Model Status and Calibration

Stephen Hundt

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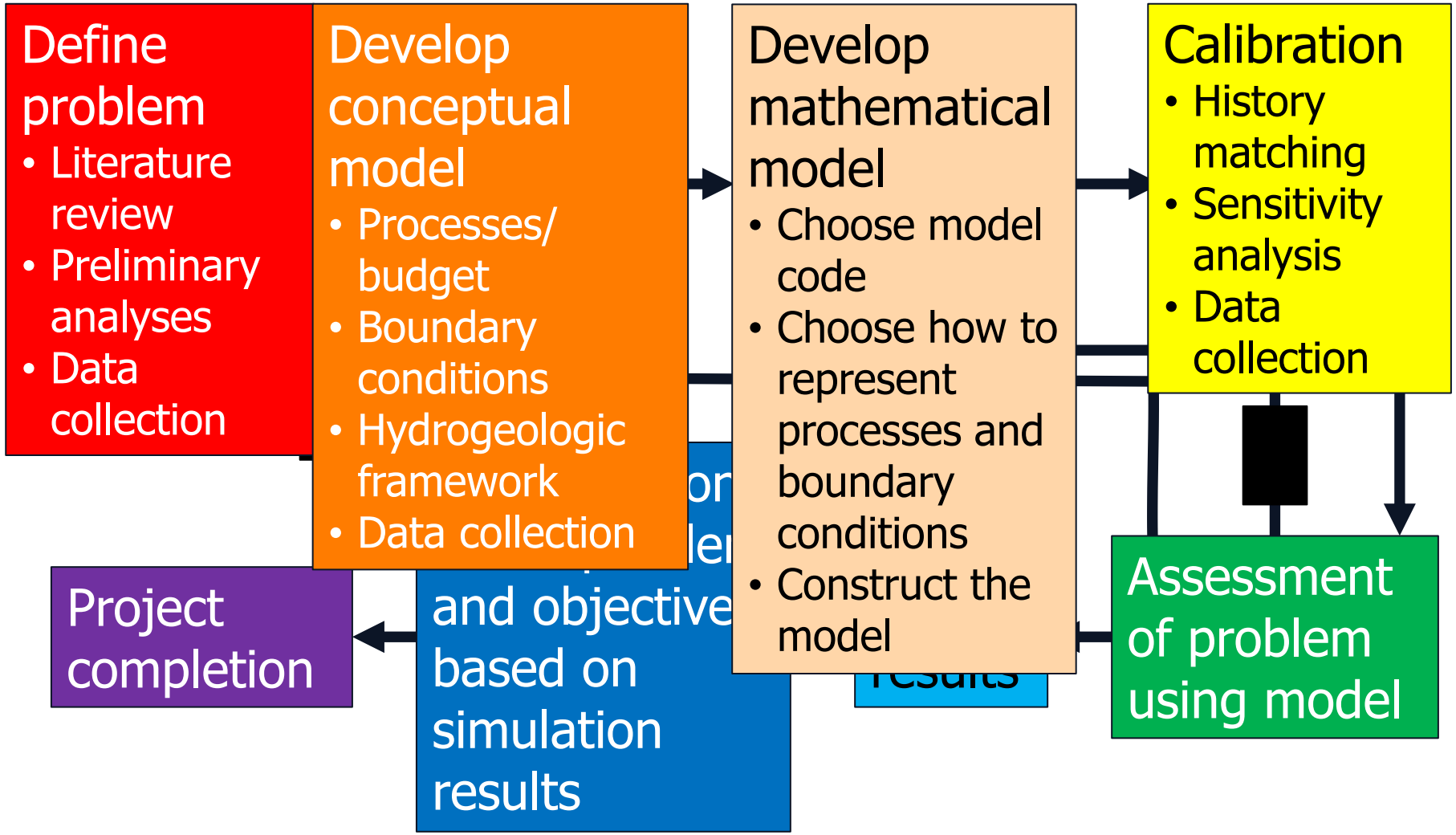
Context

Where we are

The modeling process



After Reilly (2001) TWRI 3,B8

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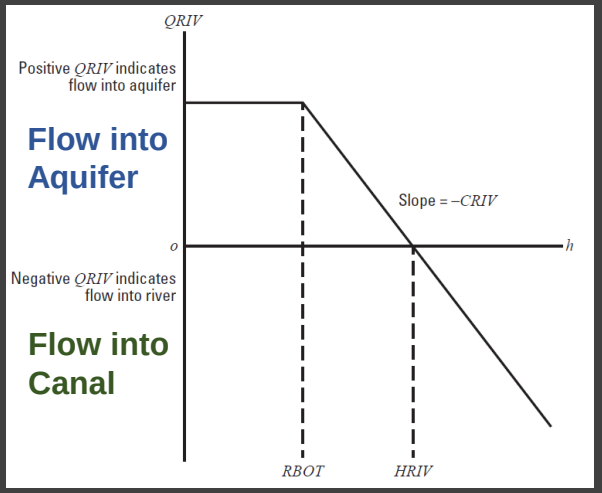
Work since last meeting

Reminder: NY Canal



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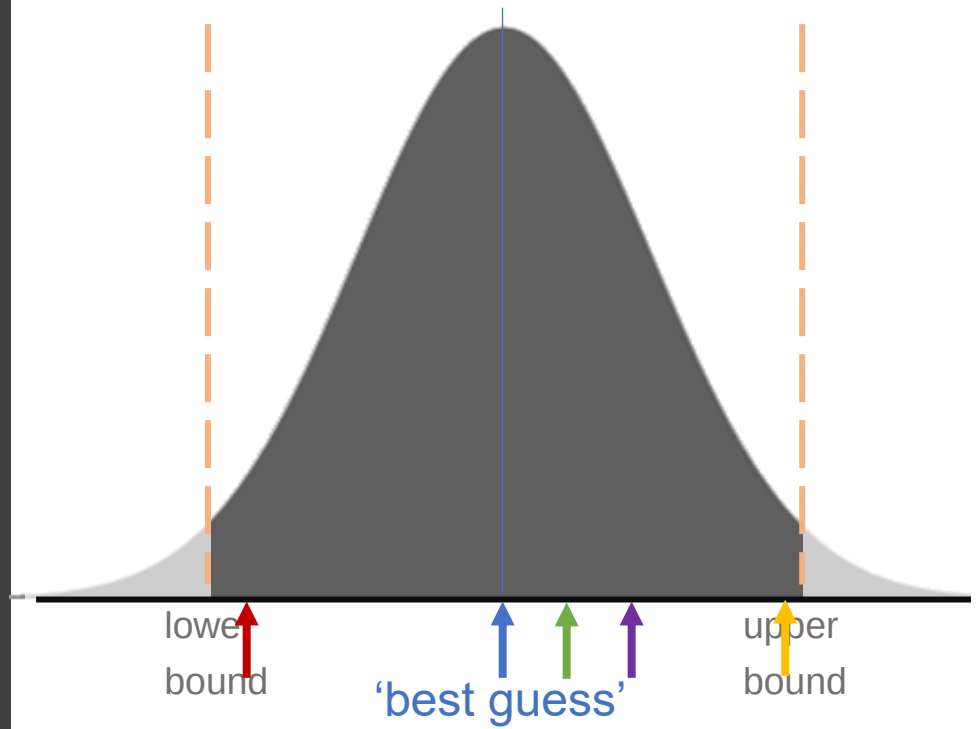
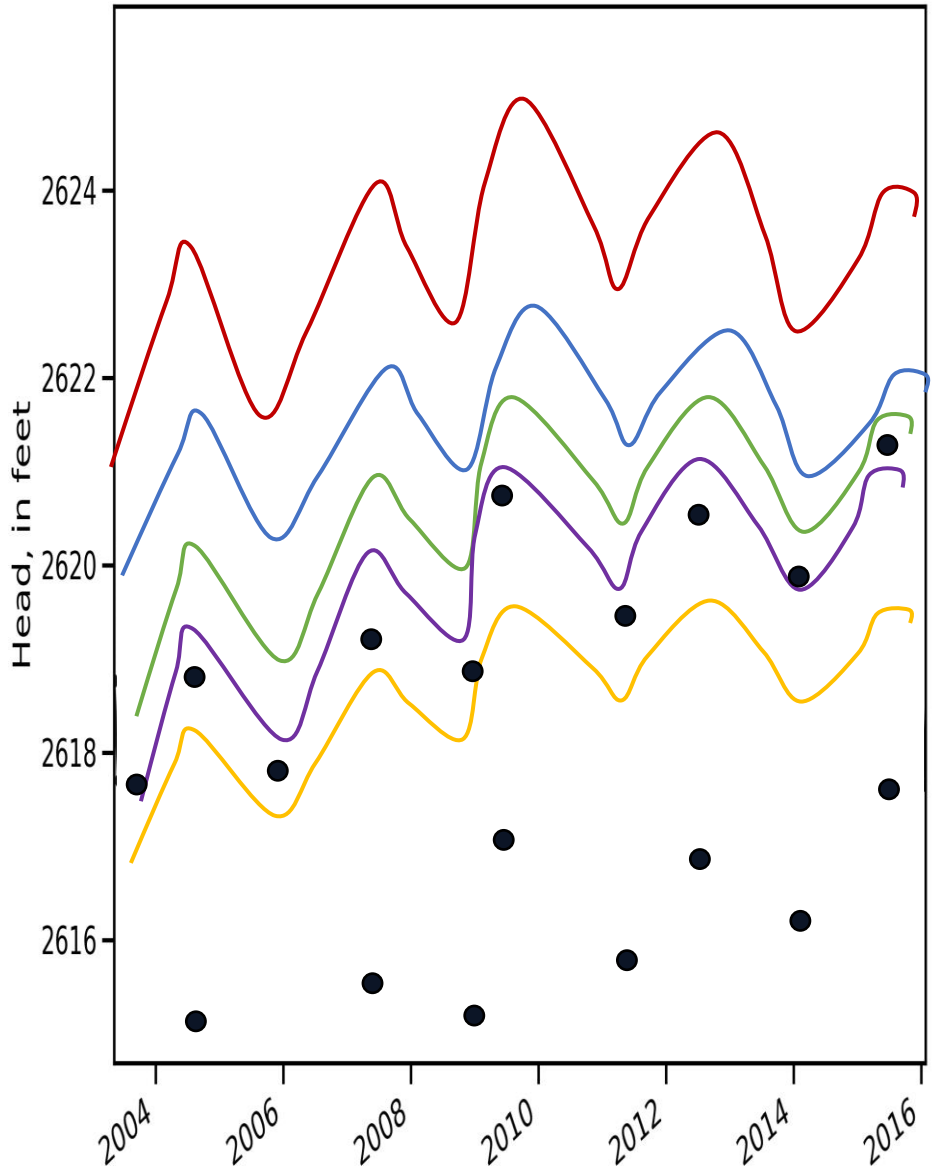
Reminder: Diagnostic (Monte Carlo) Plots





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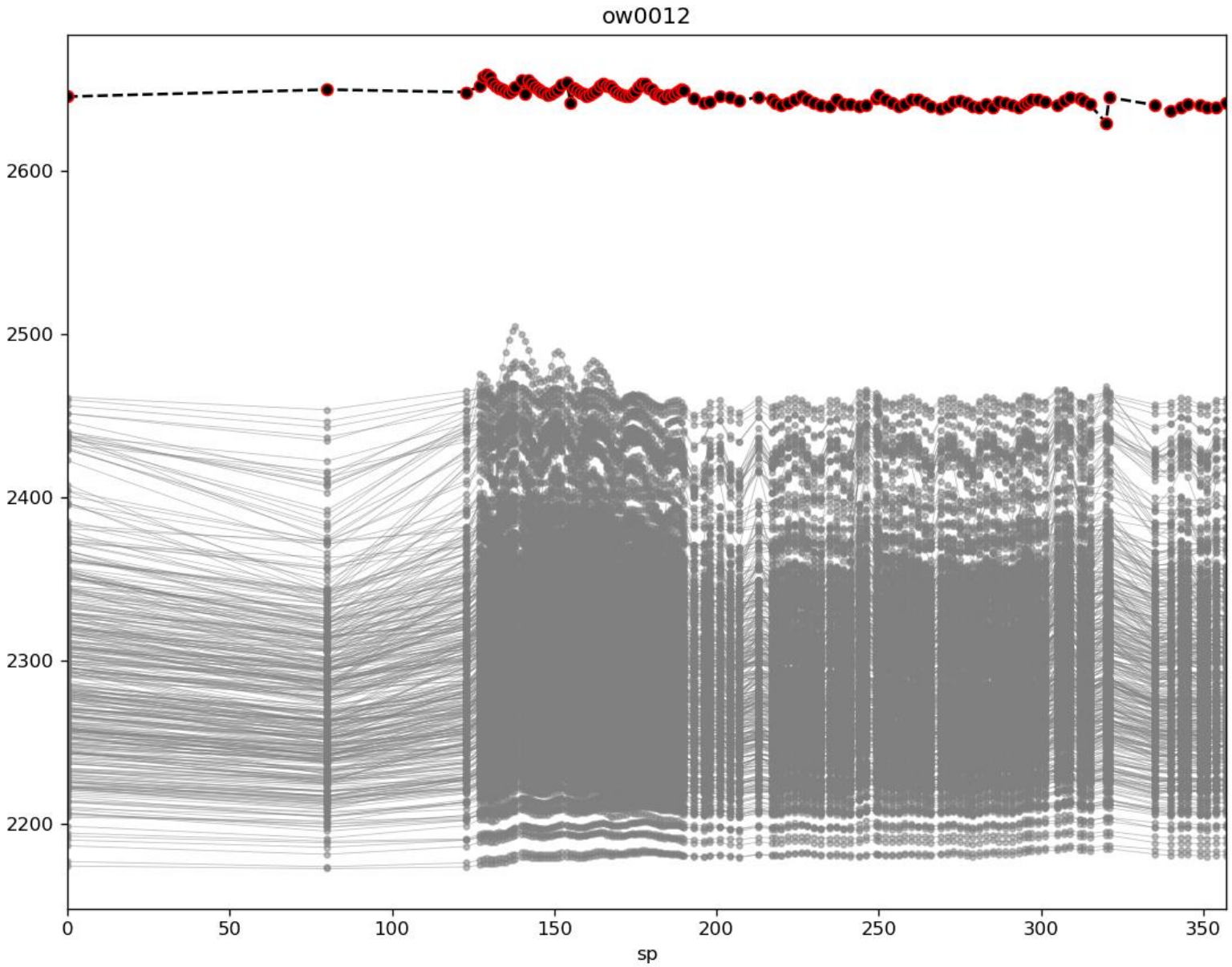

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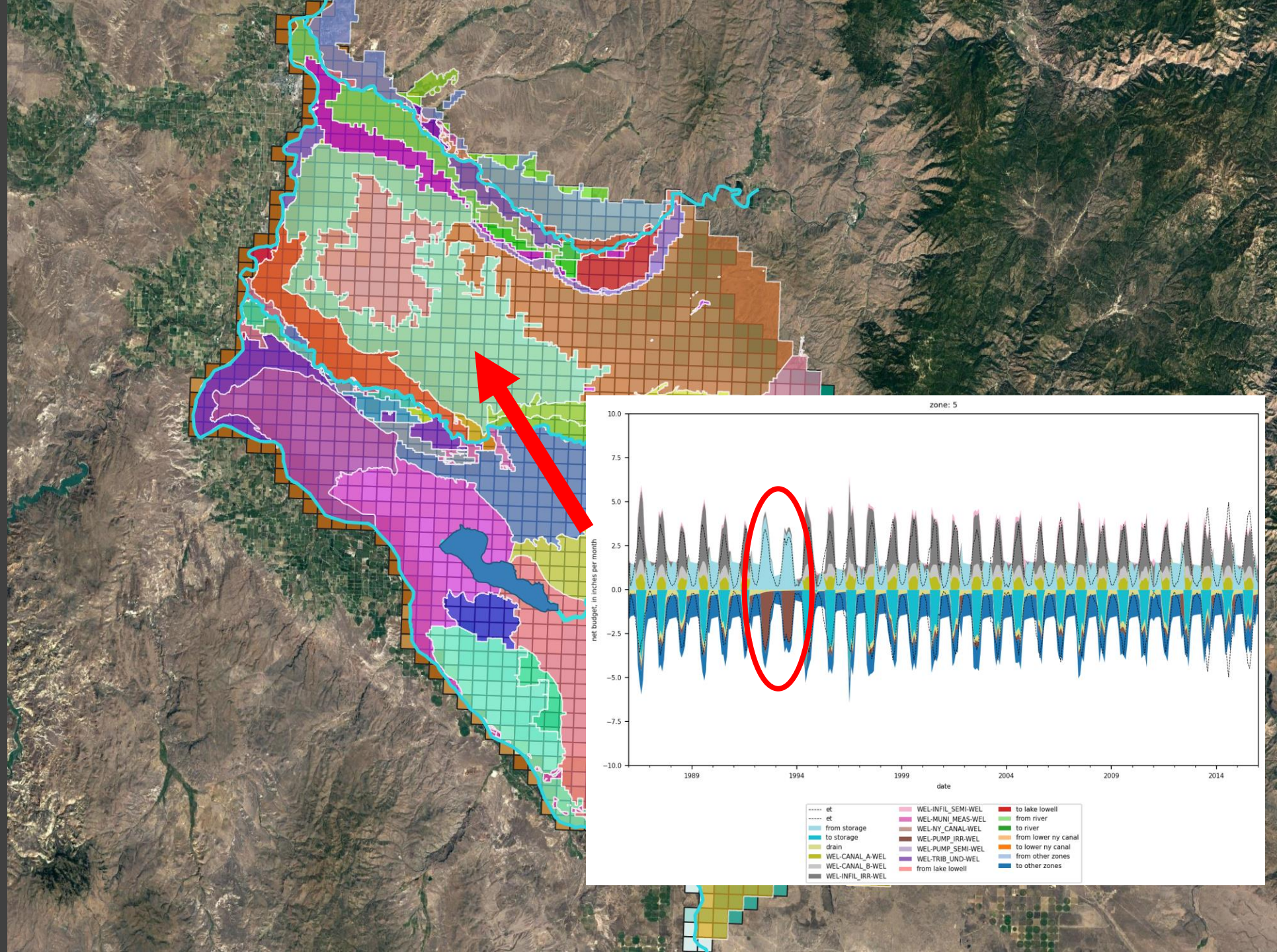
Troubleshooting: Model Structure



