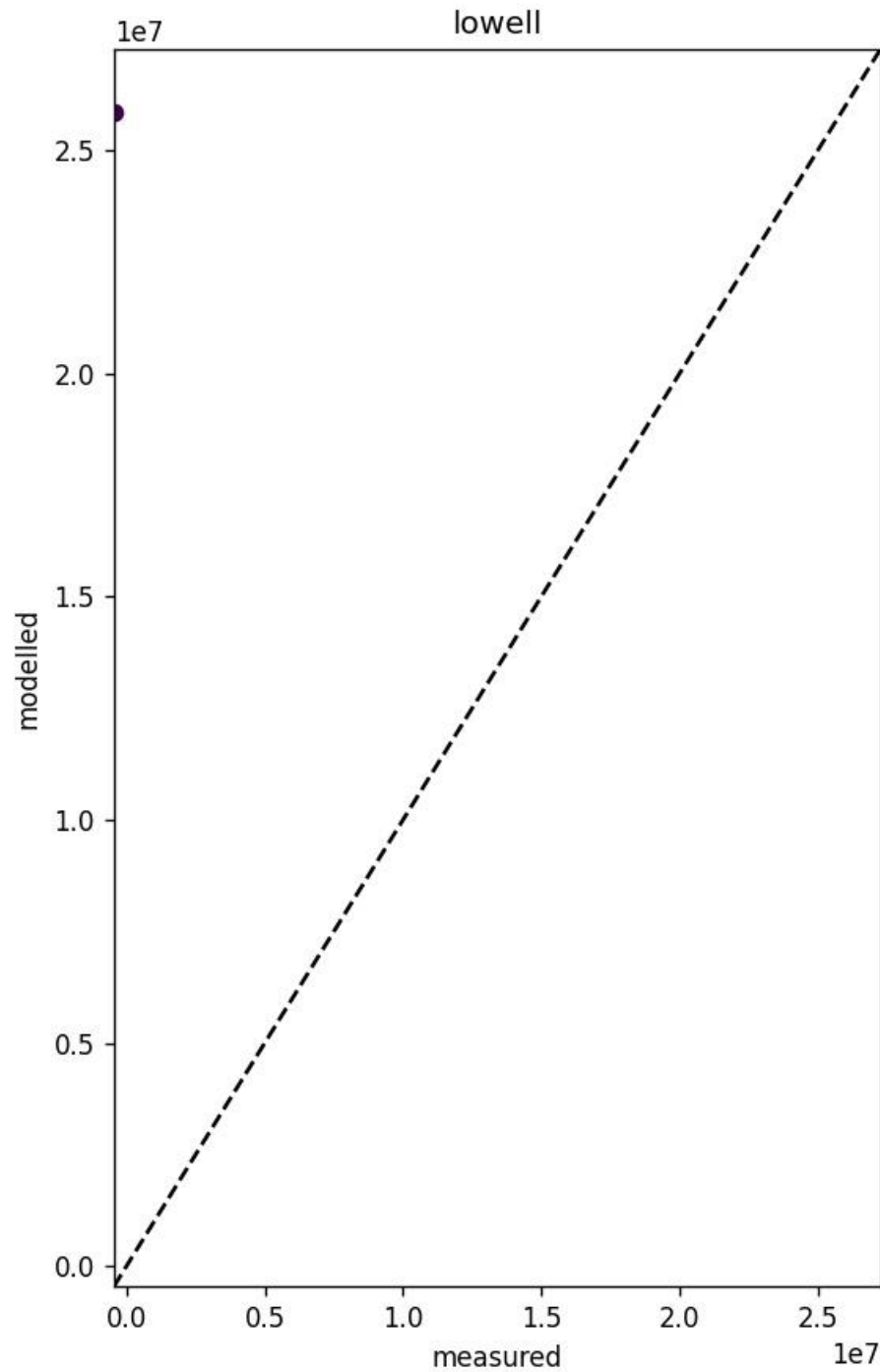
# Pseudo Steady-State

Overall residuals:  
river



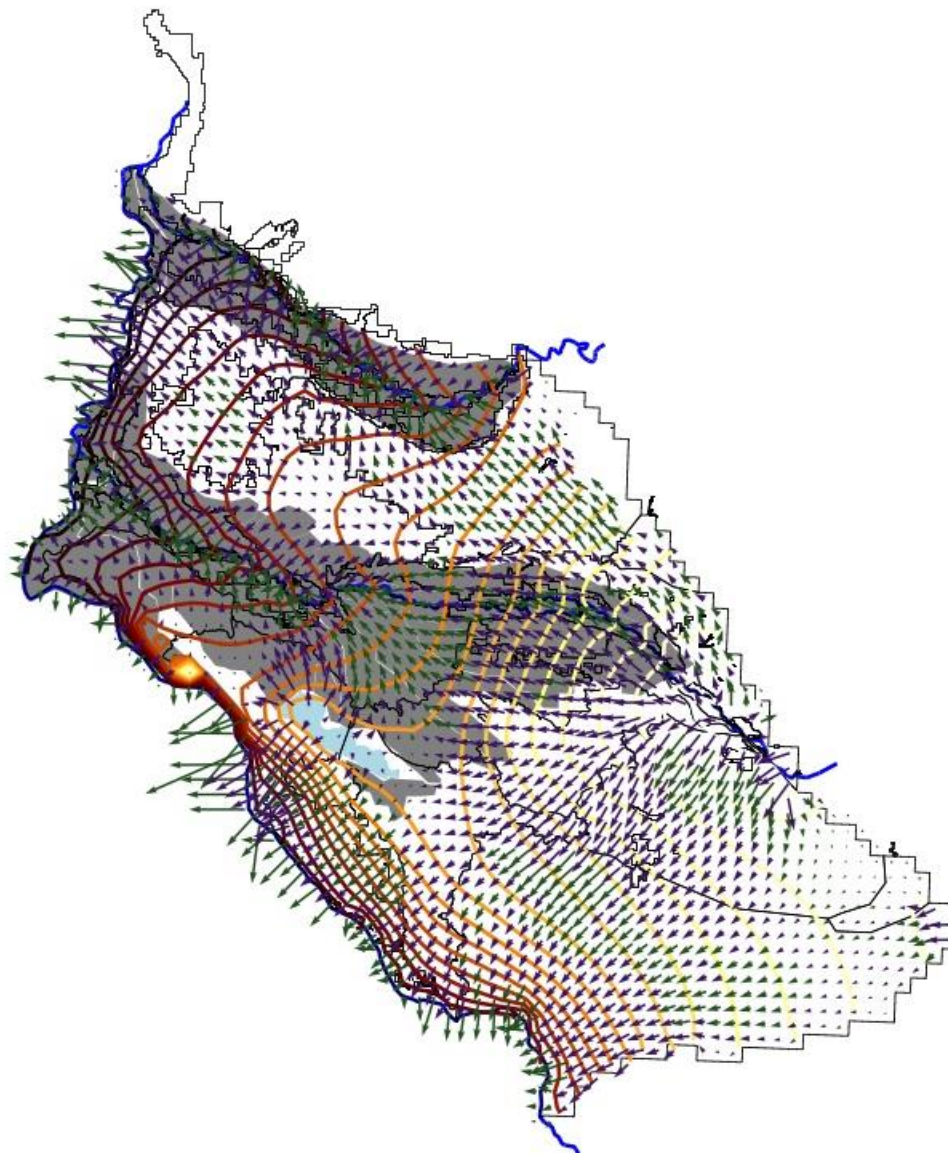
# Pseudo Steady-State

## Overall residuals: Lowell



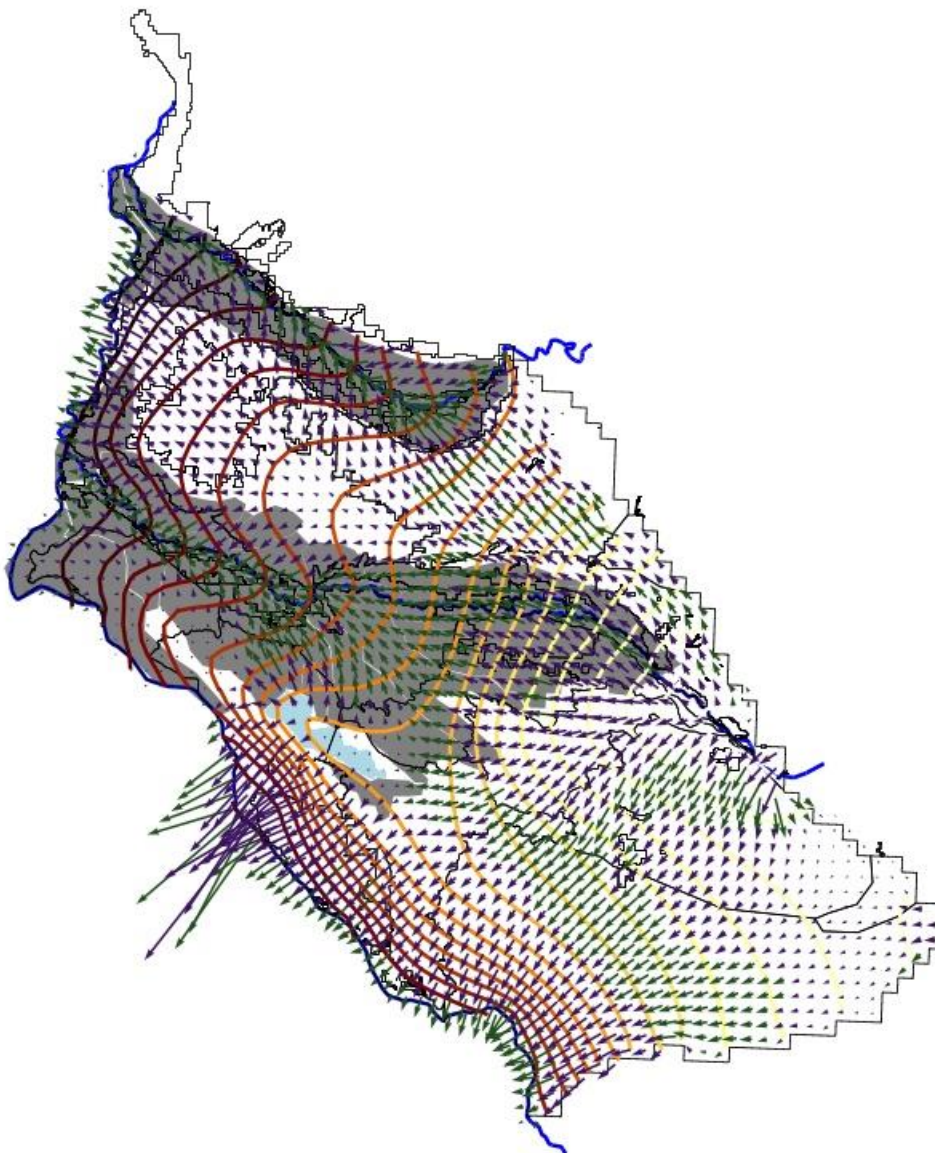
# Pseudo Steady- State Head and flux

Layer 1  
green: upward component  
purple: downward component



# Pseudo Steady- State Head and flux

Layer 6  
green: upward component  
purple: downward component



# Transient Calibration

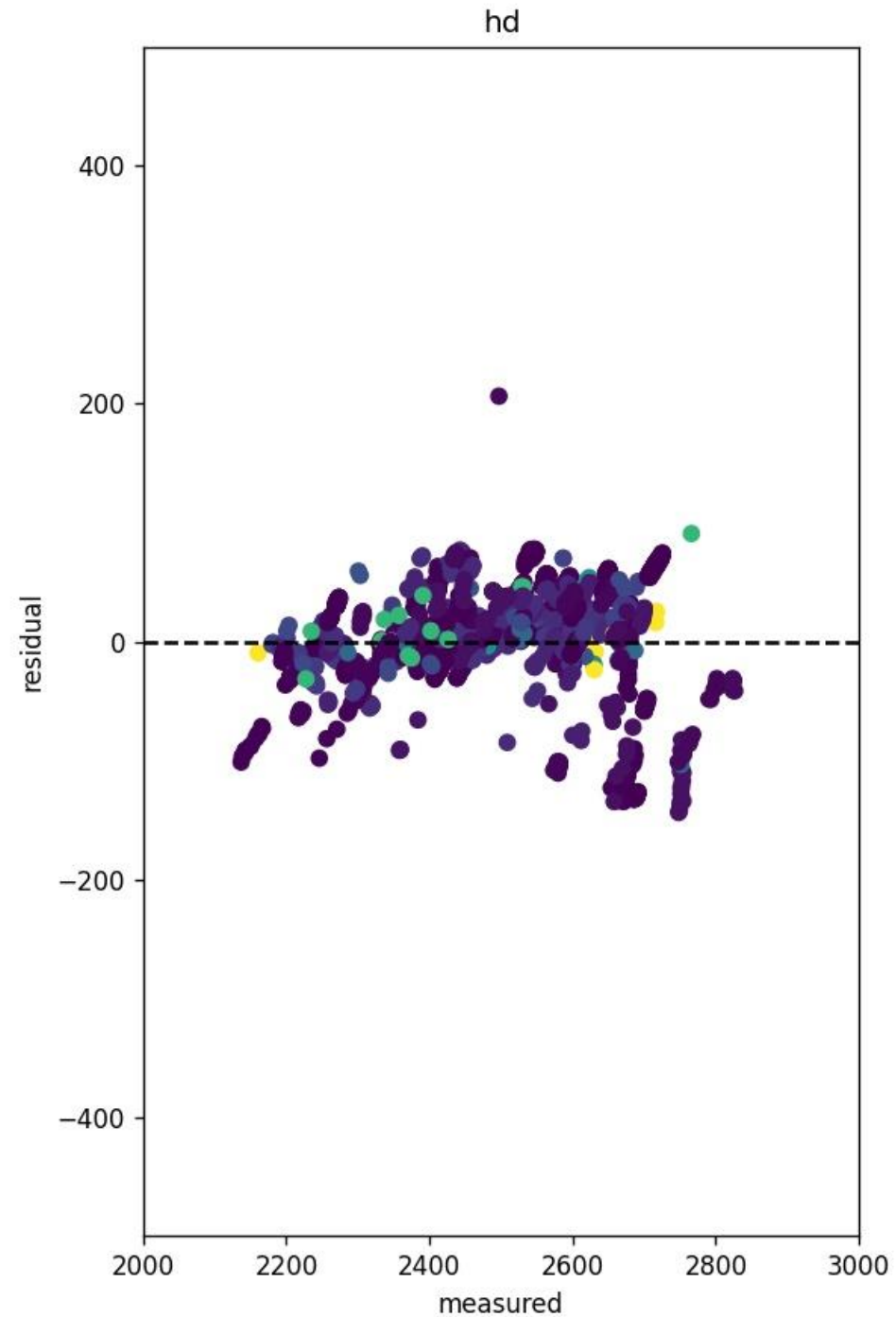
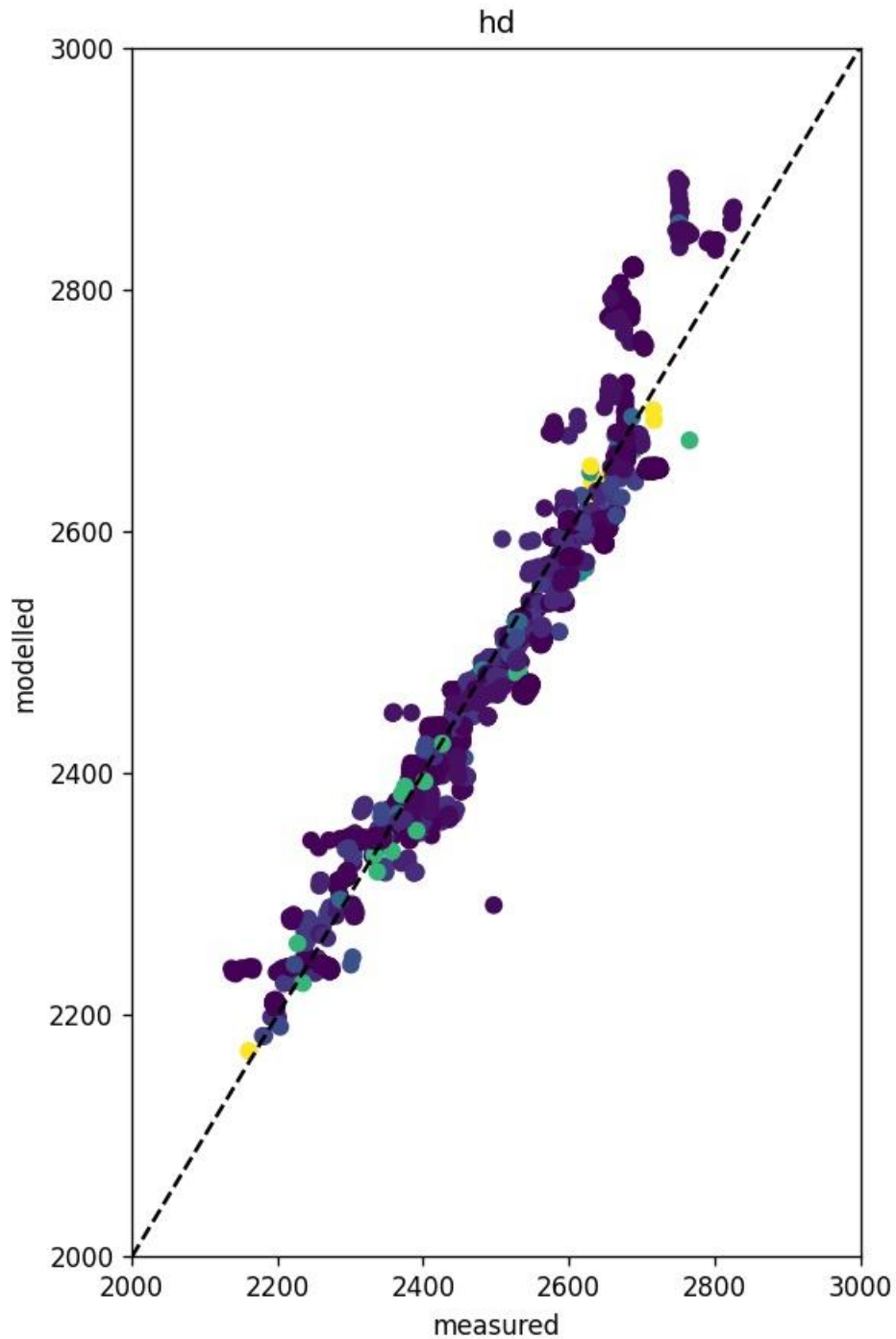