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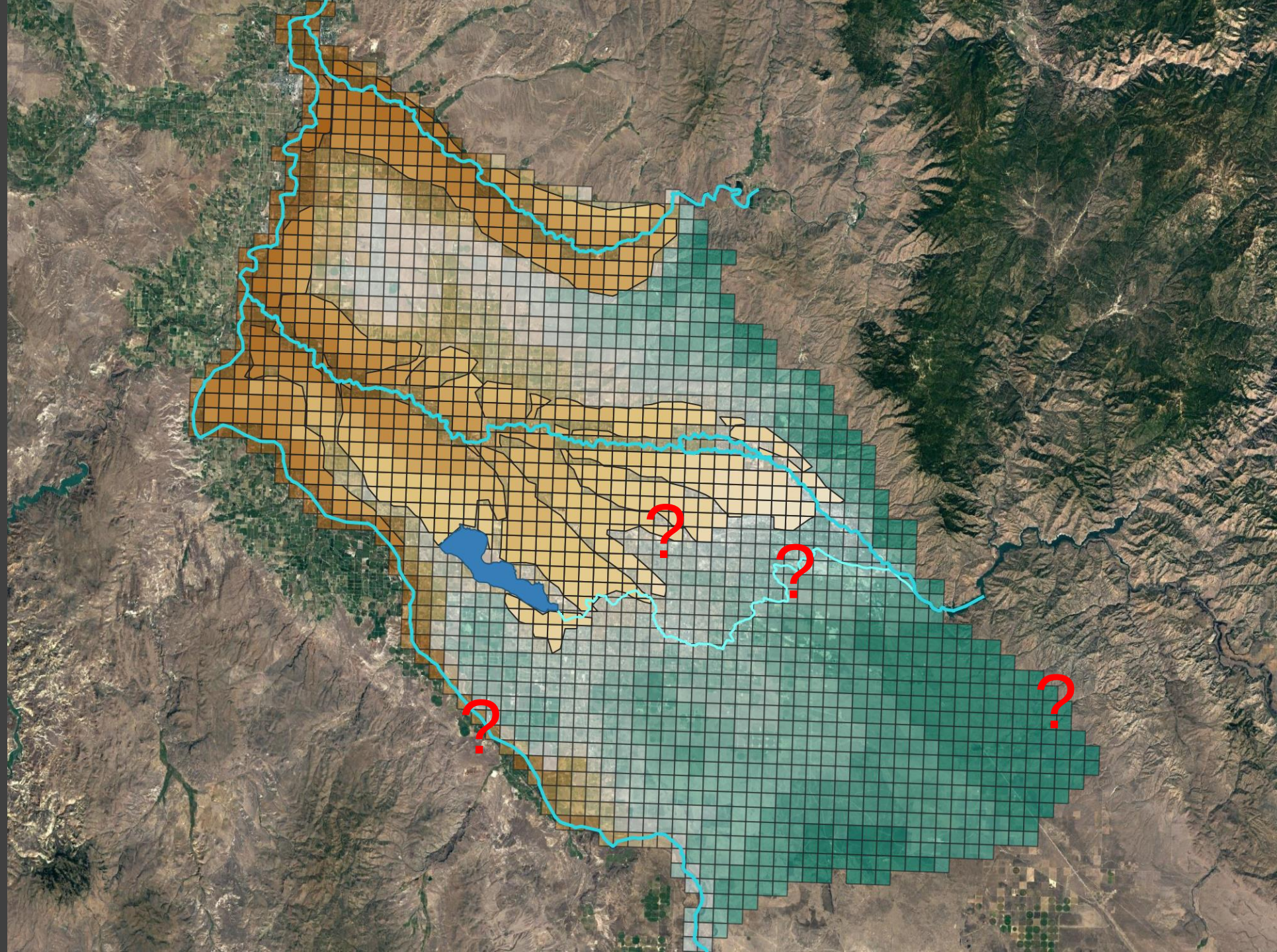

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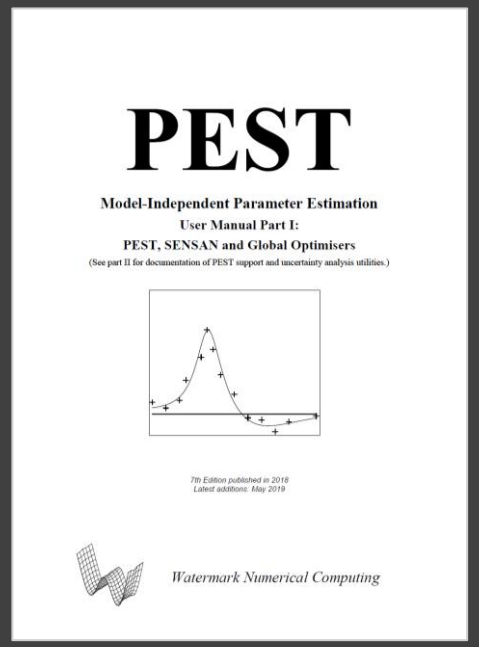
Troubleshooting: PEST 'mechanics'


PEST

Model-Independent Parameter Estimation

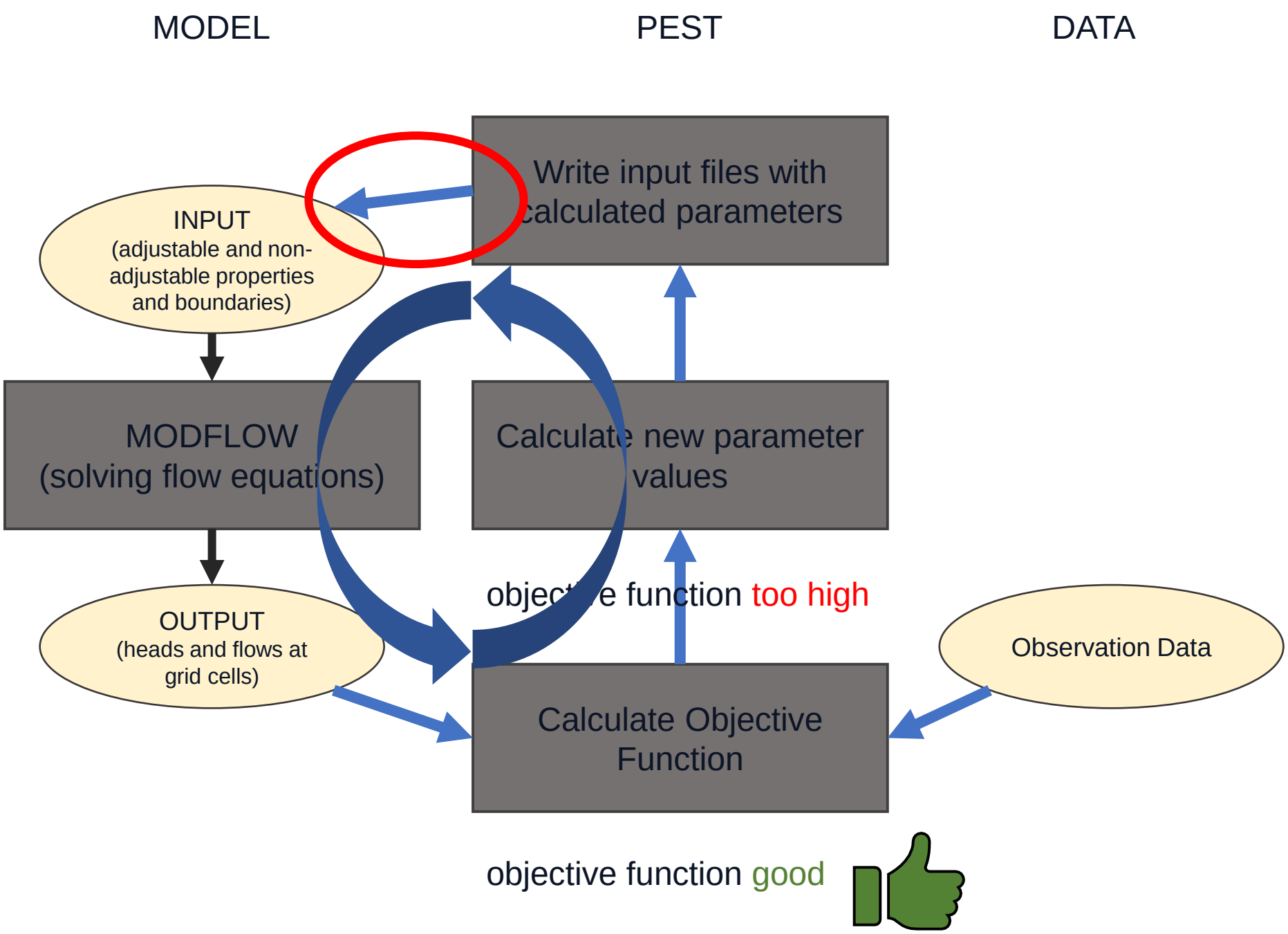
User Manual Part I:

PEST, SENSAN and Global Optimisers

(See part II for documentation of PEST support and uncertainty analysis utilities.)

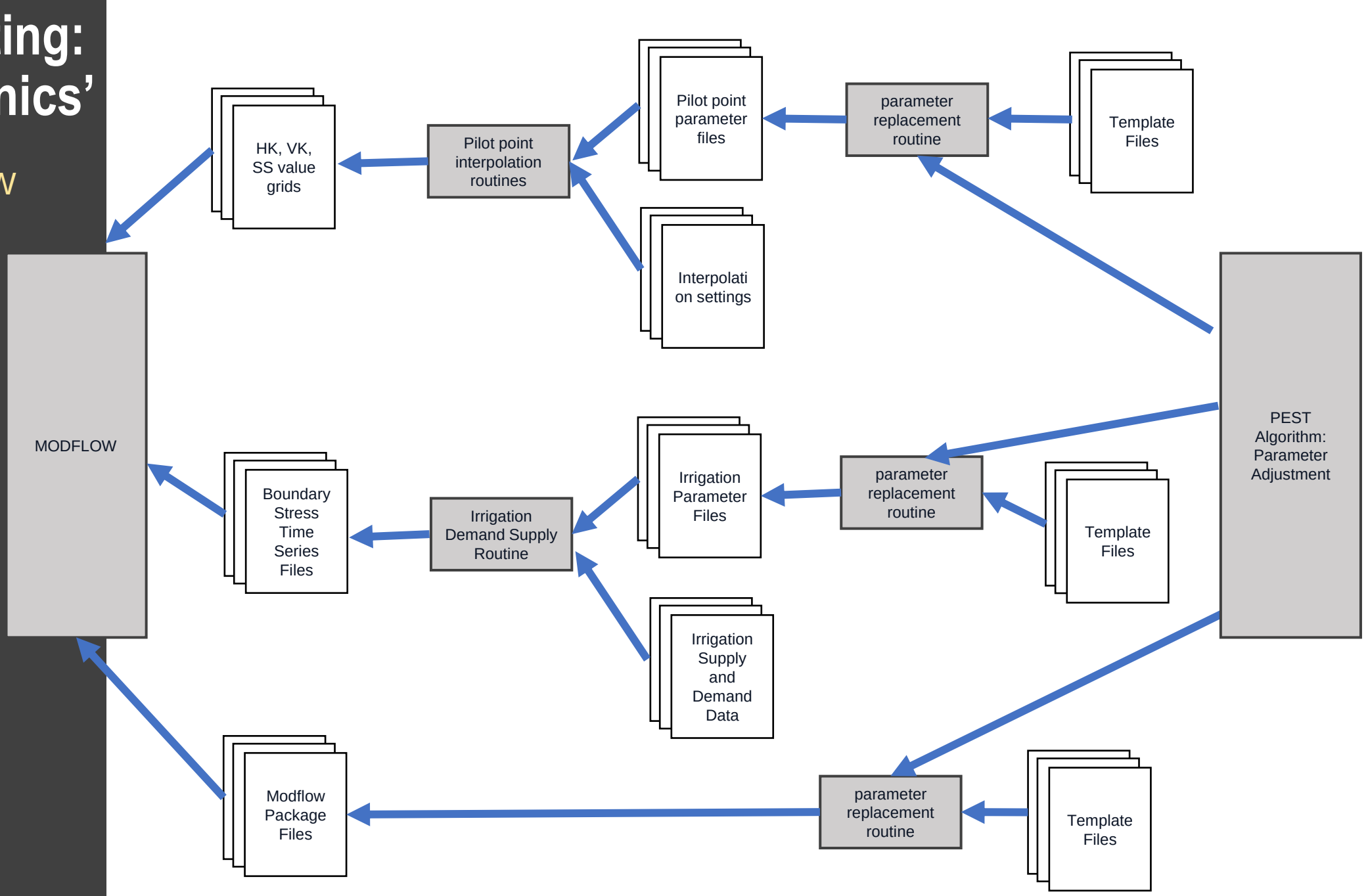
7th Edition published in 2018
Latest additions: May 2019

Watermark Numerical Computing



Troubleshooting: PEST 'mechanics'

Writing MODFLOW input files



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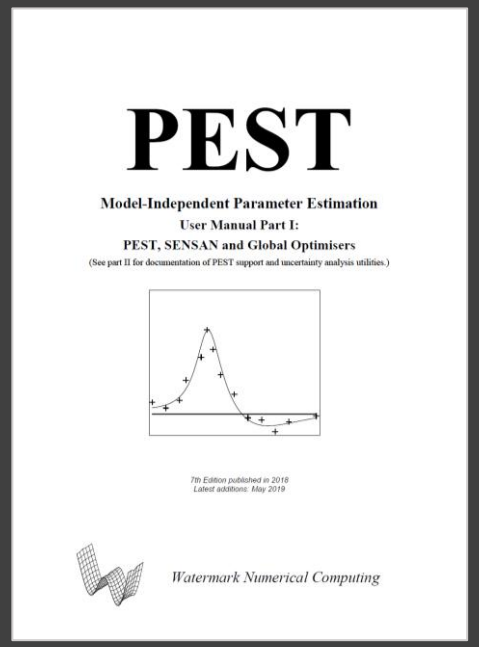
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Watermark Numerical Computing

MODEL PEST DATA

Write input files with calculated parameters

INPUT (adjustable and non-adjustable properties and boundaries)

MODFLOW (solving flow equations)