# Transient

- Add Back Periods and Observations
- 4-year burn-in period
- 1<sup>st</sup> adjustments of  $S_y$ ,  $S_s$

Observation Type	
✓	Water Levels
✓	Drain Flows
✓	Lowell Seepage
✓	River Seepage
✓	Temporal Differences
✓	Vertical Water Level Differences
✗	Net Water Budget Values*
✓	Preferred Parameters (simplified)

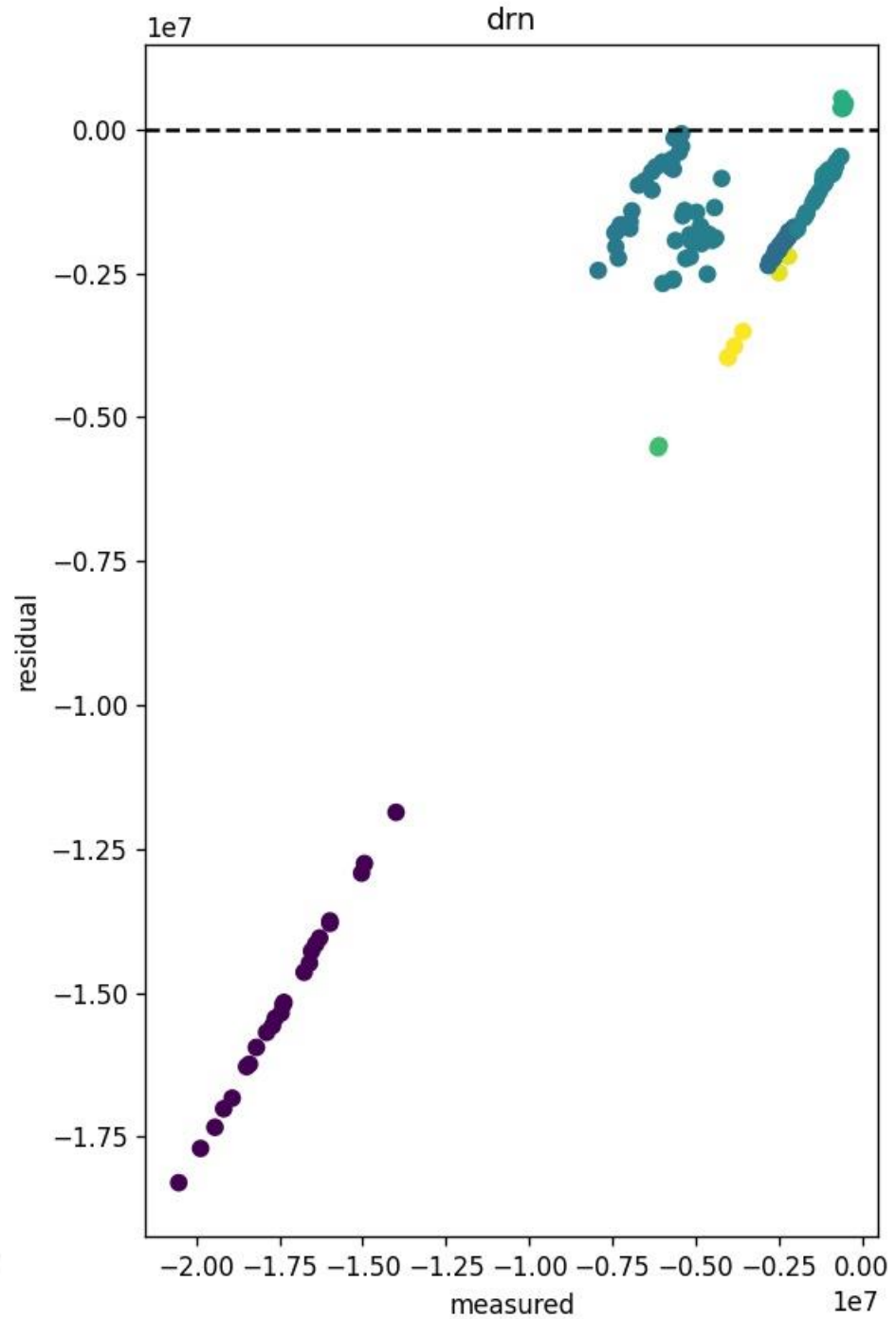
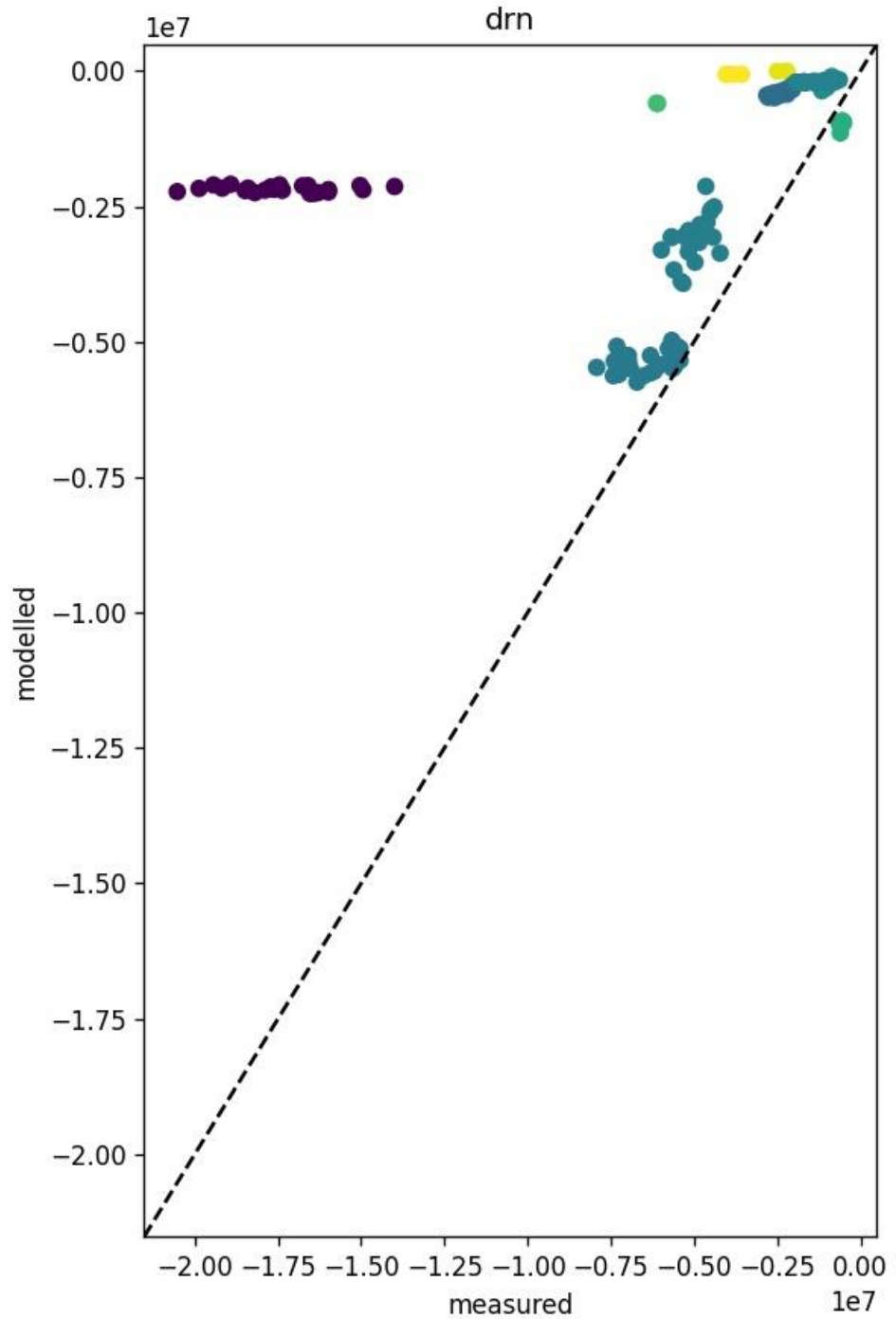
Weighting Schemes	
✓	Measurement error
✓	~ Equalize group phi
✓	# Measurements at location
✓	Spatial density
✓	Temporal density
✗	“Events”
✓	Structural error
✗	Overall budget
✗	Others???

# Transient In progress...

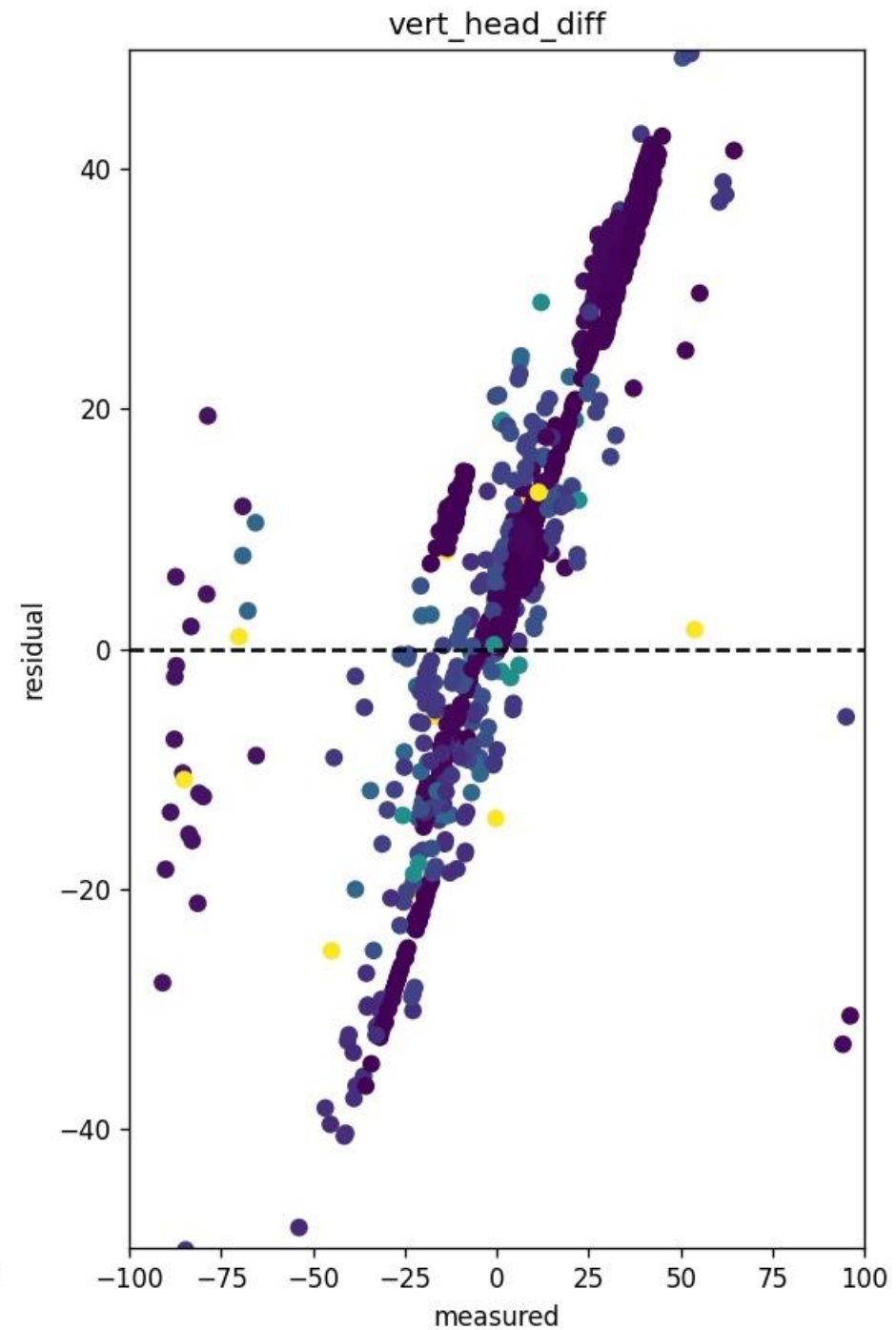
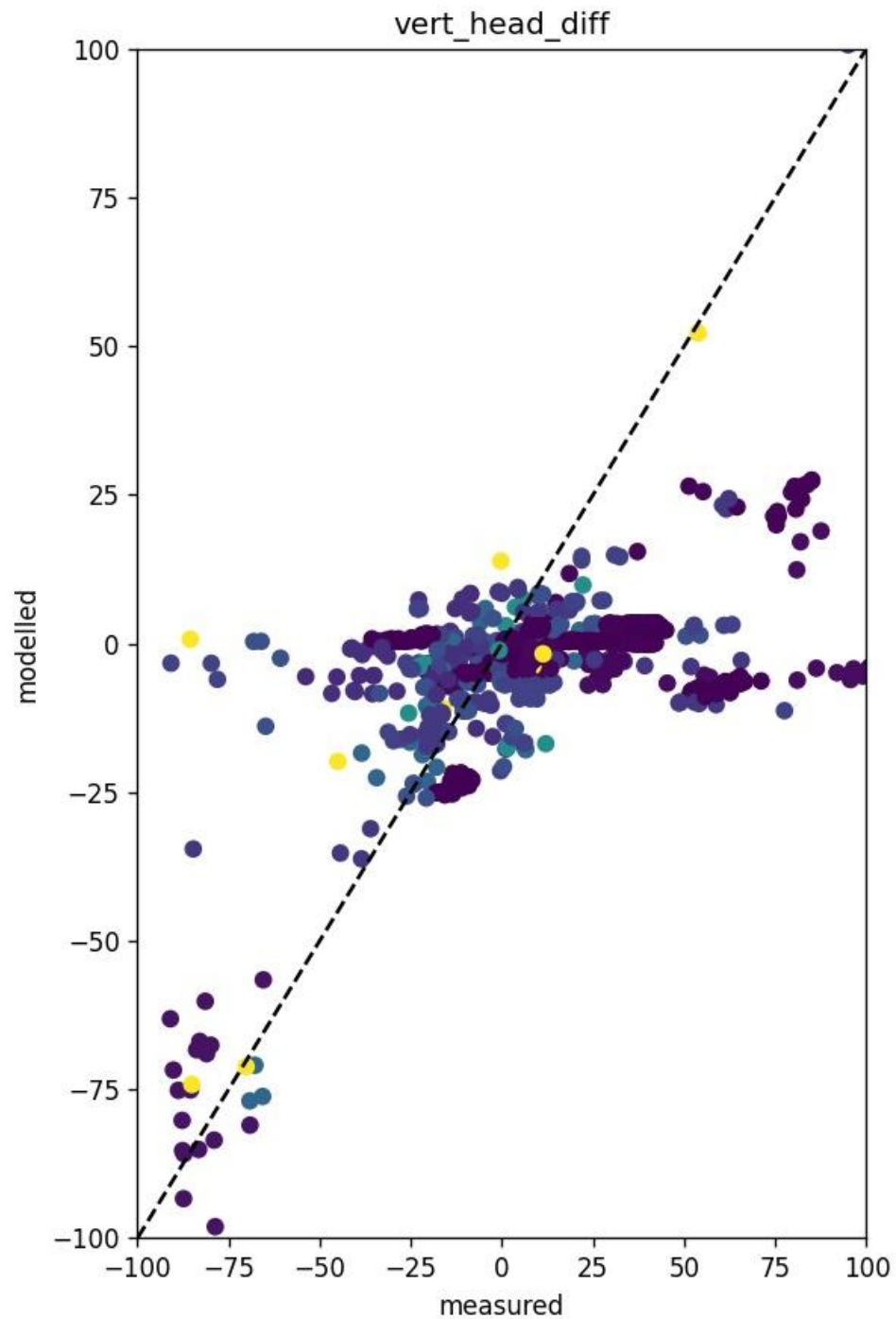