Calculate new parameter values

OUTPUT (heads and flows at grid cells)

objective function too high

Observation Data

Calculate Objective Function

objective function good

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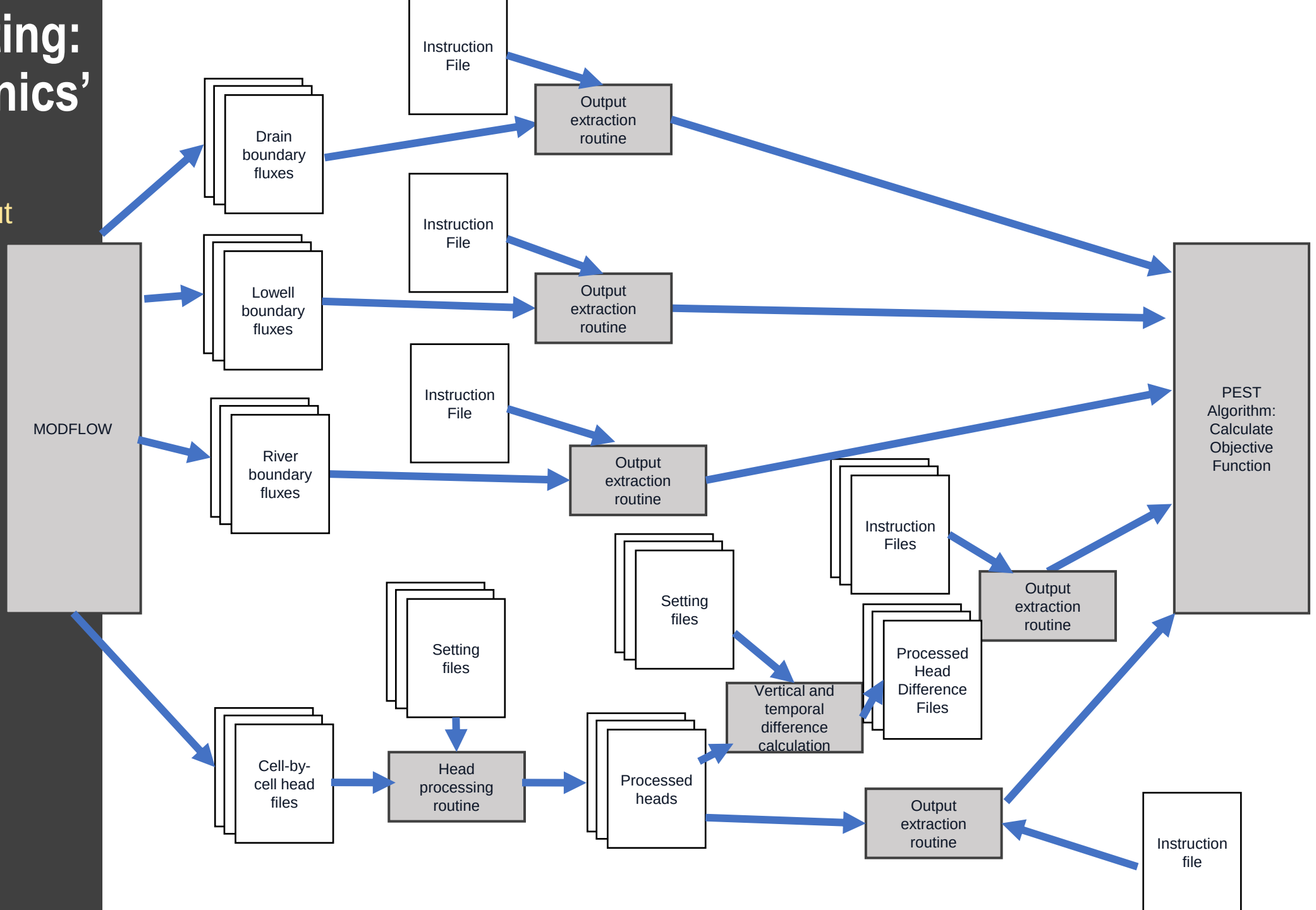
Troubleshooting: PEST 'mechanics'

Reading MODFLOW Output Files



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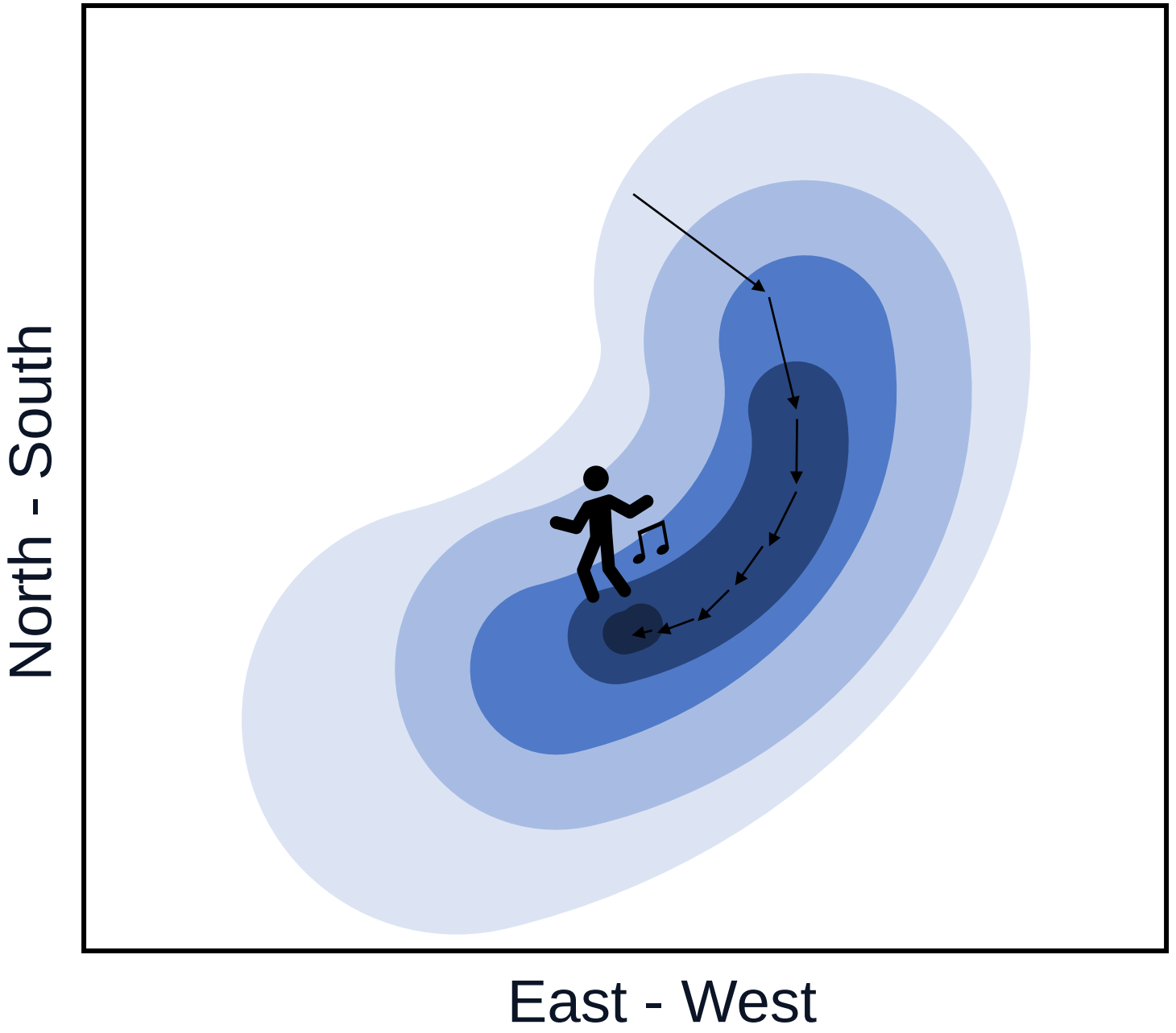
Manual Adjustments



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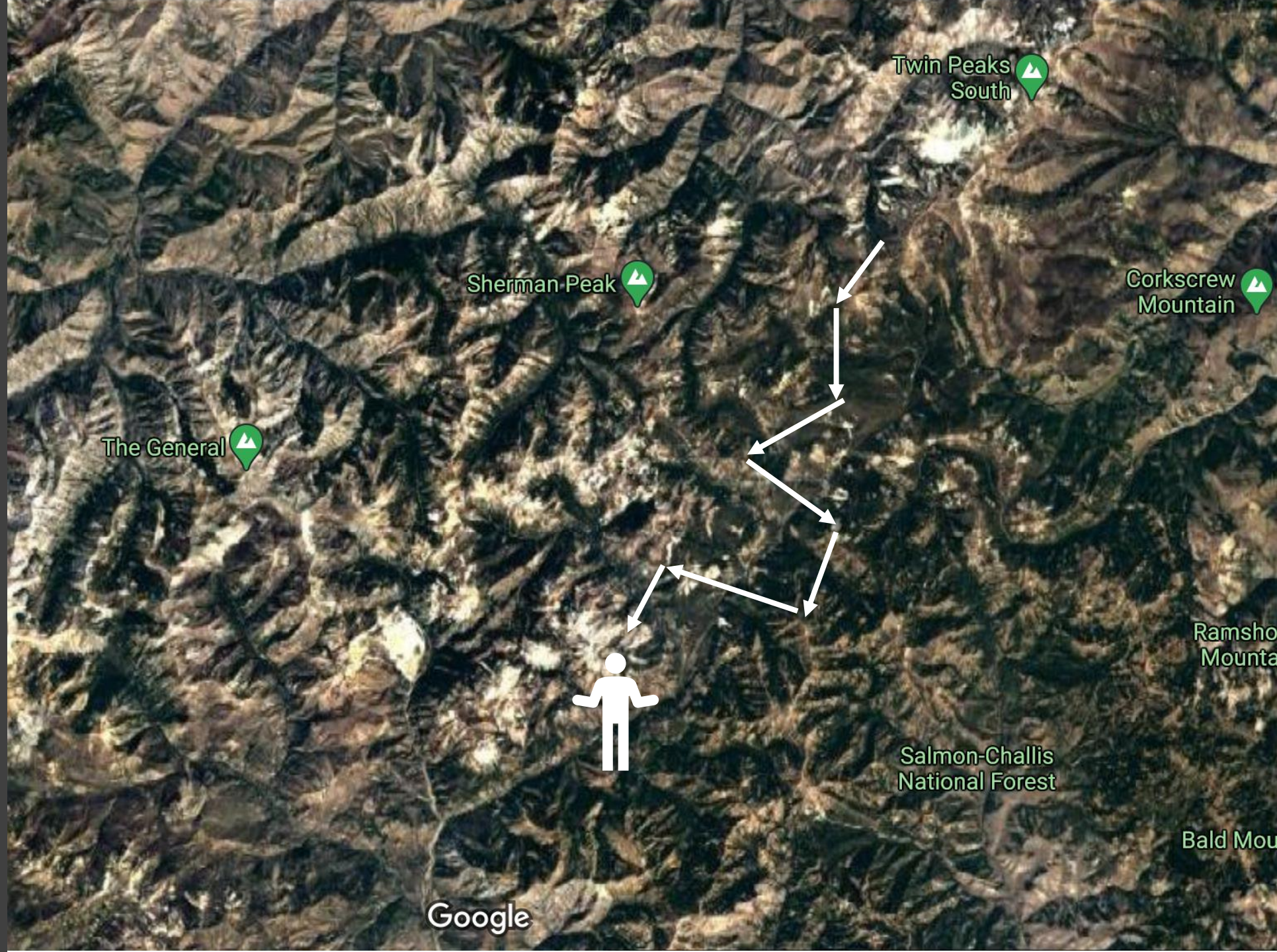

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Trying It All

	Observation Type	Approximate Number
✓	Water Levels	10,000 ‘s
✓	Drain Flows	100’s
✓	Lowe Seepage	100’s
✓	R age	100
✓	Tem rences	
✓	Vertica el Differenc	
✗	Net Water ues*	
✓	Preferred Para	--

- ✓ - Number of ments at location
- ✓ - Spatial de
- ✗ - Tempo ity
- ✗ - “Eve
- ✗ - S error
- ✗ - budget
- ✗ - ers???

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Taking a Step Back: subset of targets

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

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

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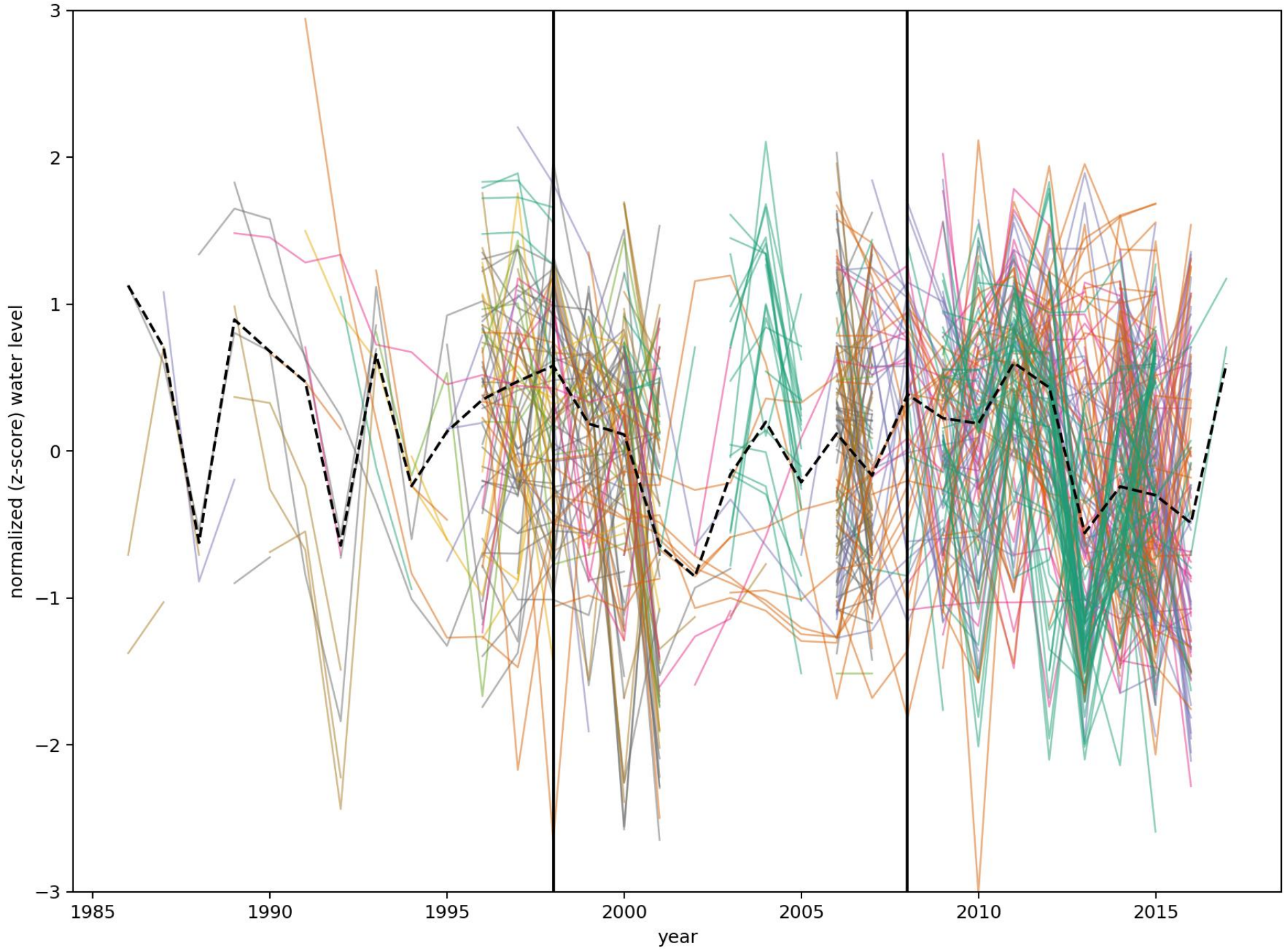
Taking a Step Back: psuedo-steady-state