# Transient In progress...

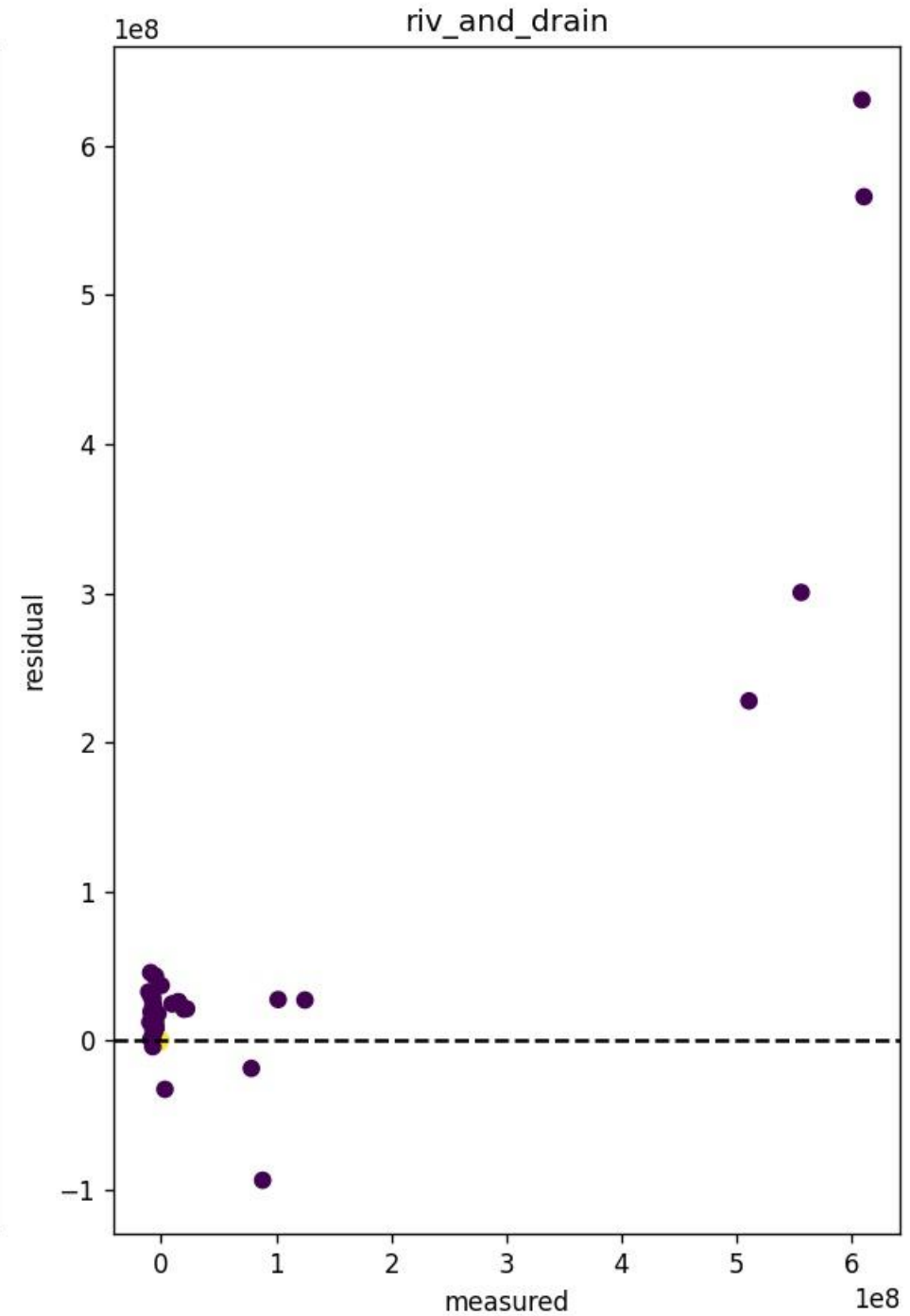
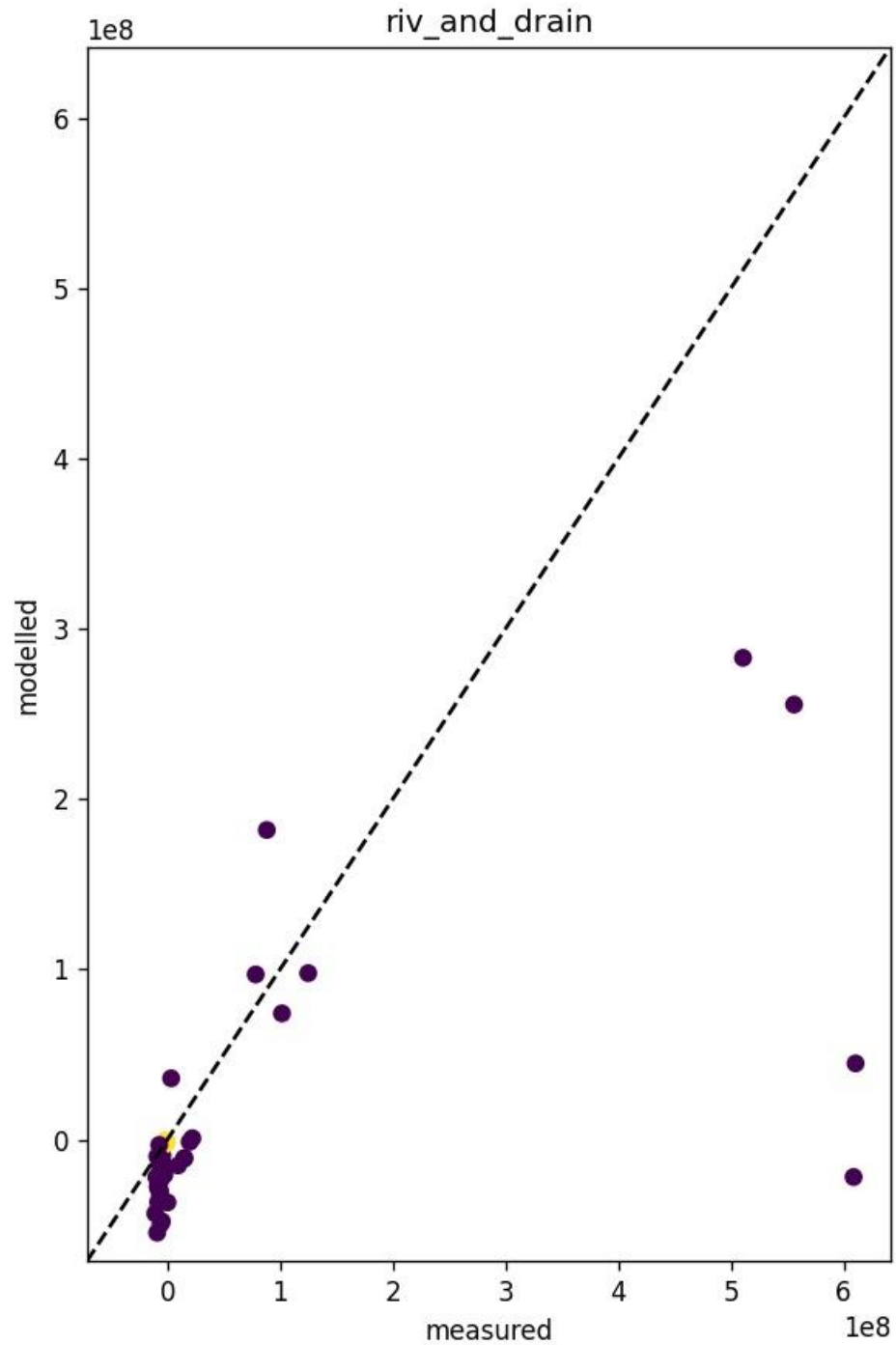


# Transient In progress...



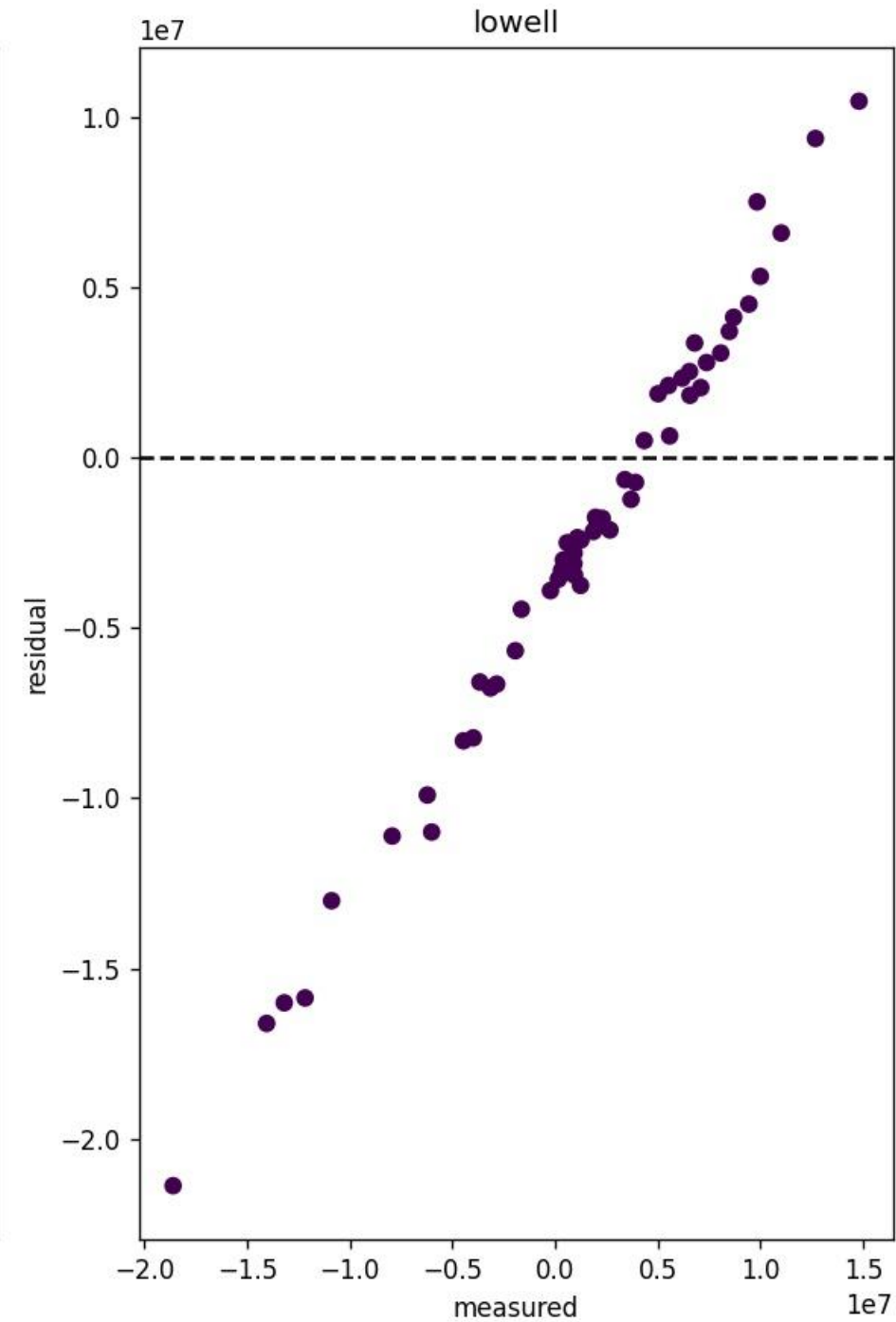
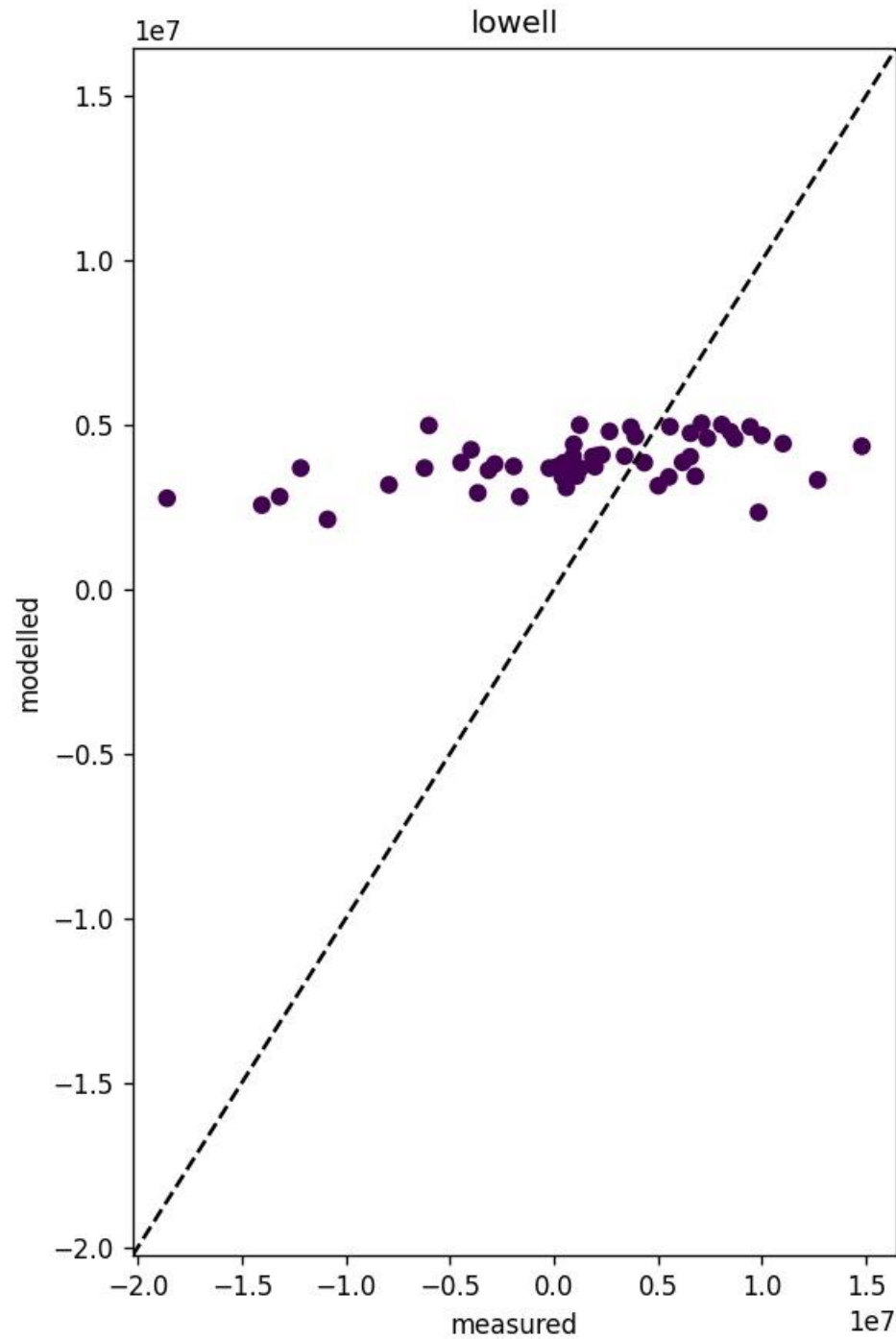
# Transient

In progress...



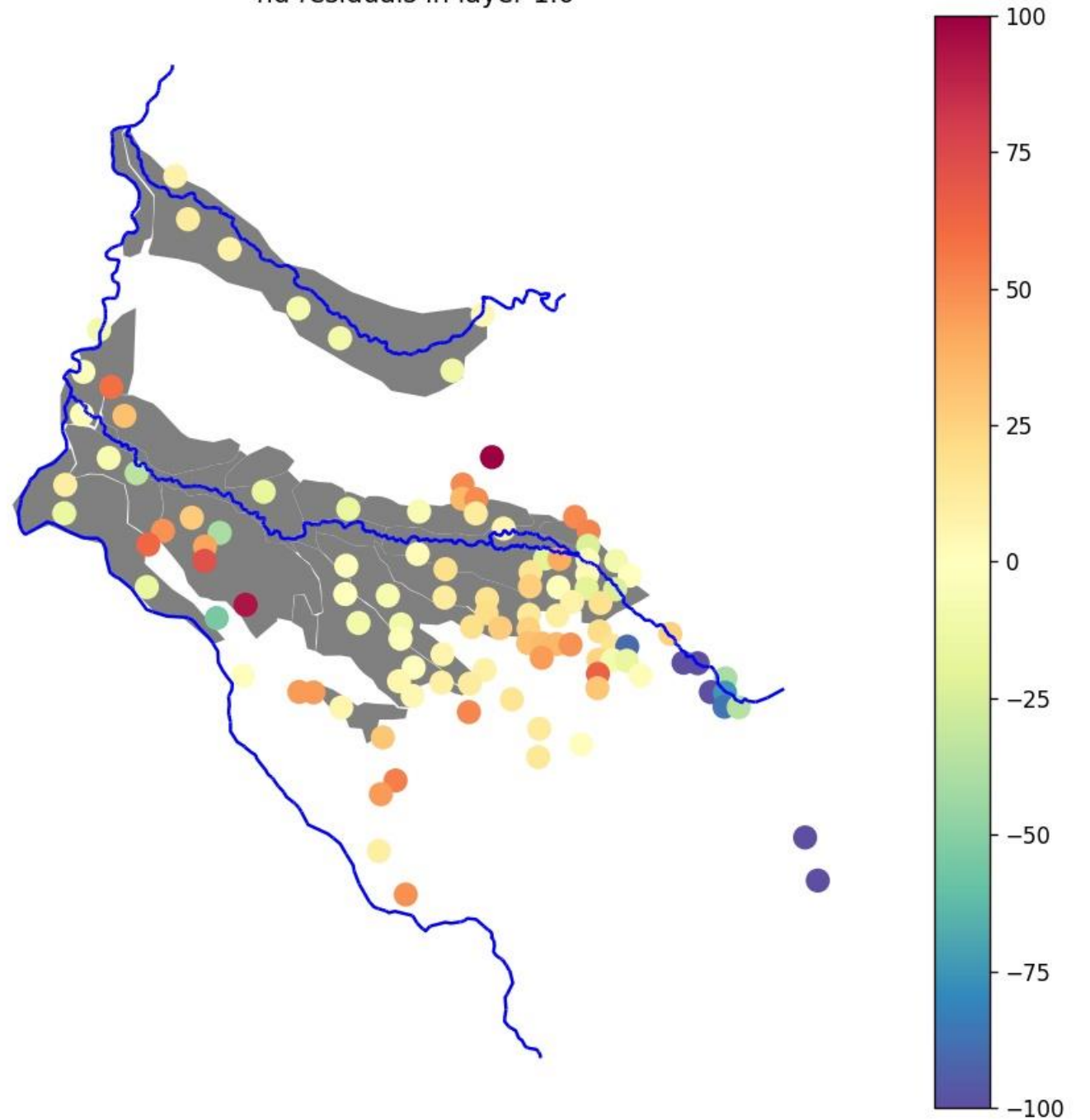
# Transient

In progress...