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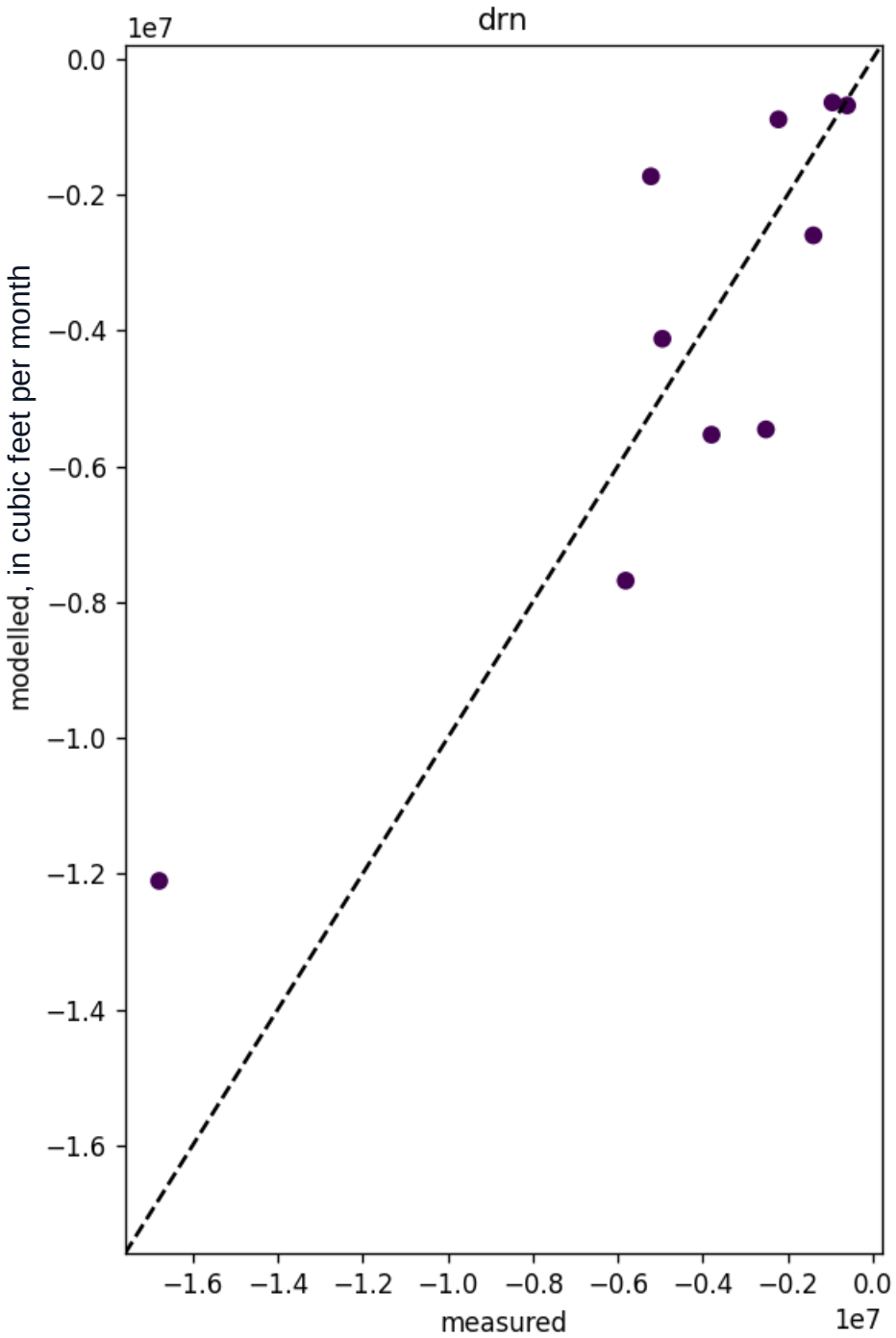
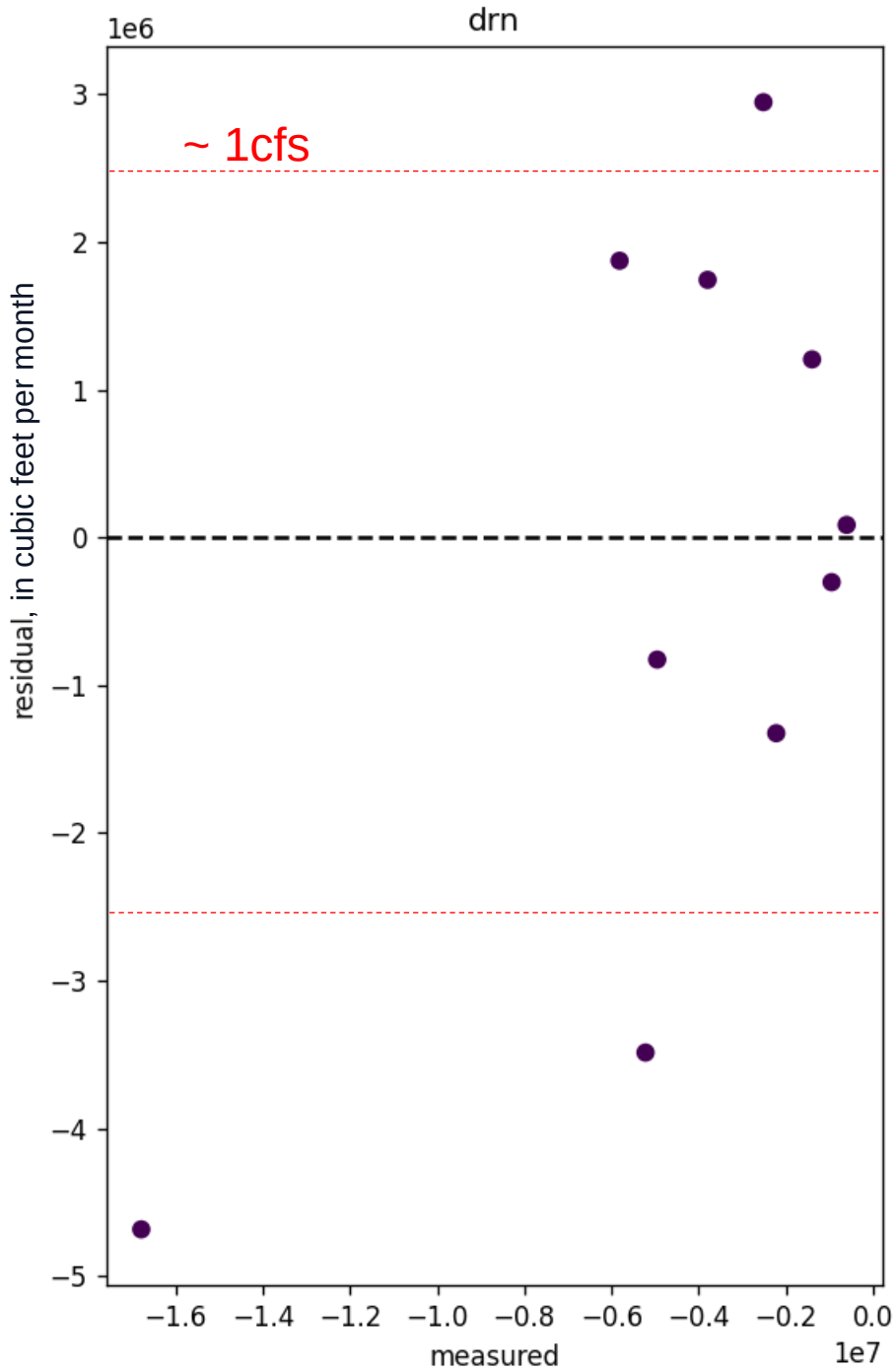
Current calibration status*

*ugly, but *preliminary*

Residual Summary





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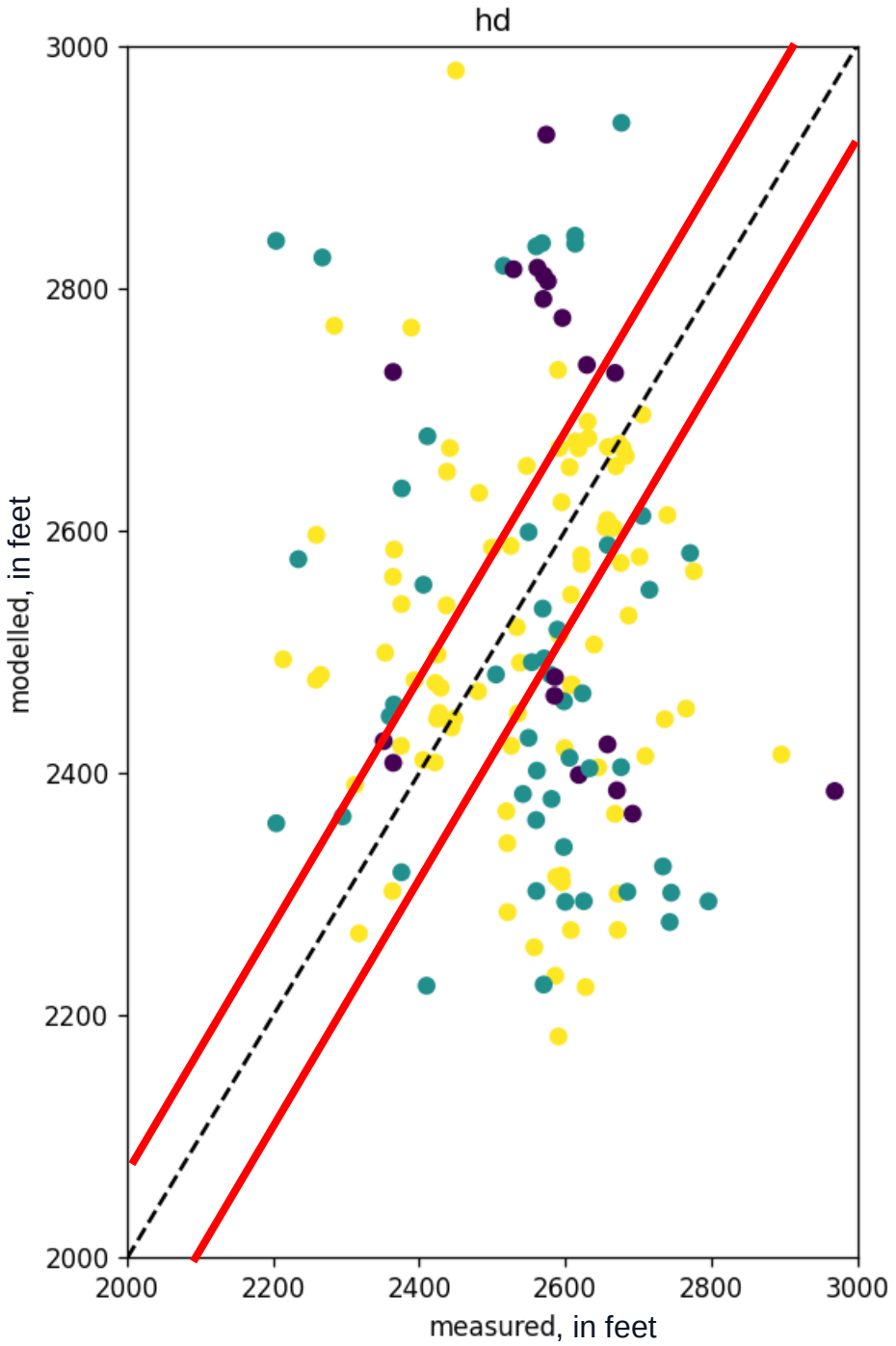

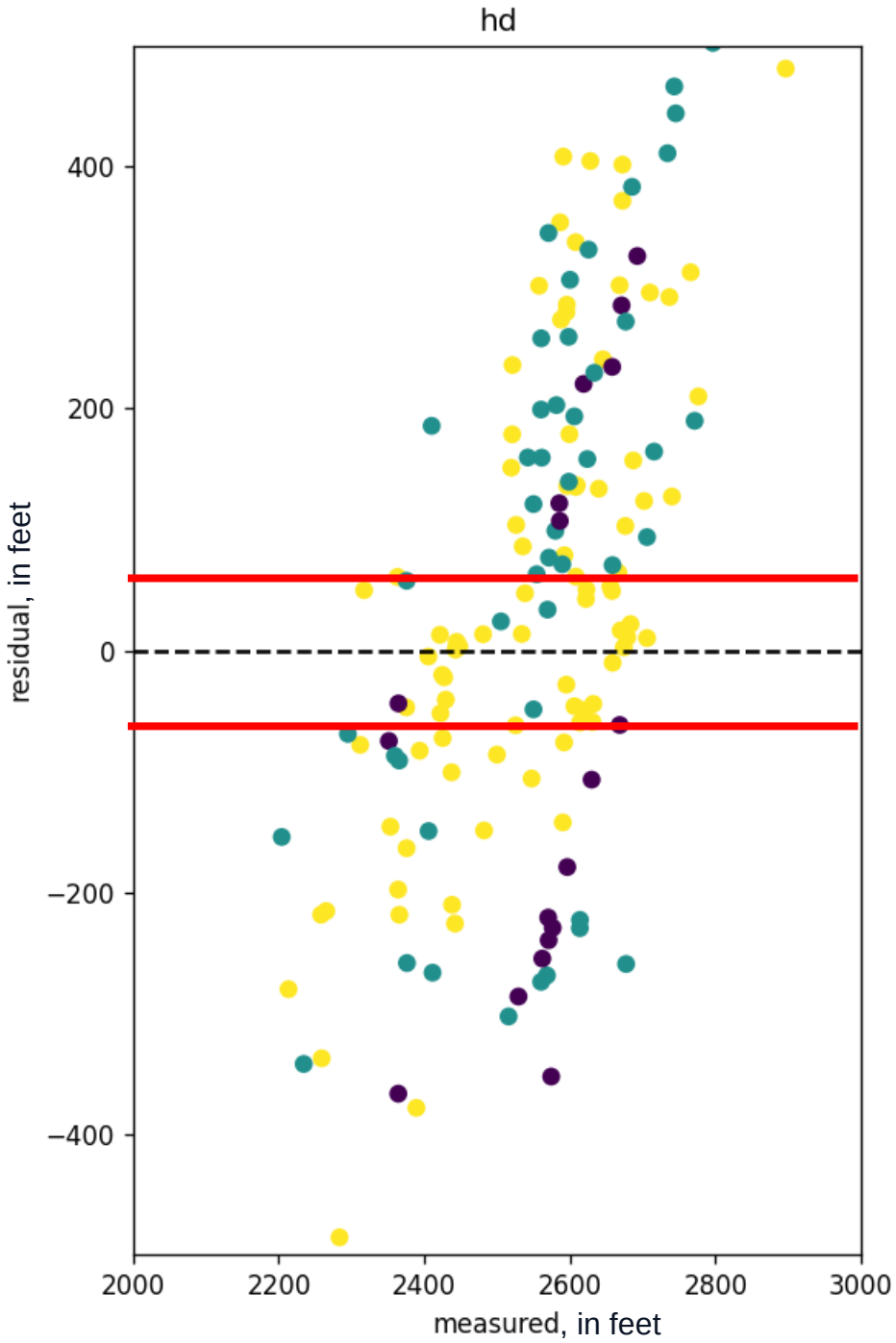

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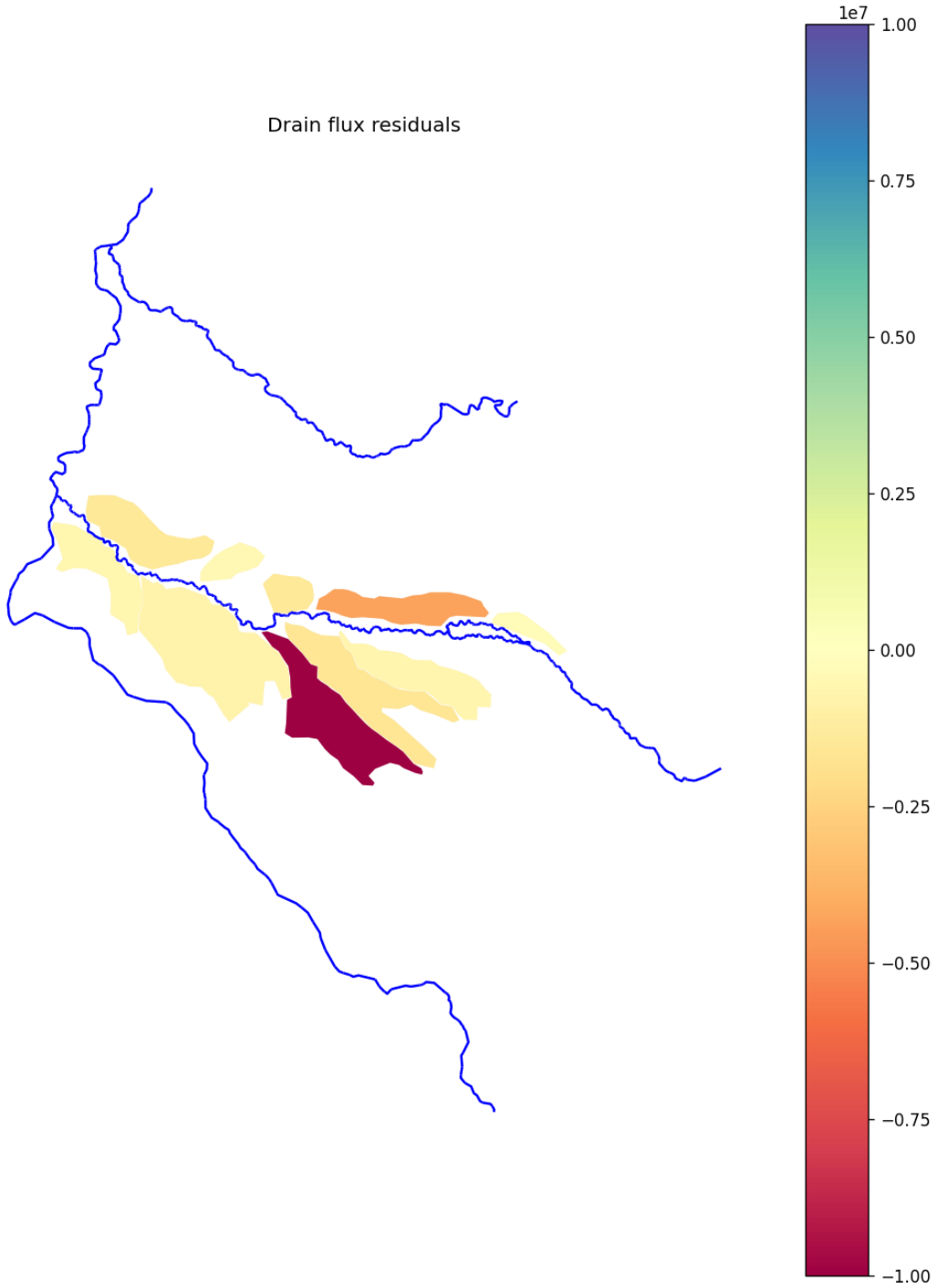
Residual Maps