# Transient In progress...

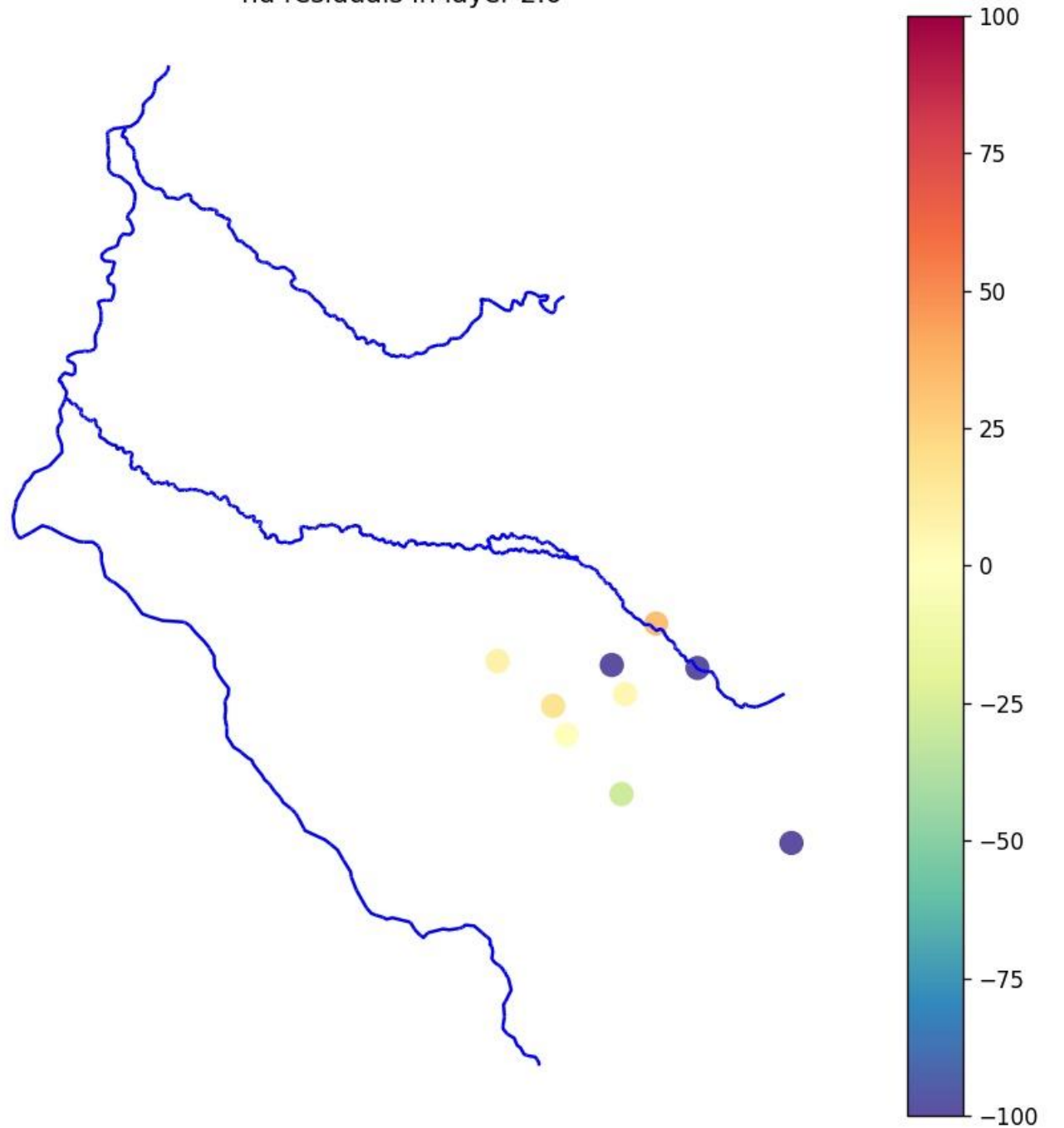
hd residuals in layer 1.0



# Transient

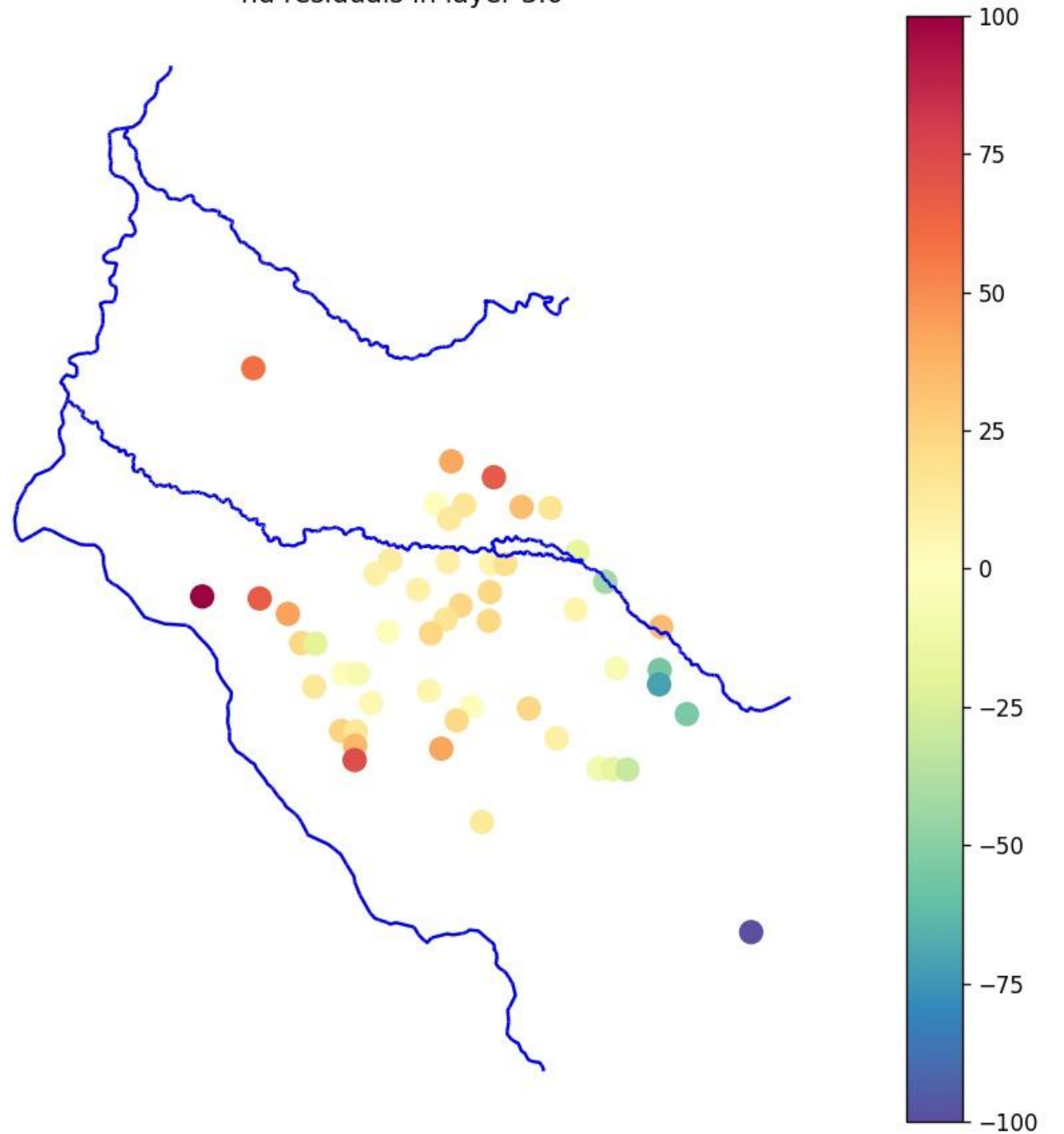
In progress...

hd residuals in layer 2.0



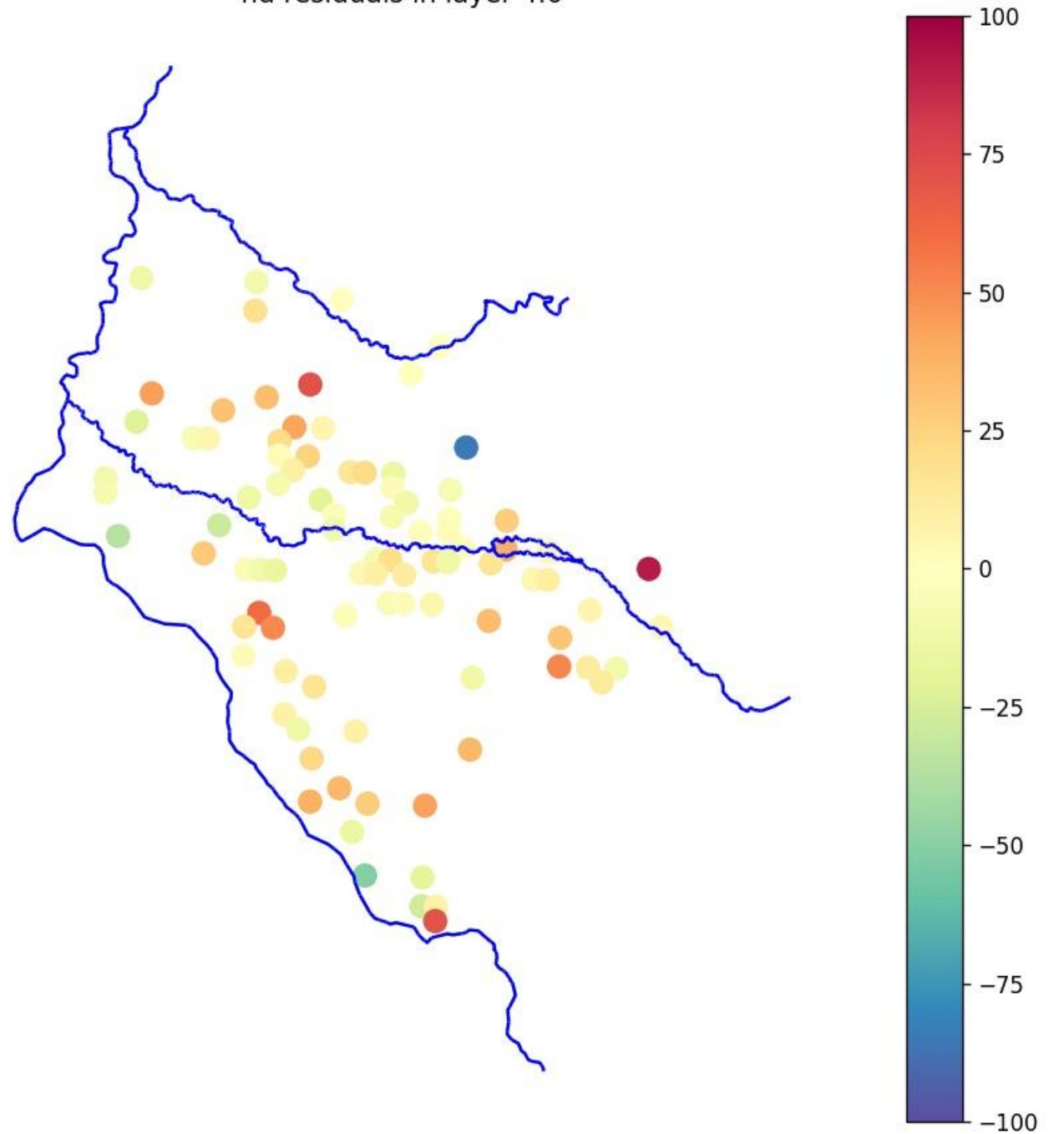
# Transient In progress...