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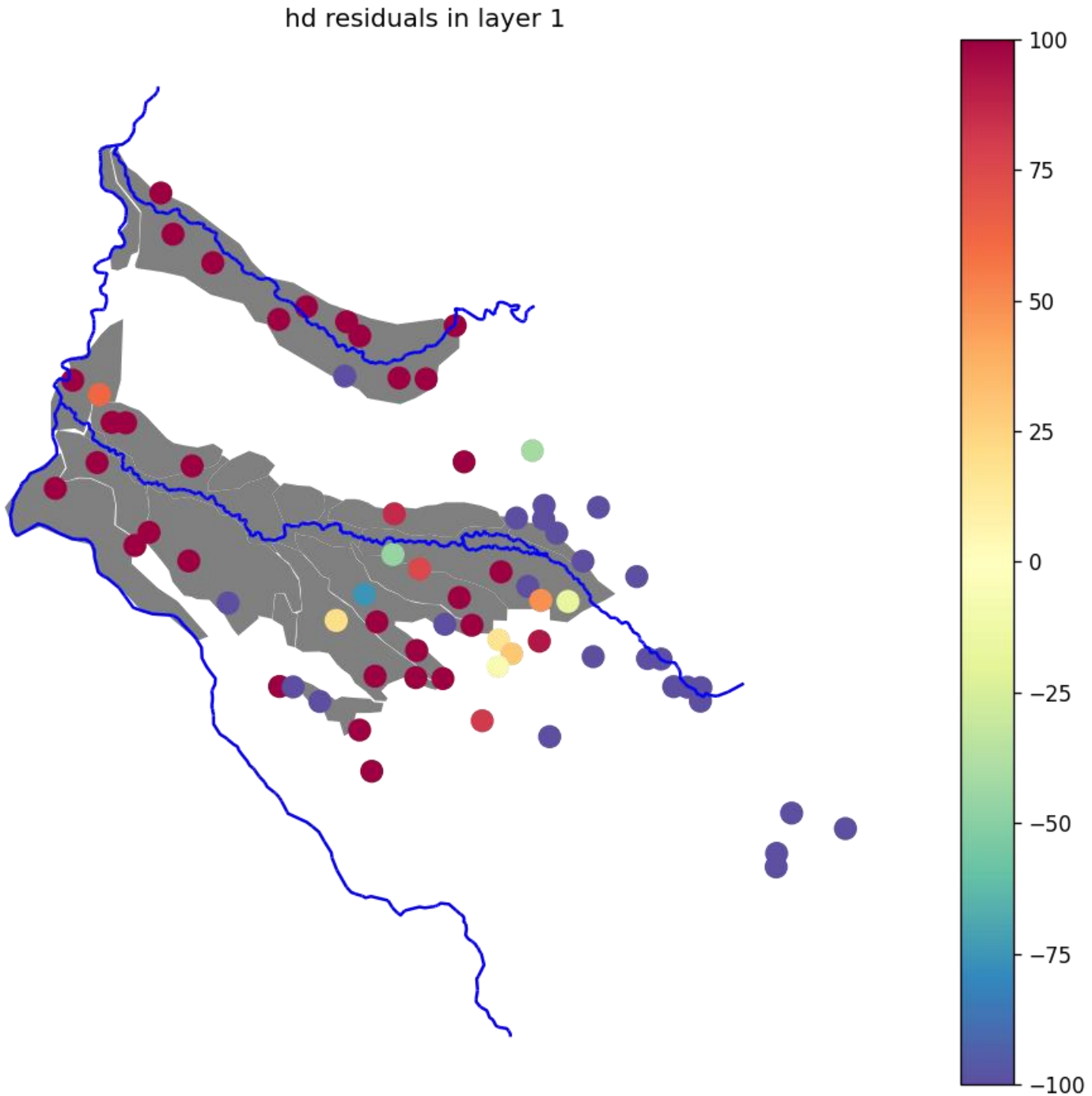

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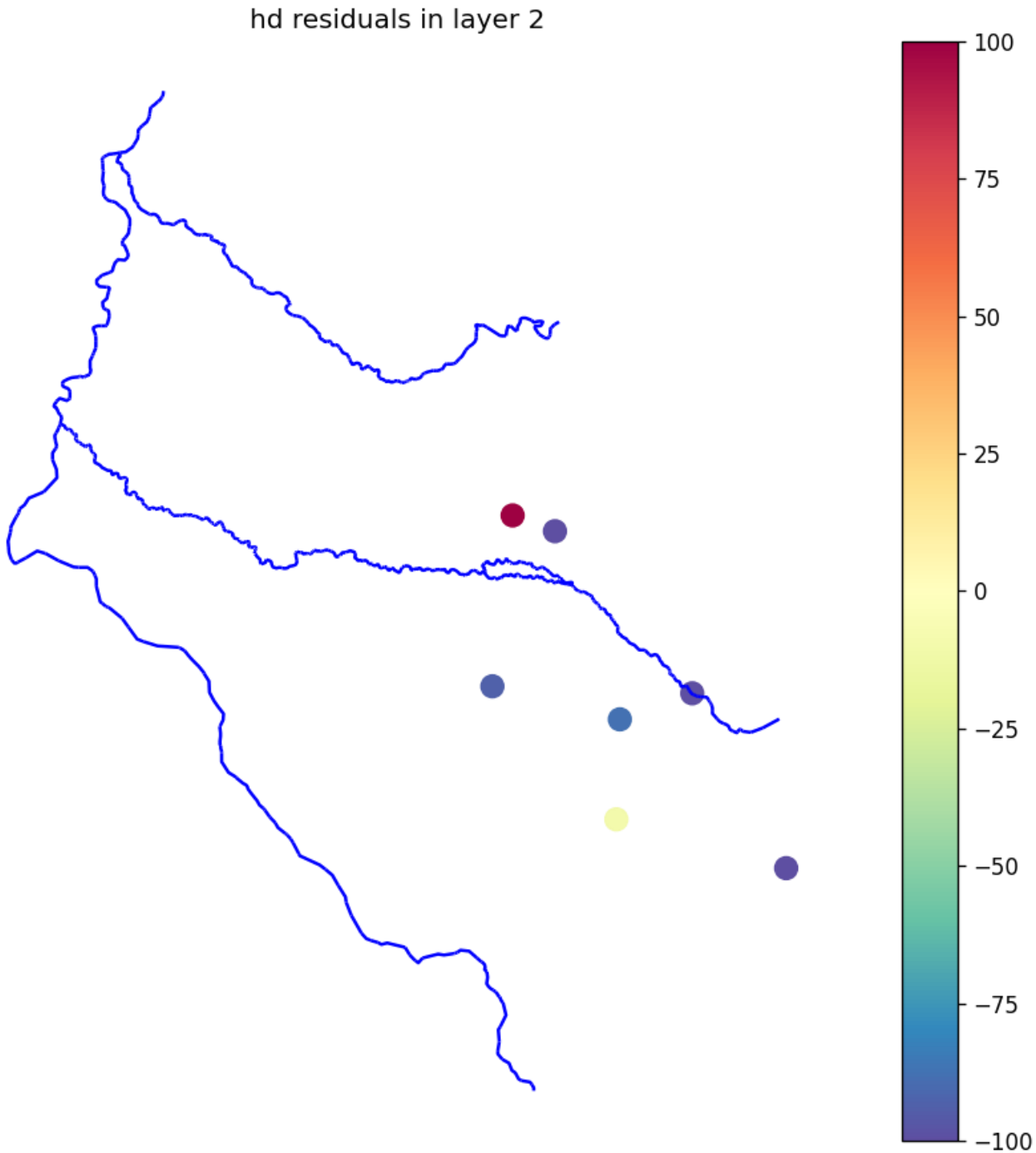

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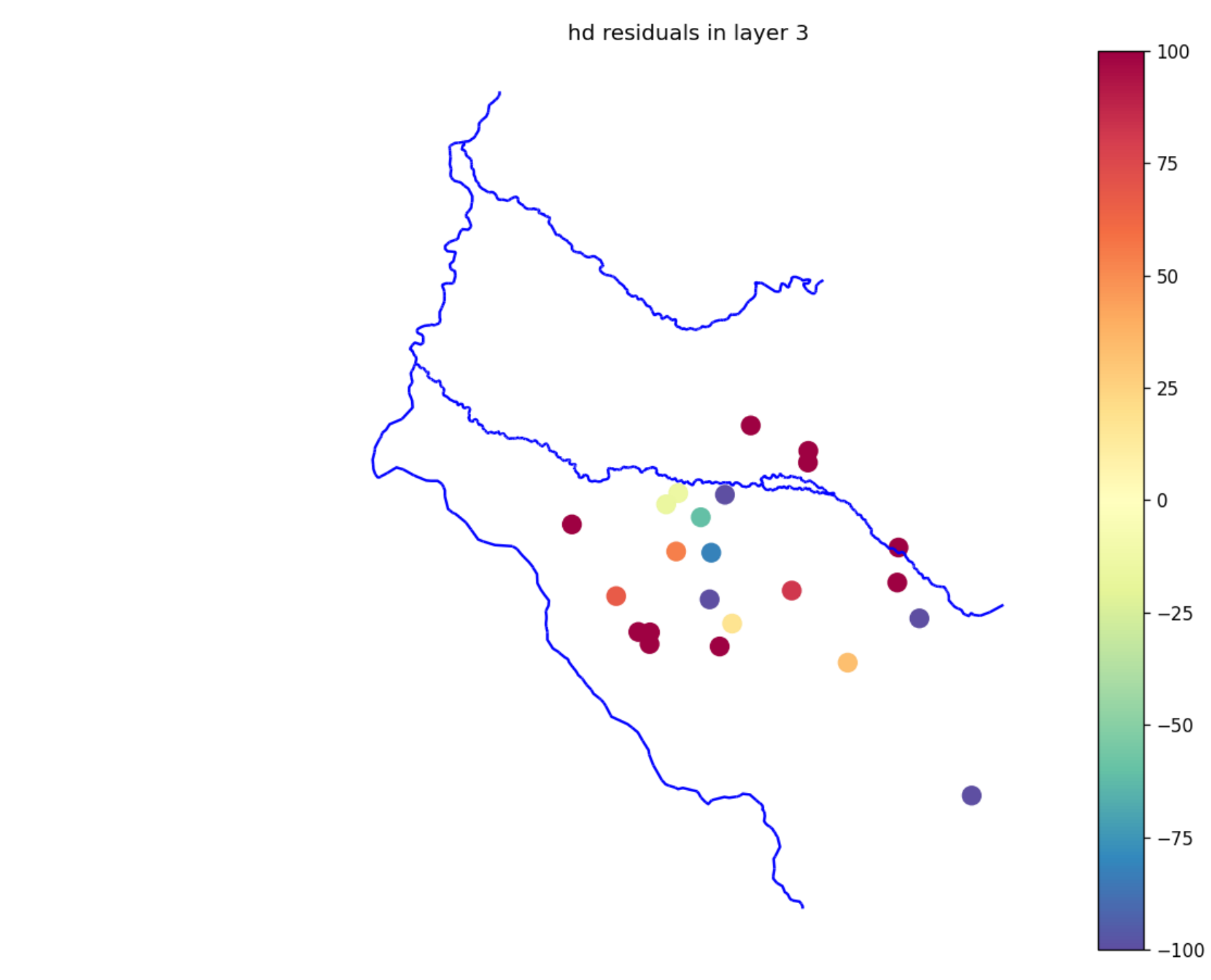

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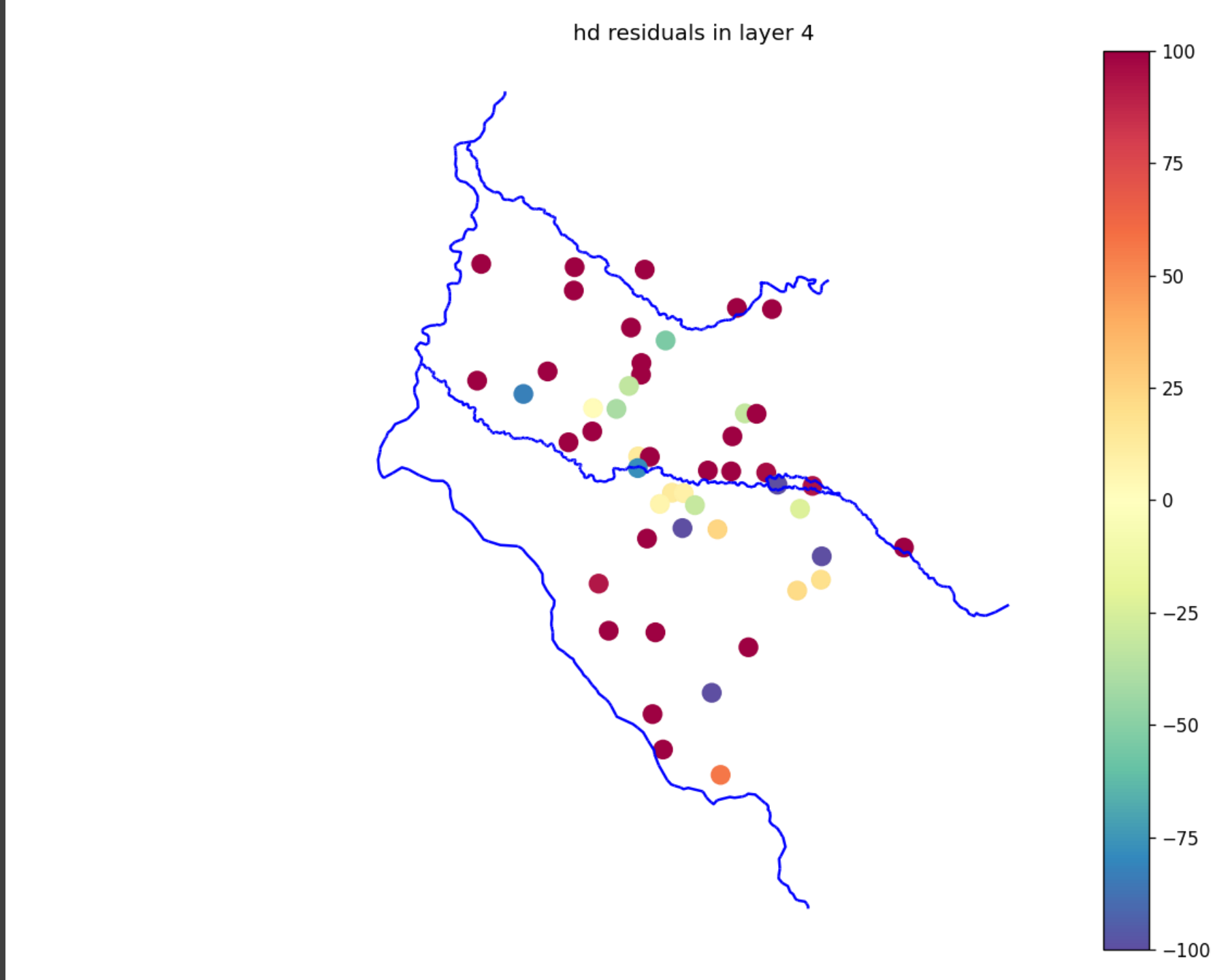

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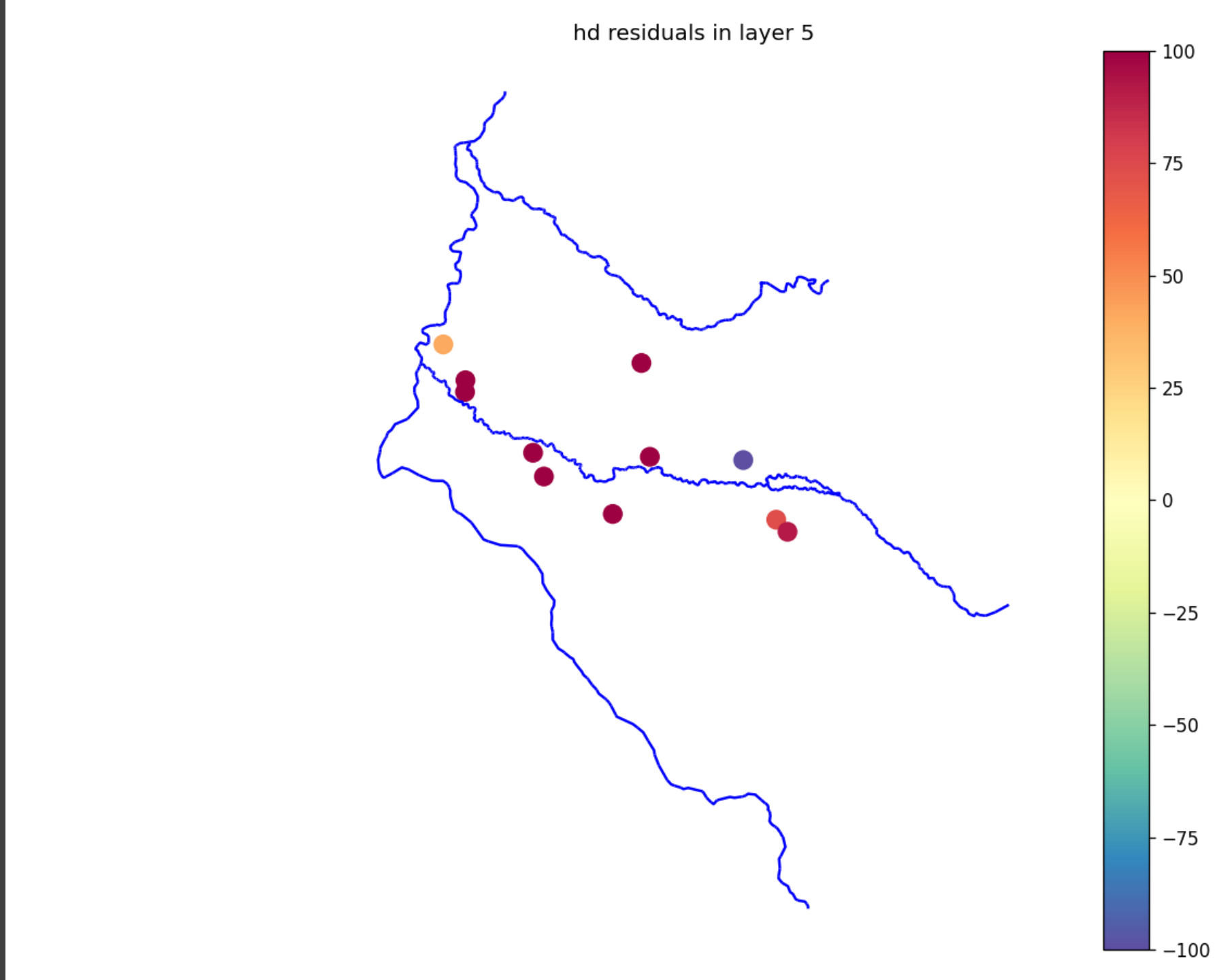

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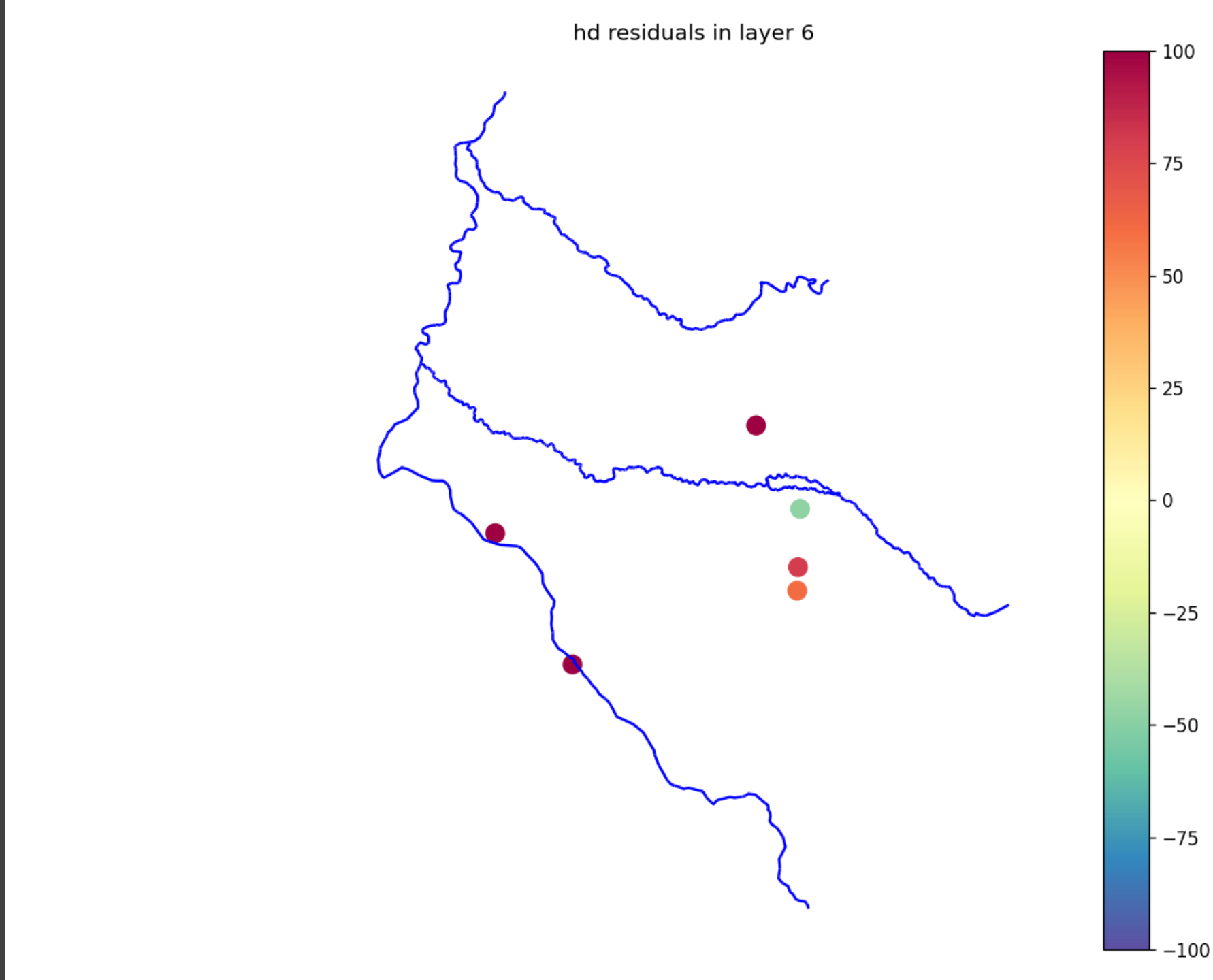

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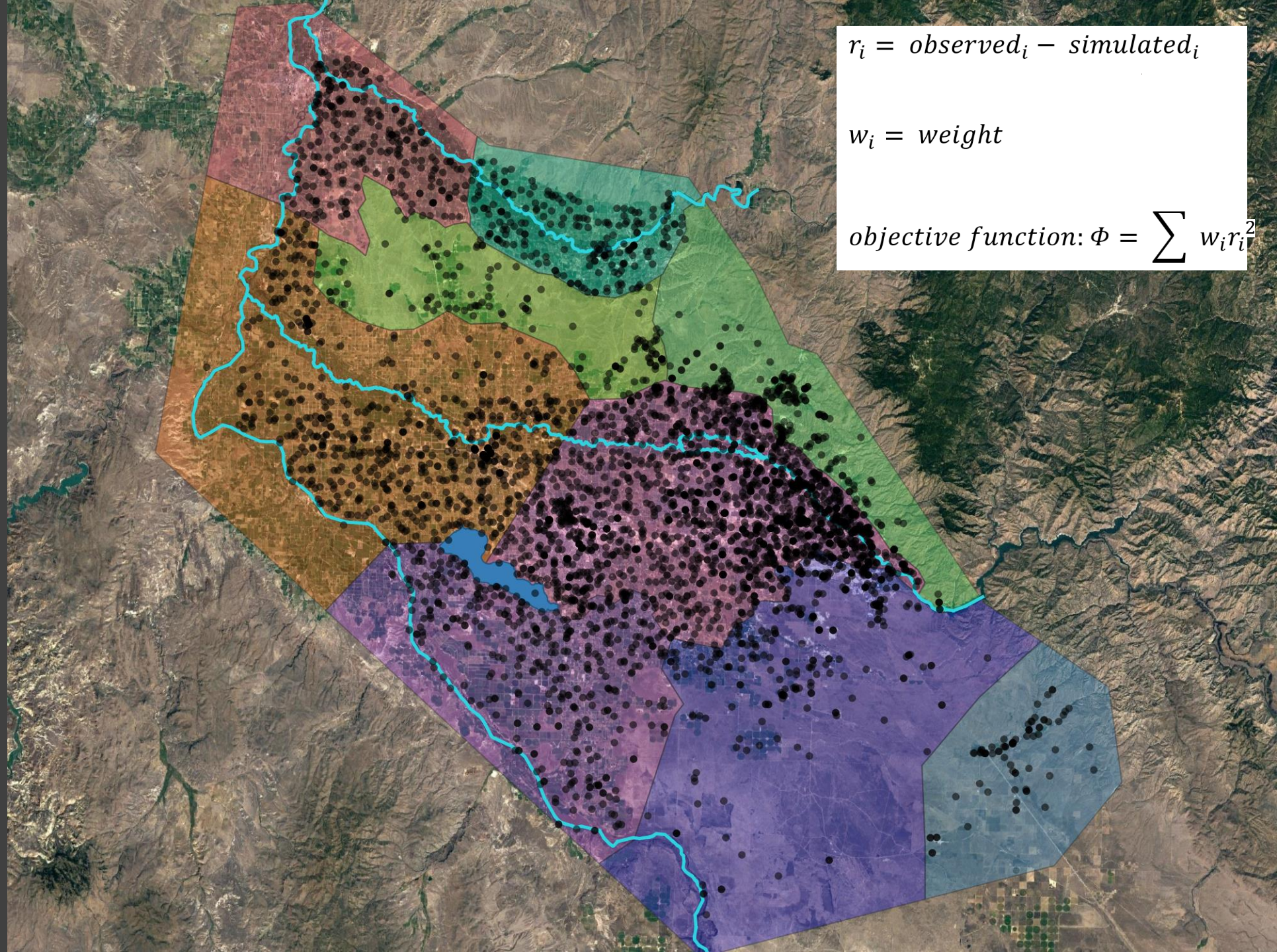
Phi Proportion Maps



$$r_i = observed_i - simulated_i$$

$$w_i = weight$$

$$objective\ function: \Phi = \sum w_i r_i^2$$

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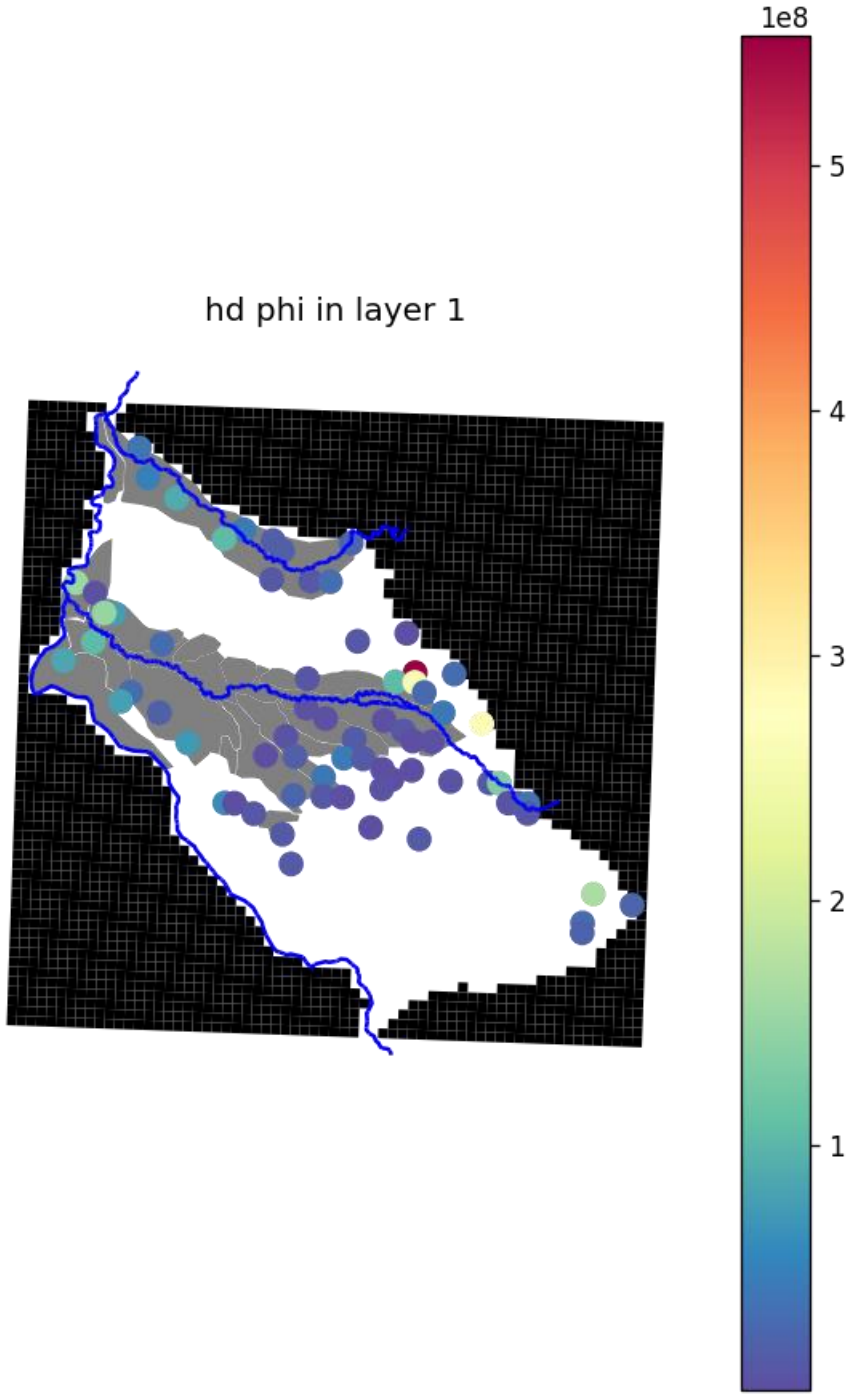