hd residuals in layer 3.0



# Transient In progress...

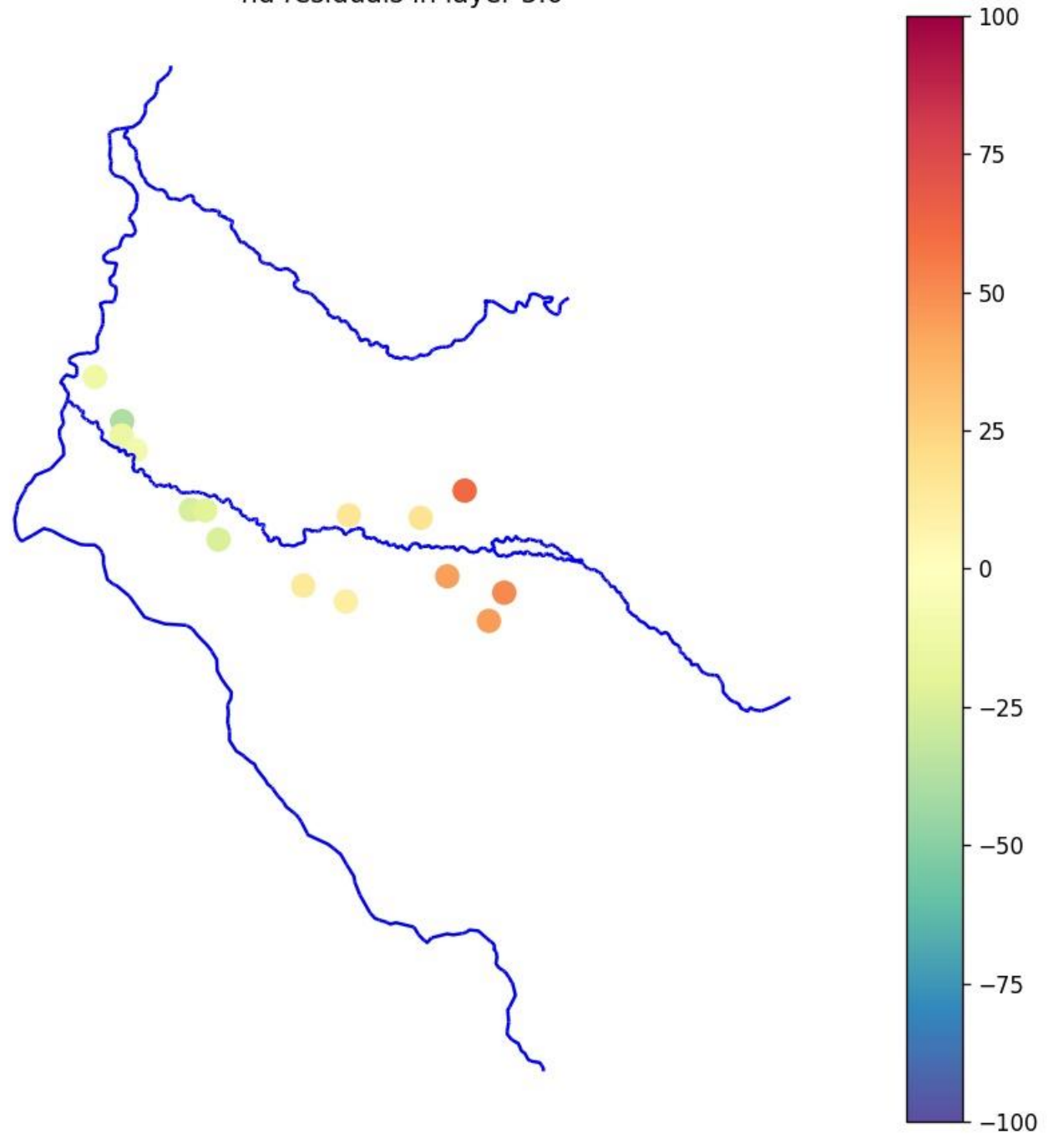
hd residuals in layer 4.0





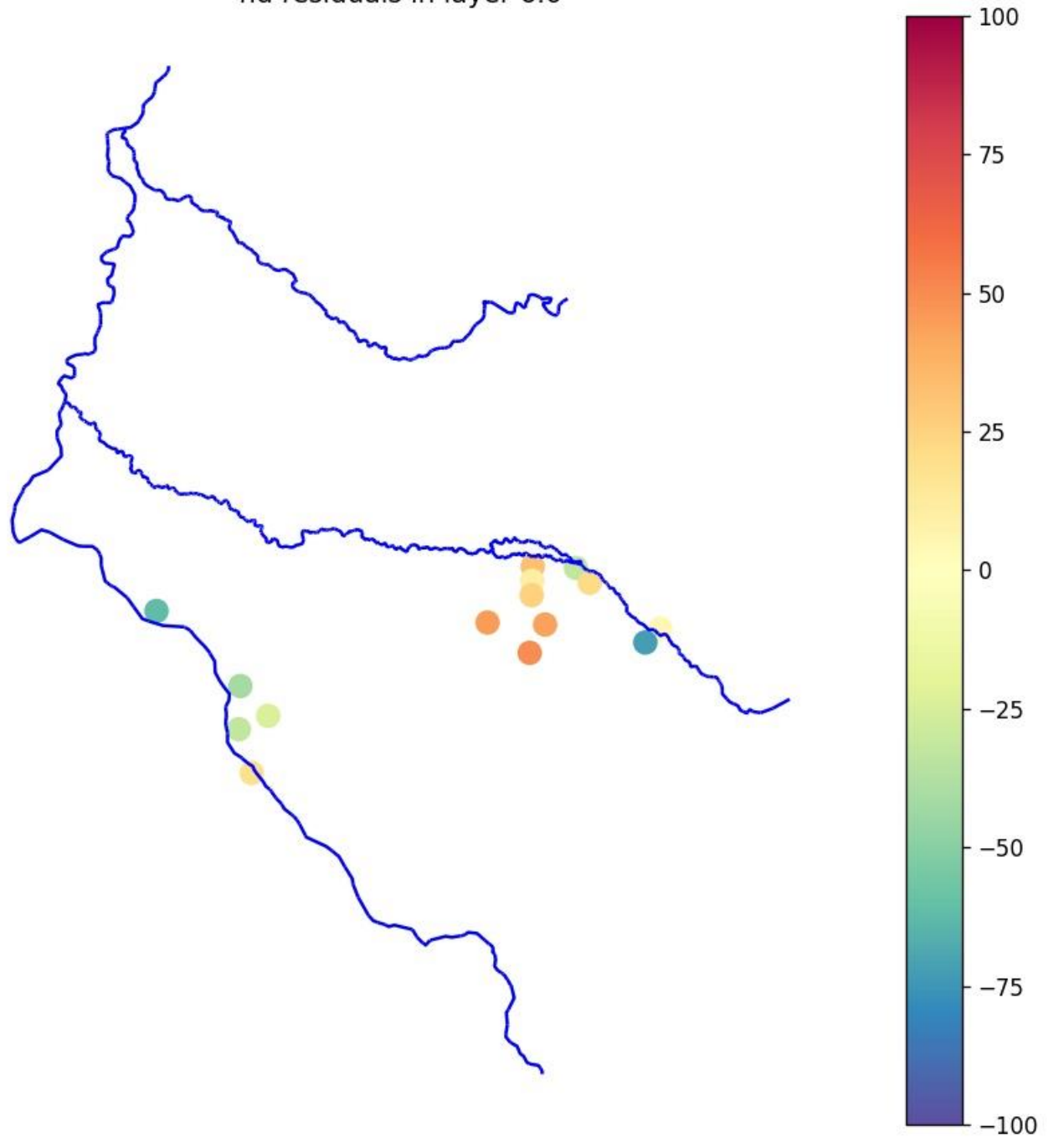
# Transient In progress...

hd residuals in layer 5.0



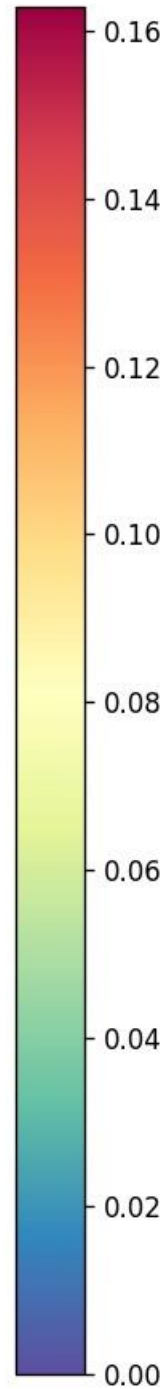
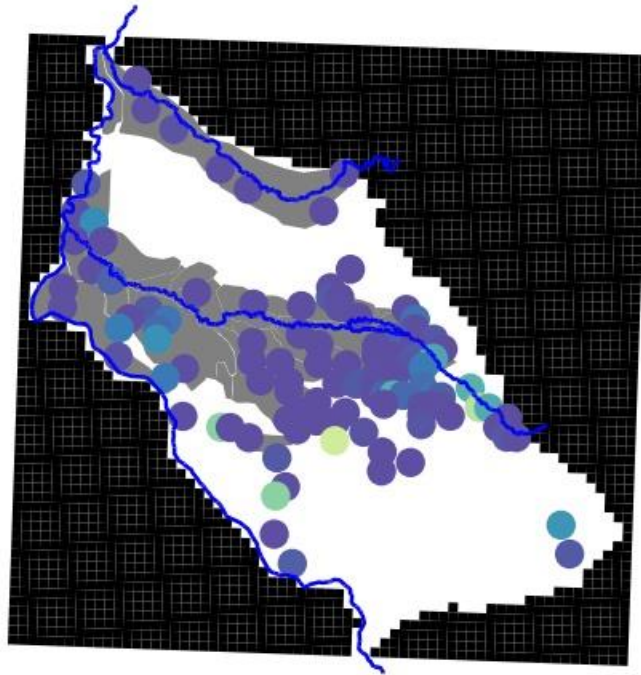
# Transient In progress...

hd residuals in layer 6.0

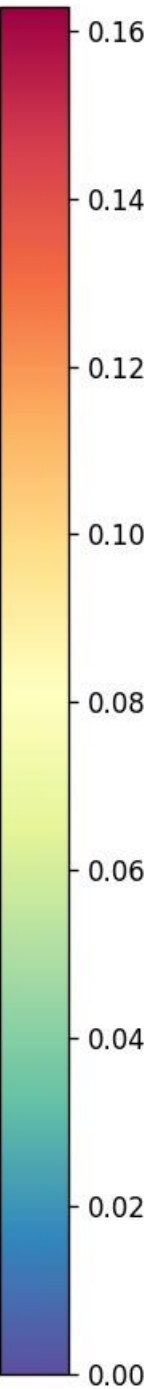
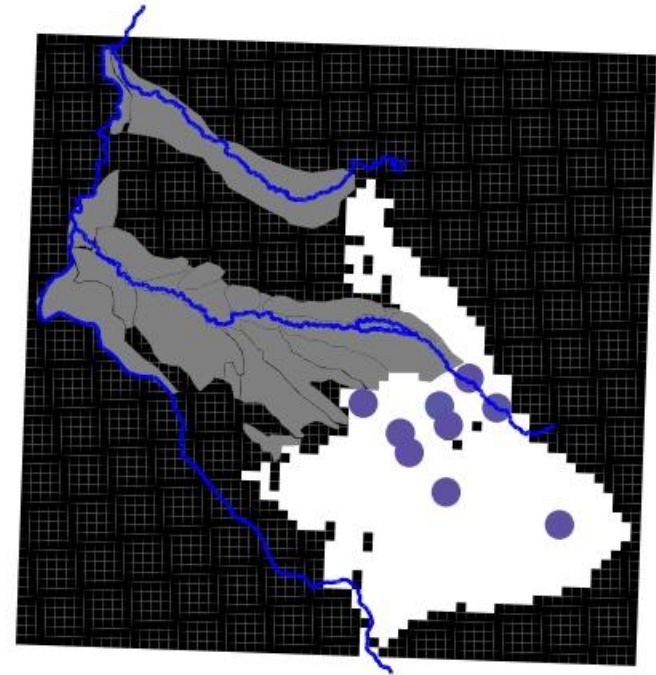


# Transient In progress...

hd in layer 1  
proportion of group phi

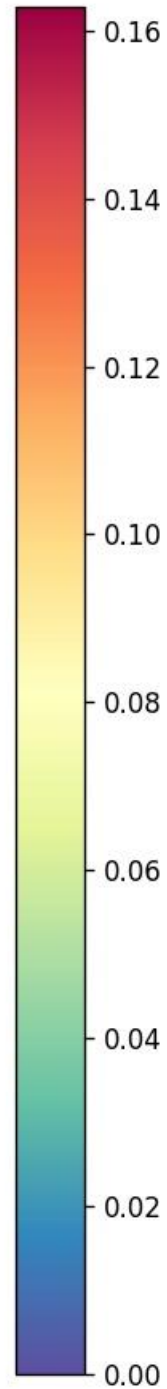
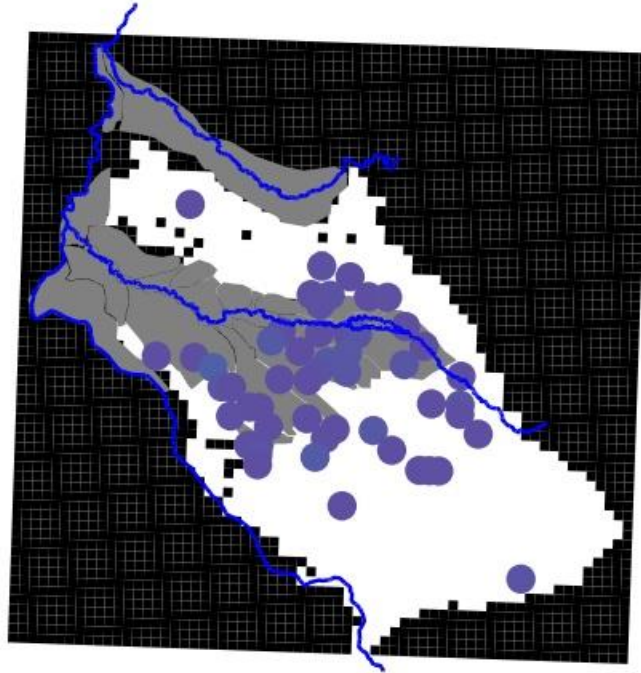


hd in layer 2  
proportion of group phi

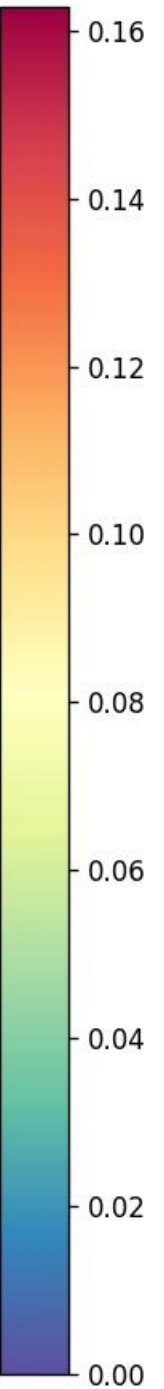
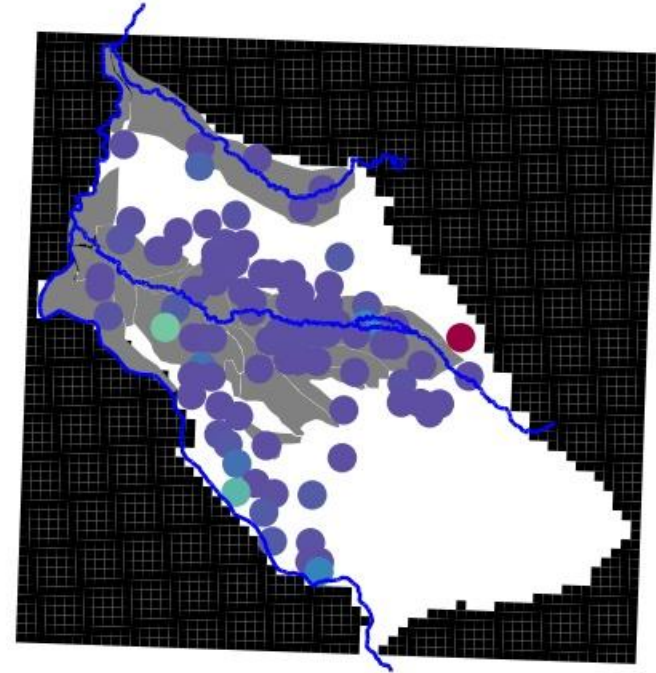