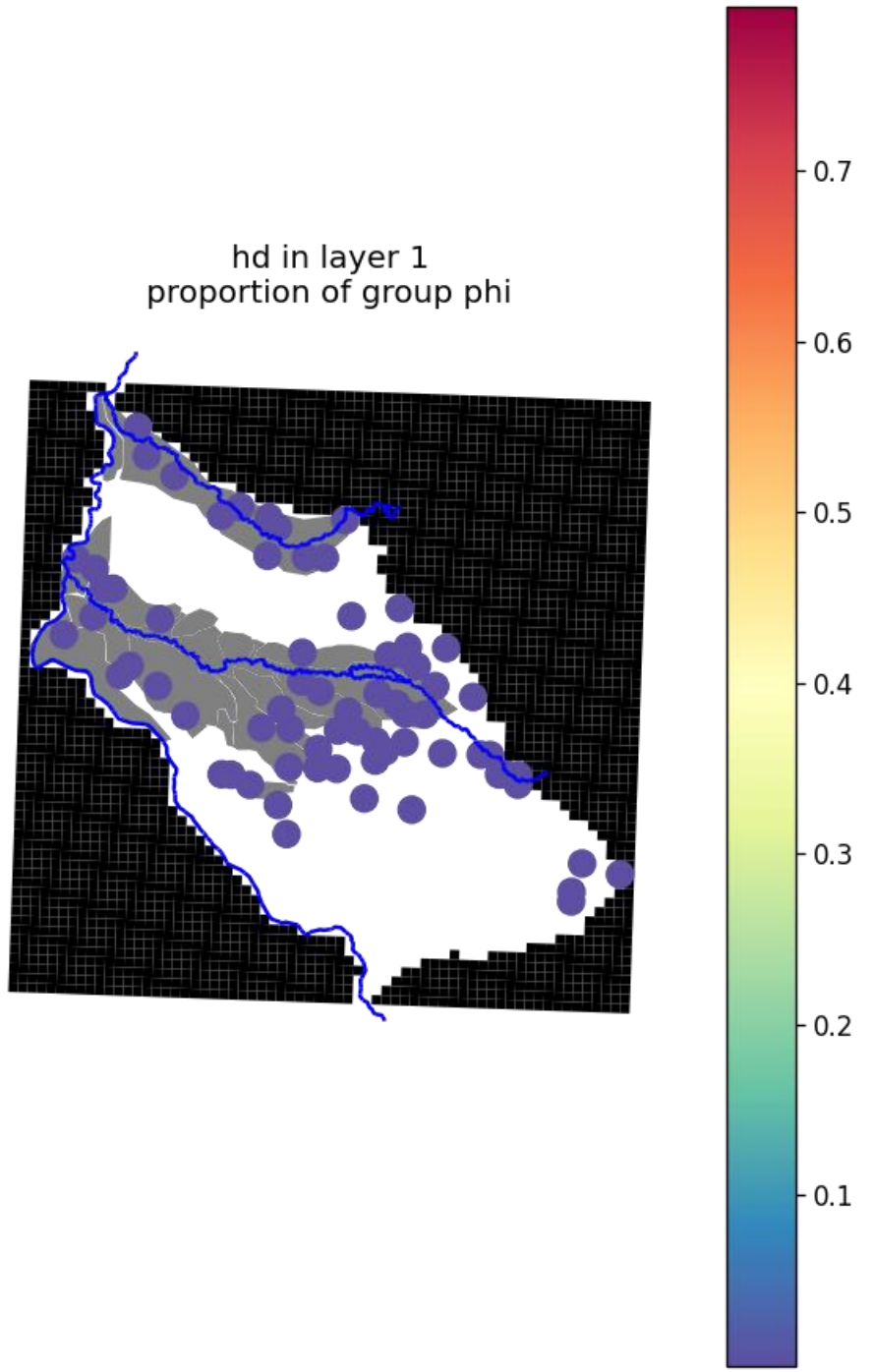

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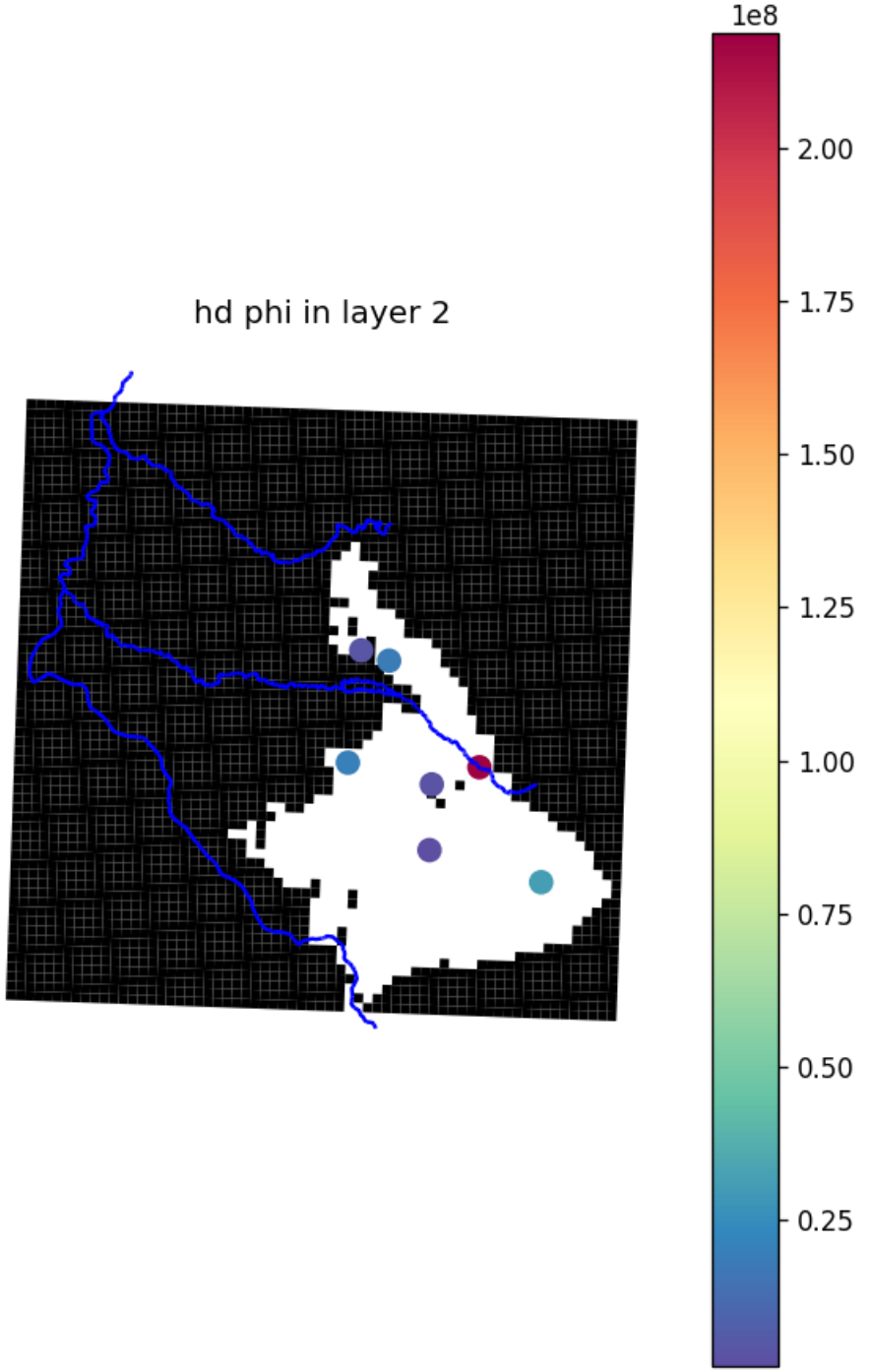

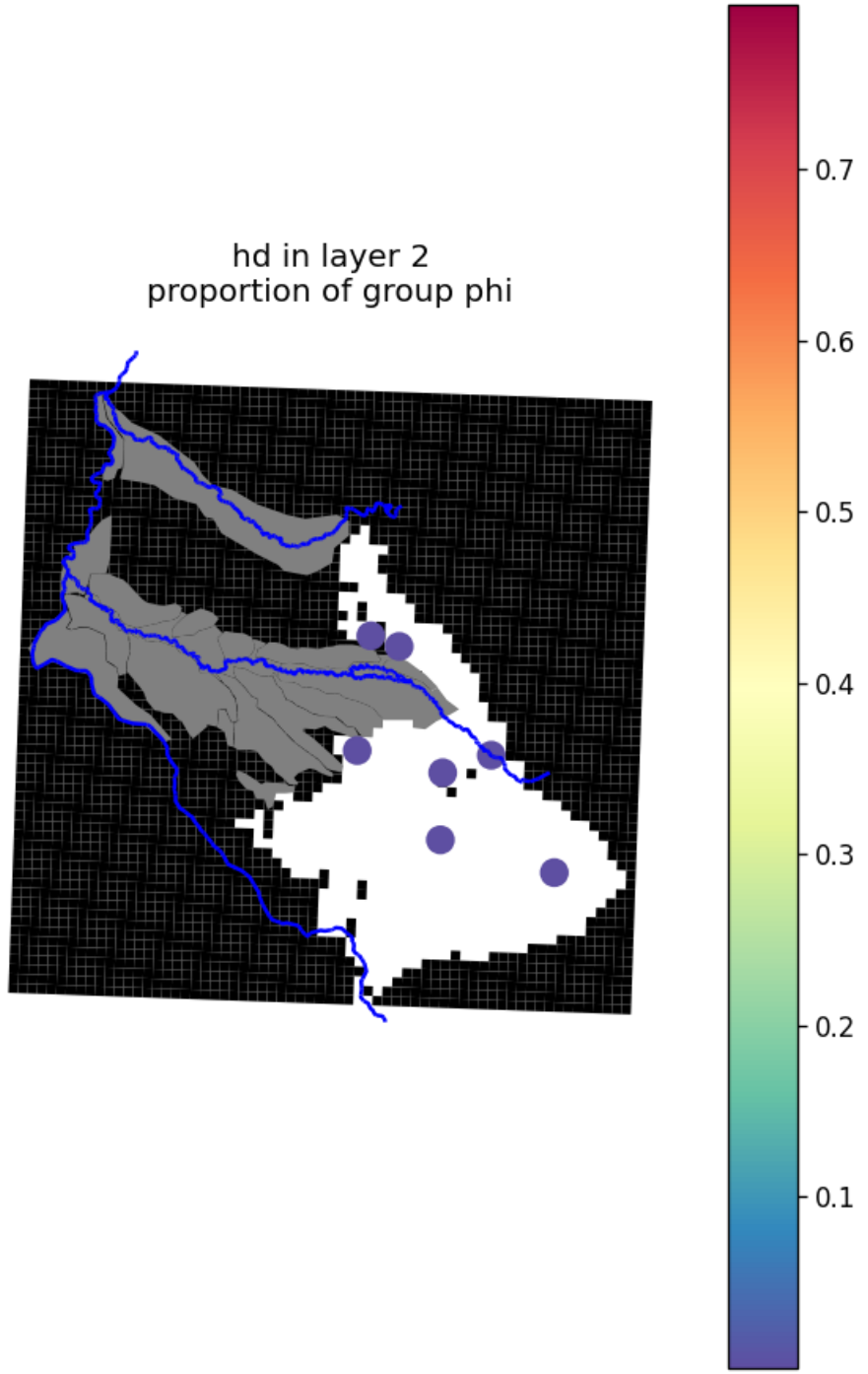

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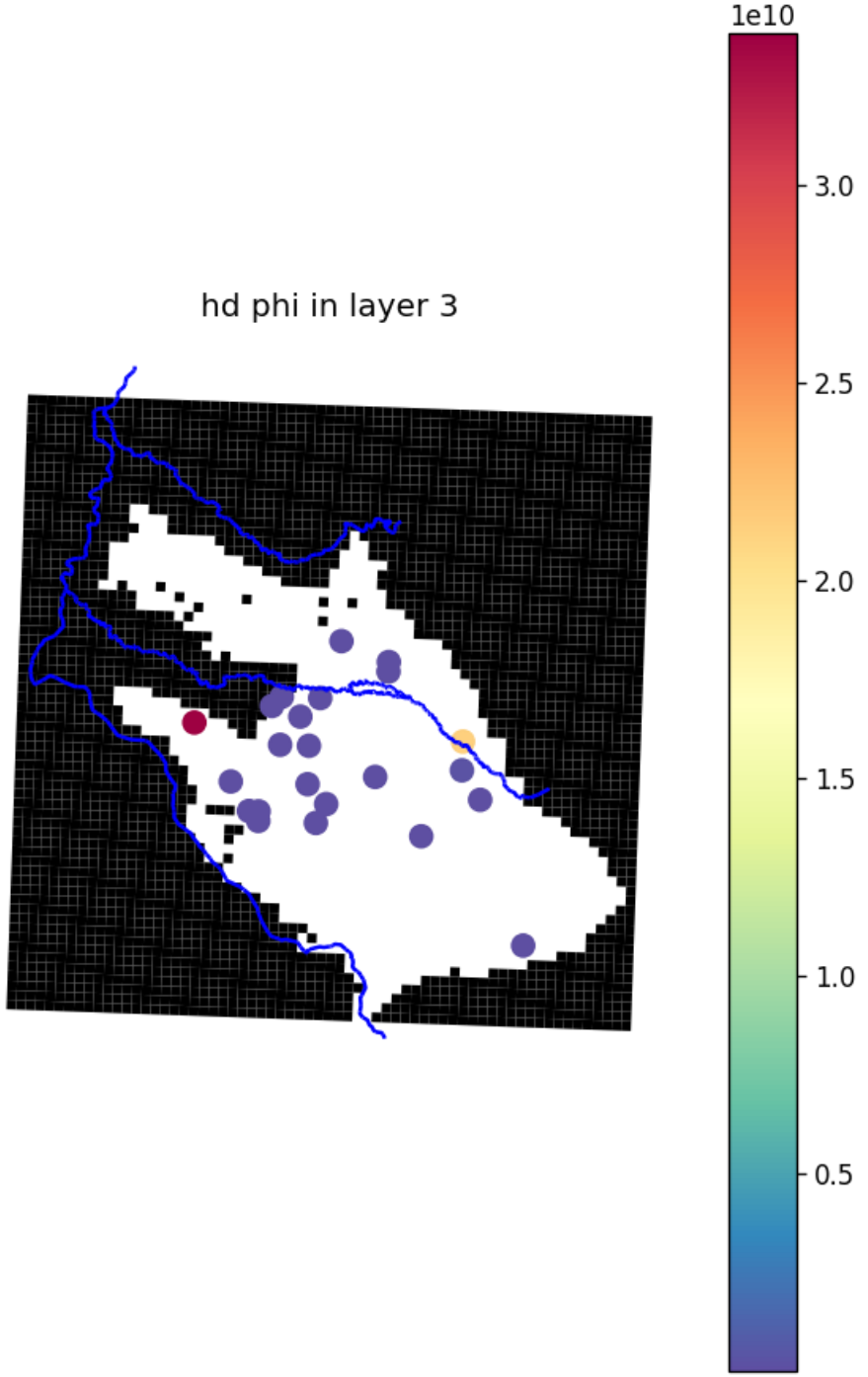

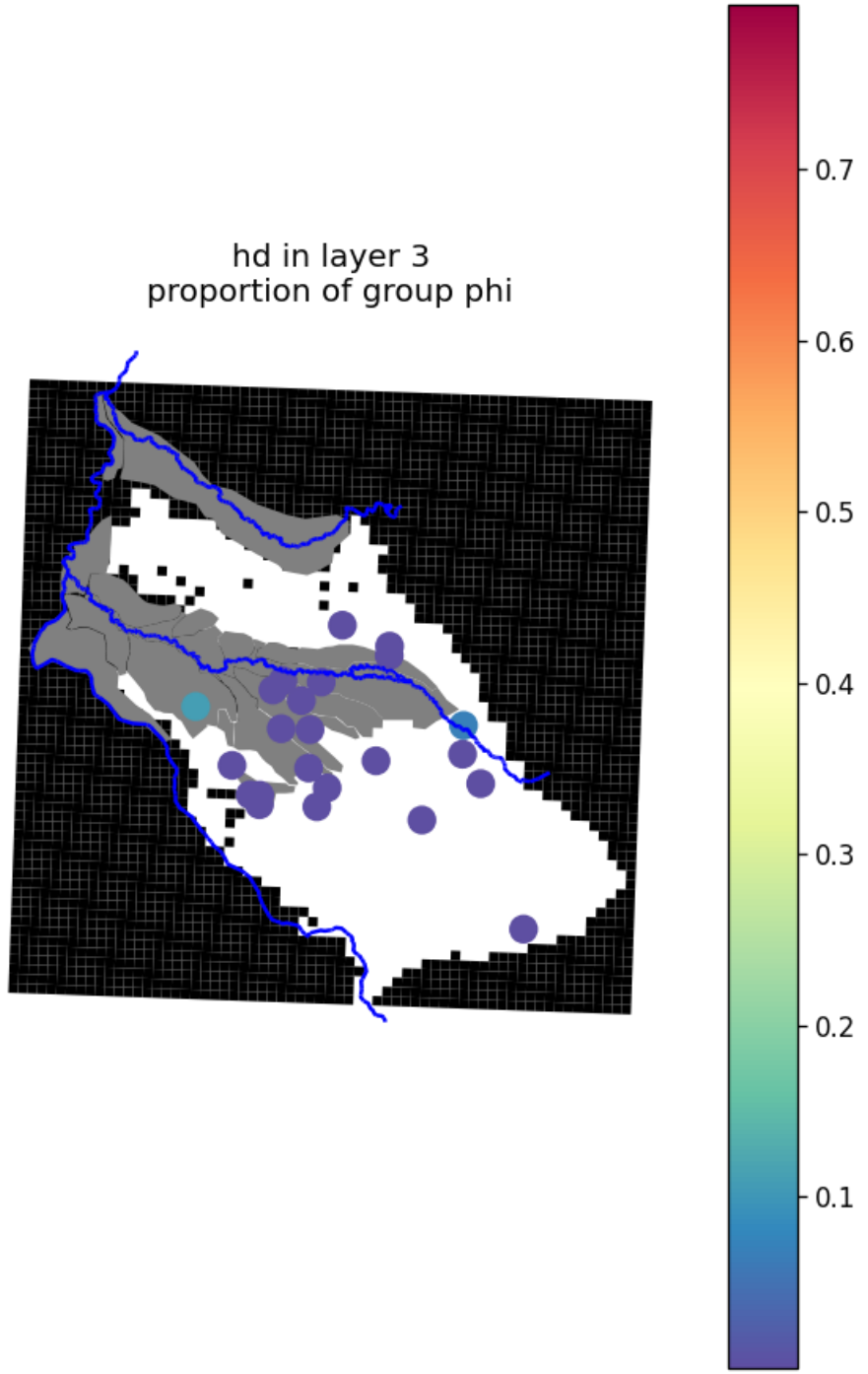

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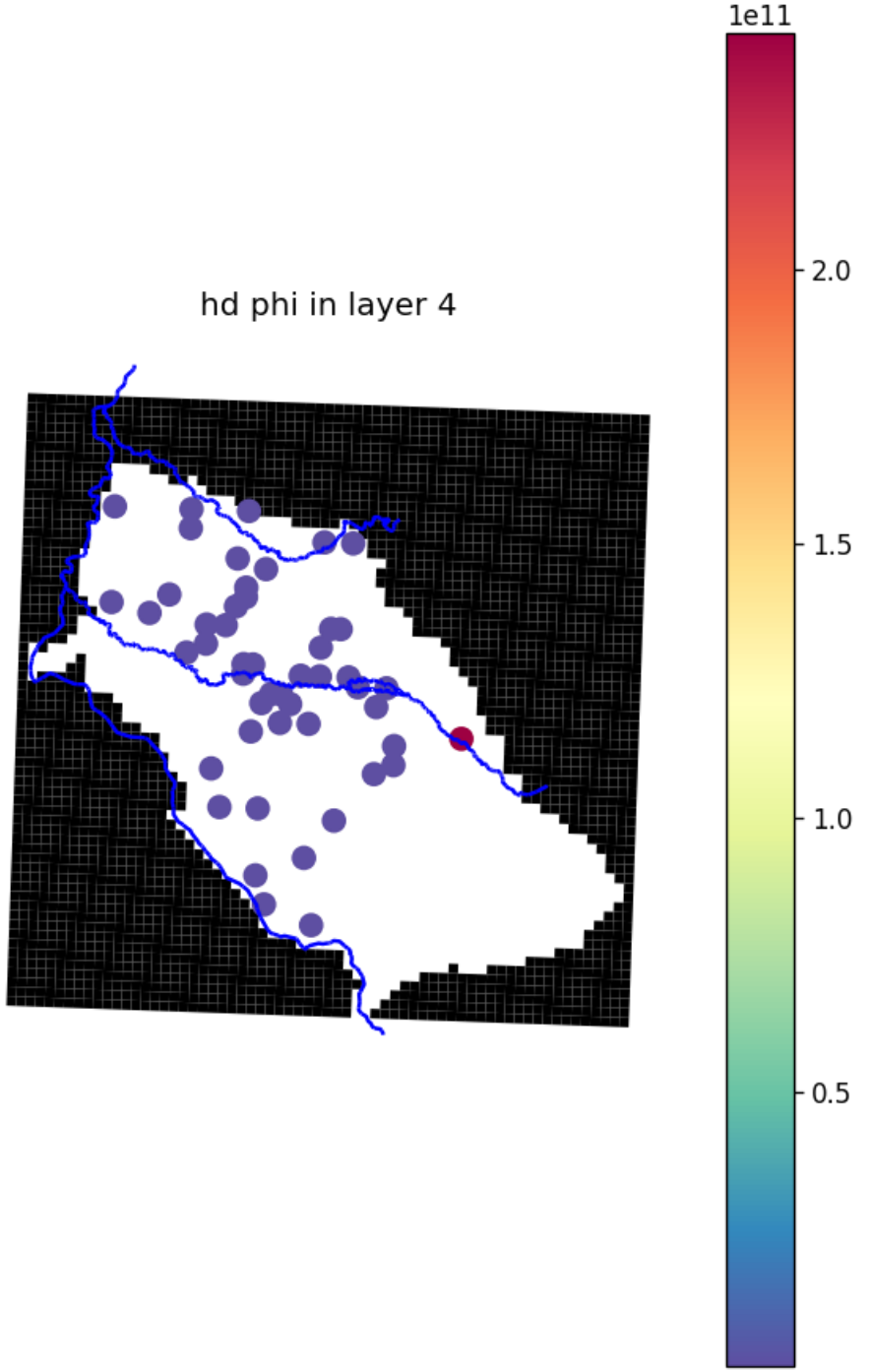