# Transient In progress...

hd in layer 3  
proportion of group phi

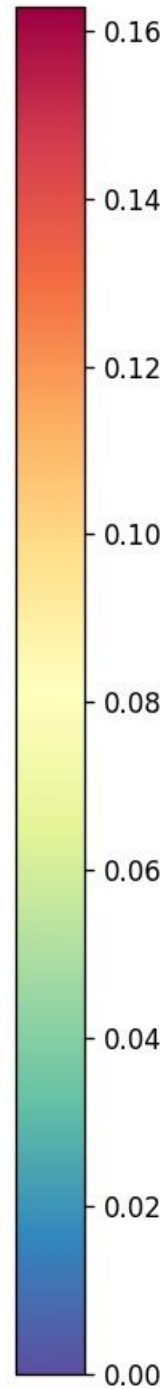
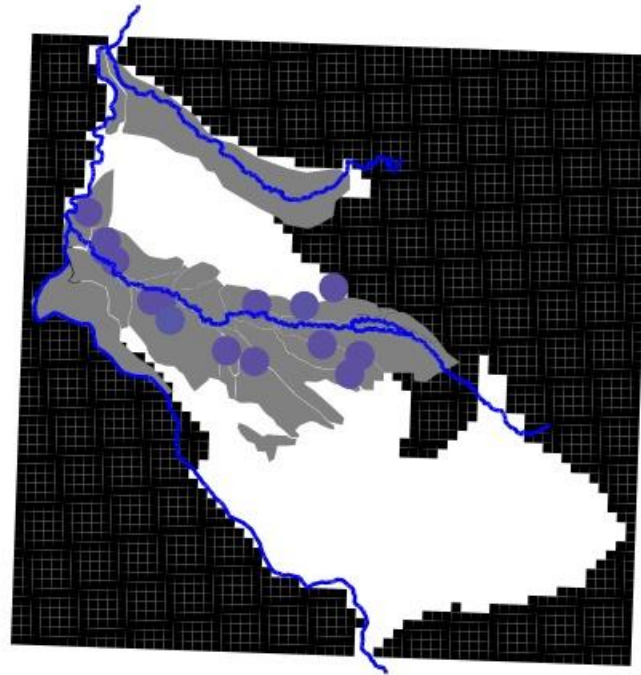


hd in layer 4  
proportion of group phi

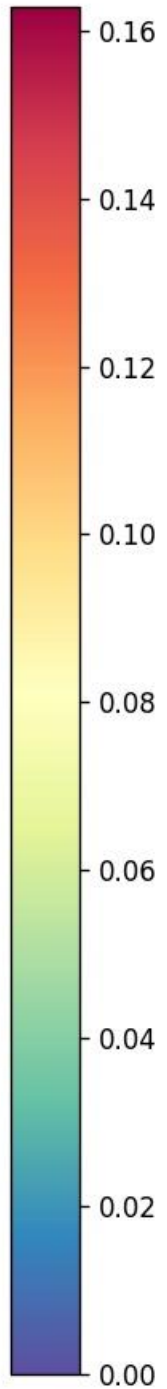
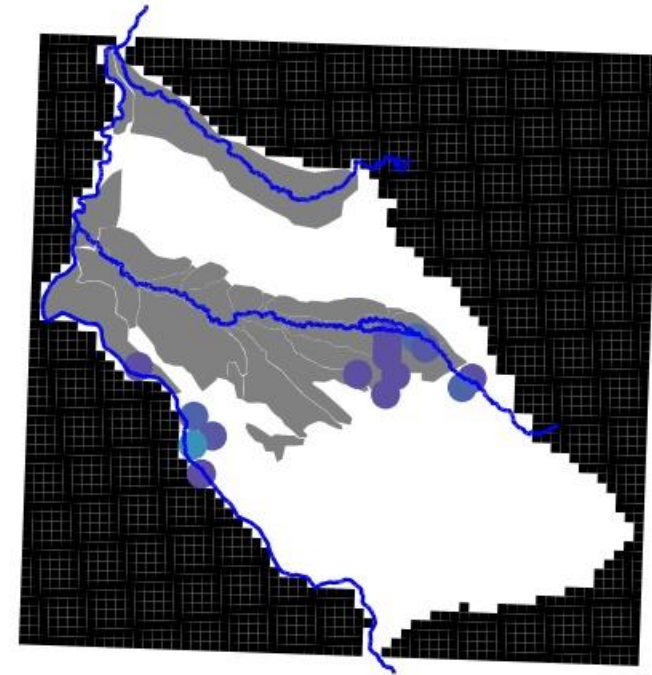


# Transient In progress...

hd in layer 5  
proportion of group phi

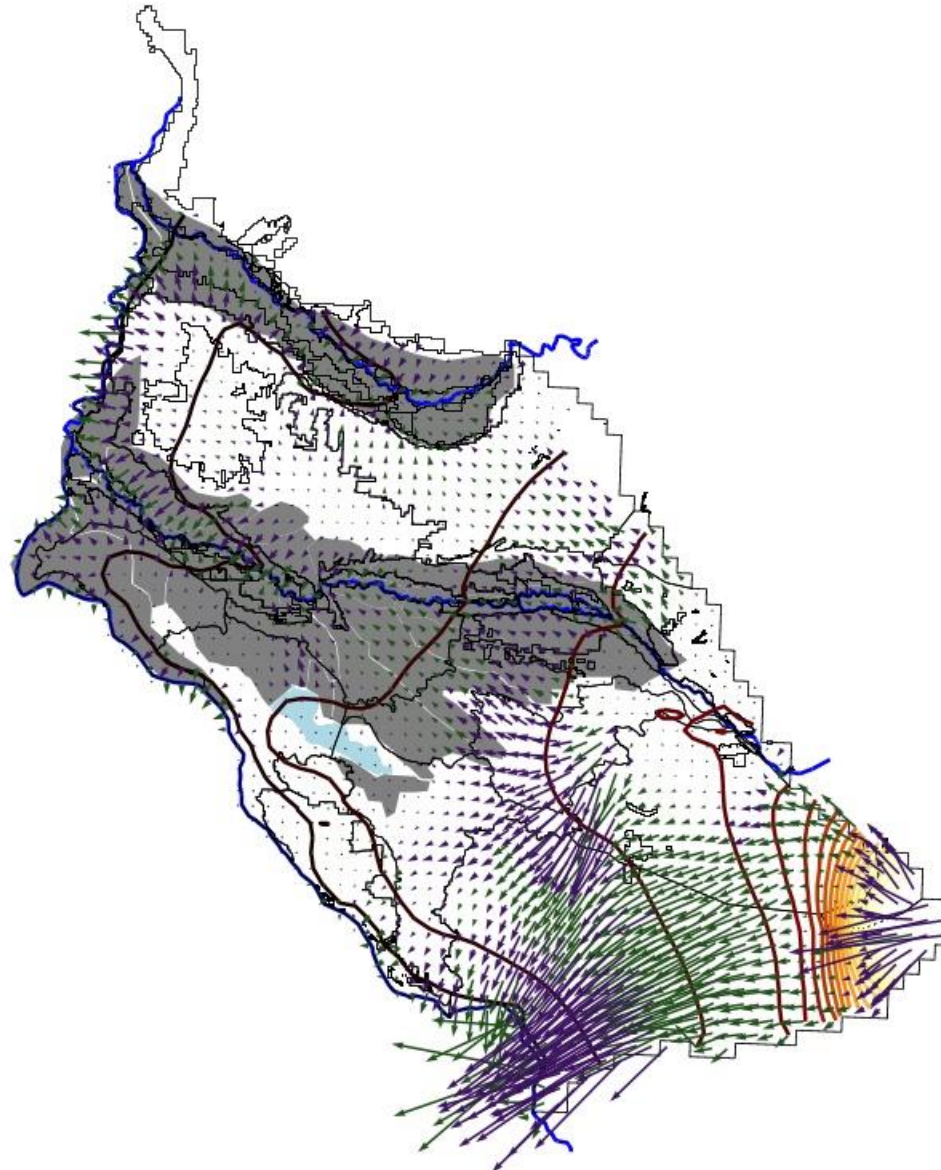


hd in layer 6  
proportion of group phi

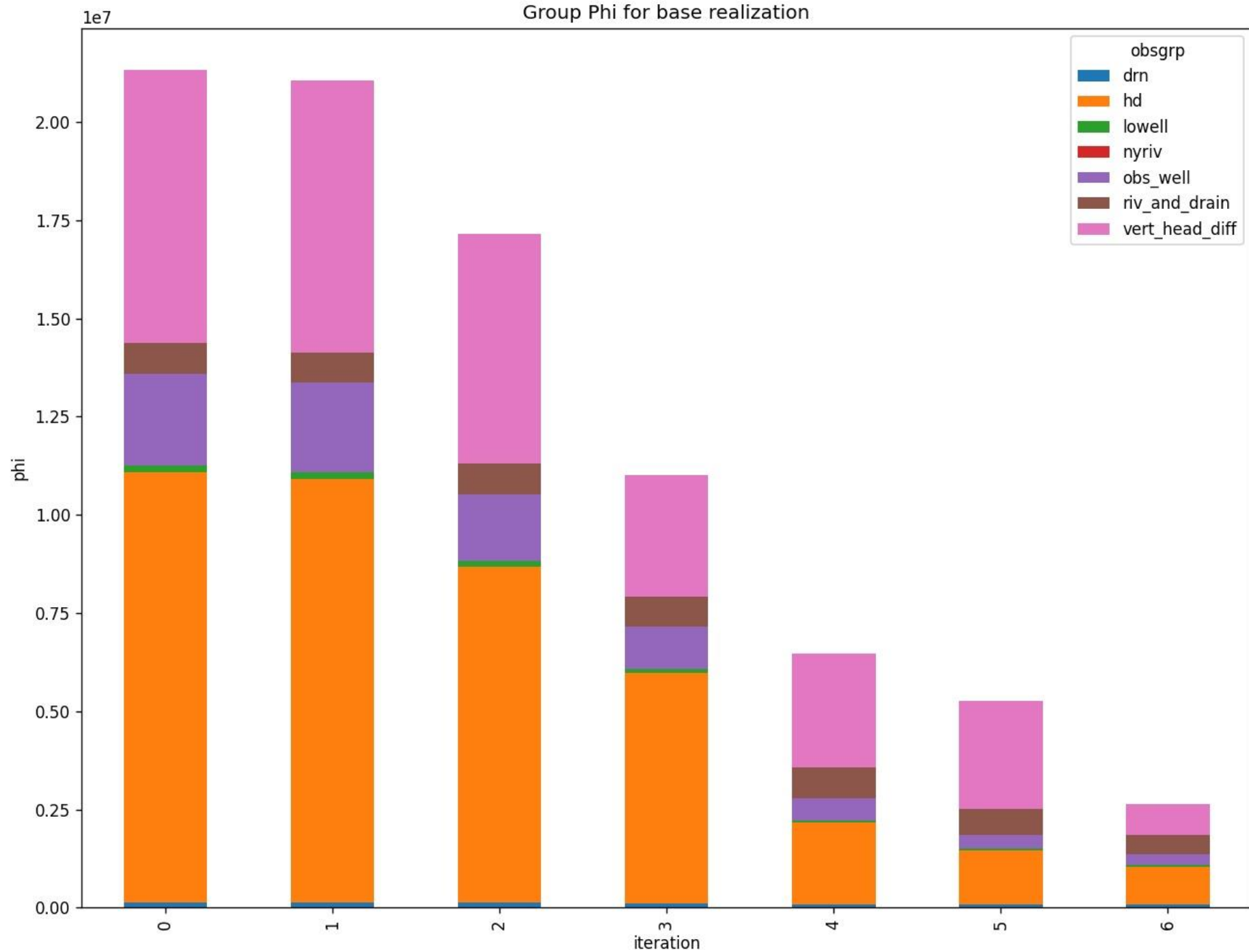


# Transient In progress...

Layer 1  
green: upward component  
purple: downward component



# Transient In progress...



# Next Steps



# Next steps

## **Continue to improve fit**

- manual fixes
- auto weight adjustments

## **Decide when its 'good enough'**

- you help me decide
- never perfect...

## **Try finer grid**

- see where and how much fit improves

## **Report**

- next winter / spring

Thanks for listening!