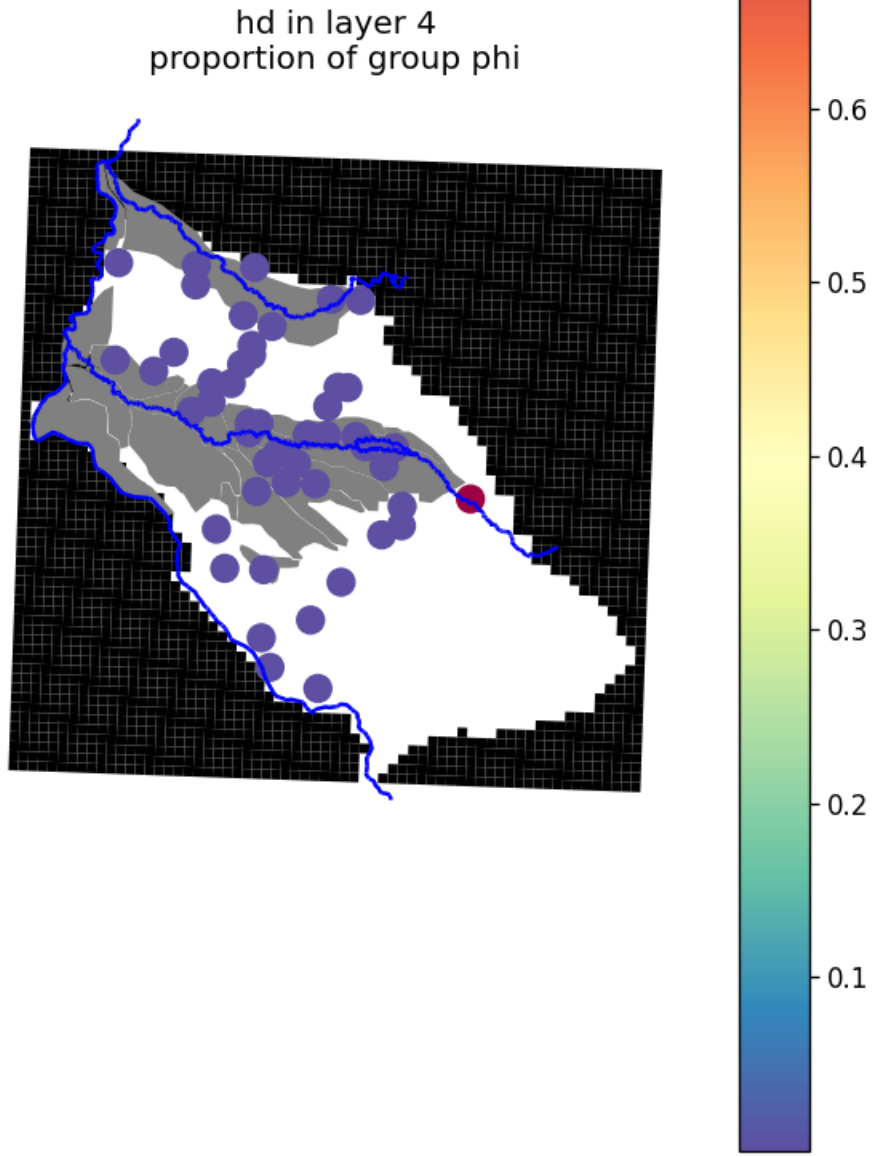

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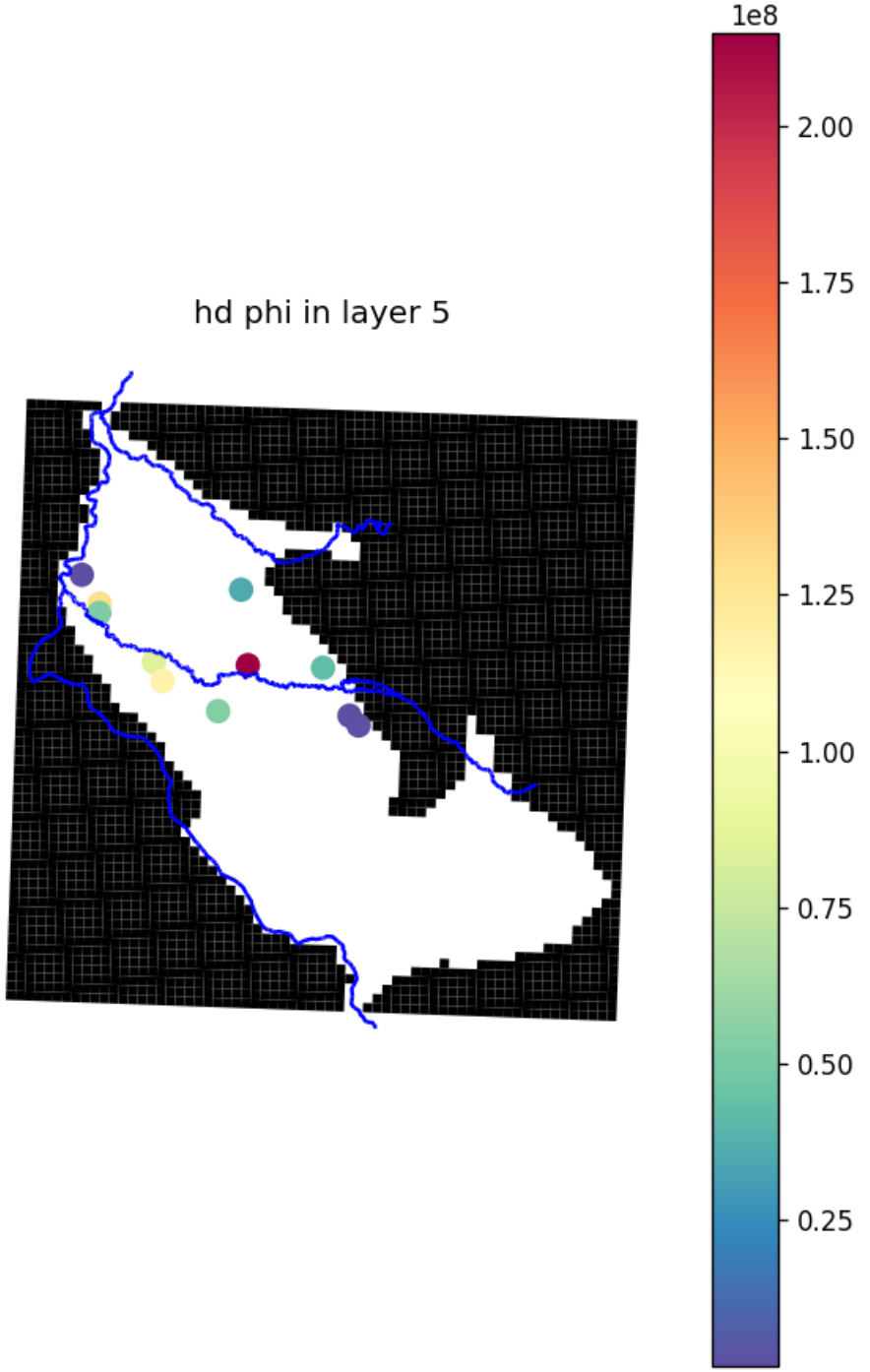

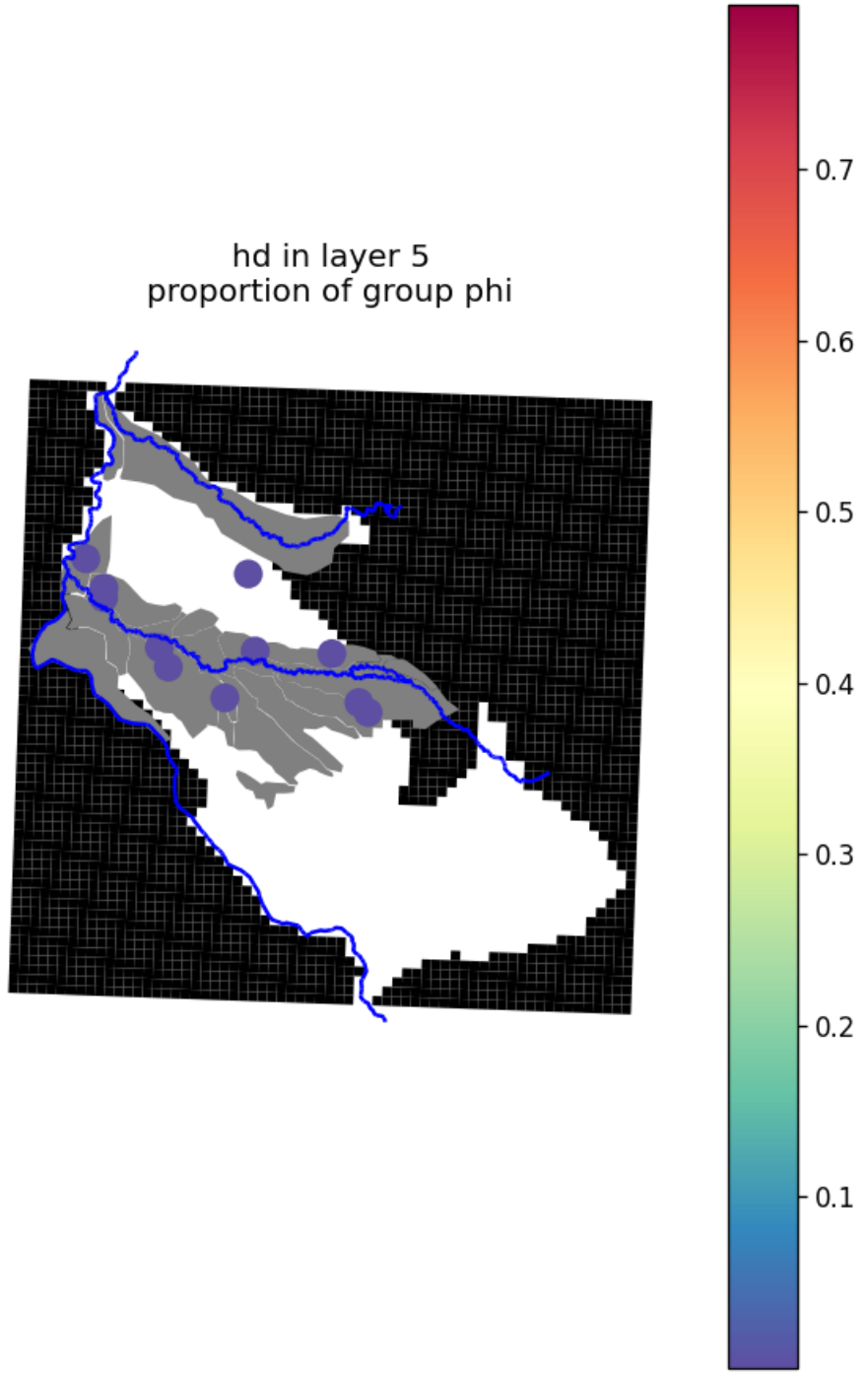

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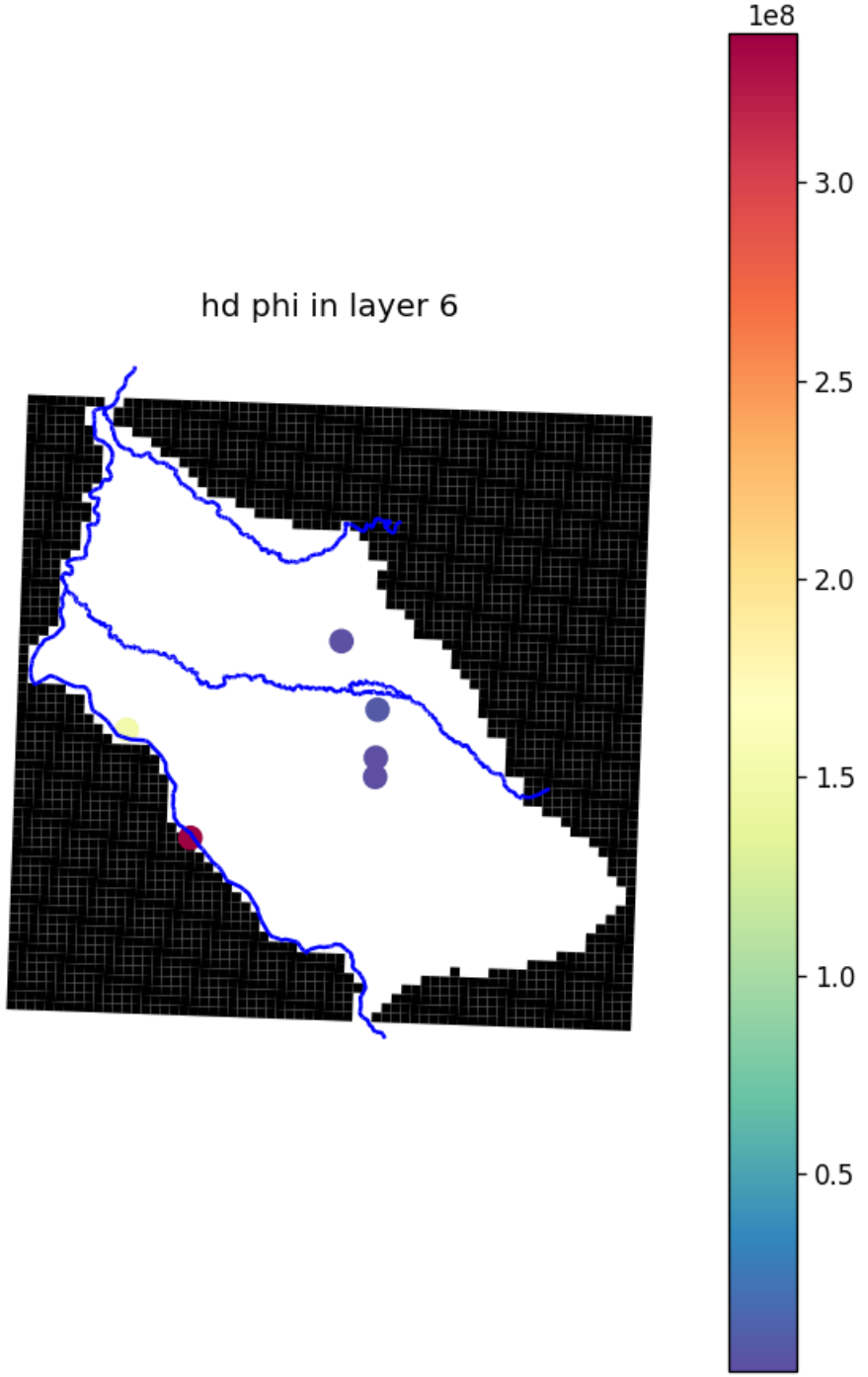

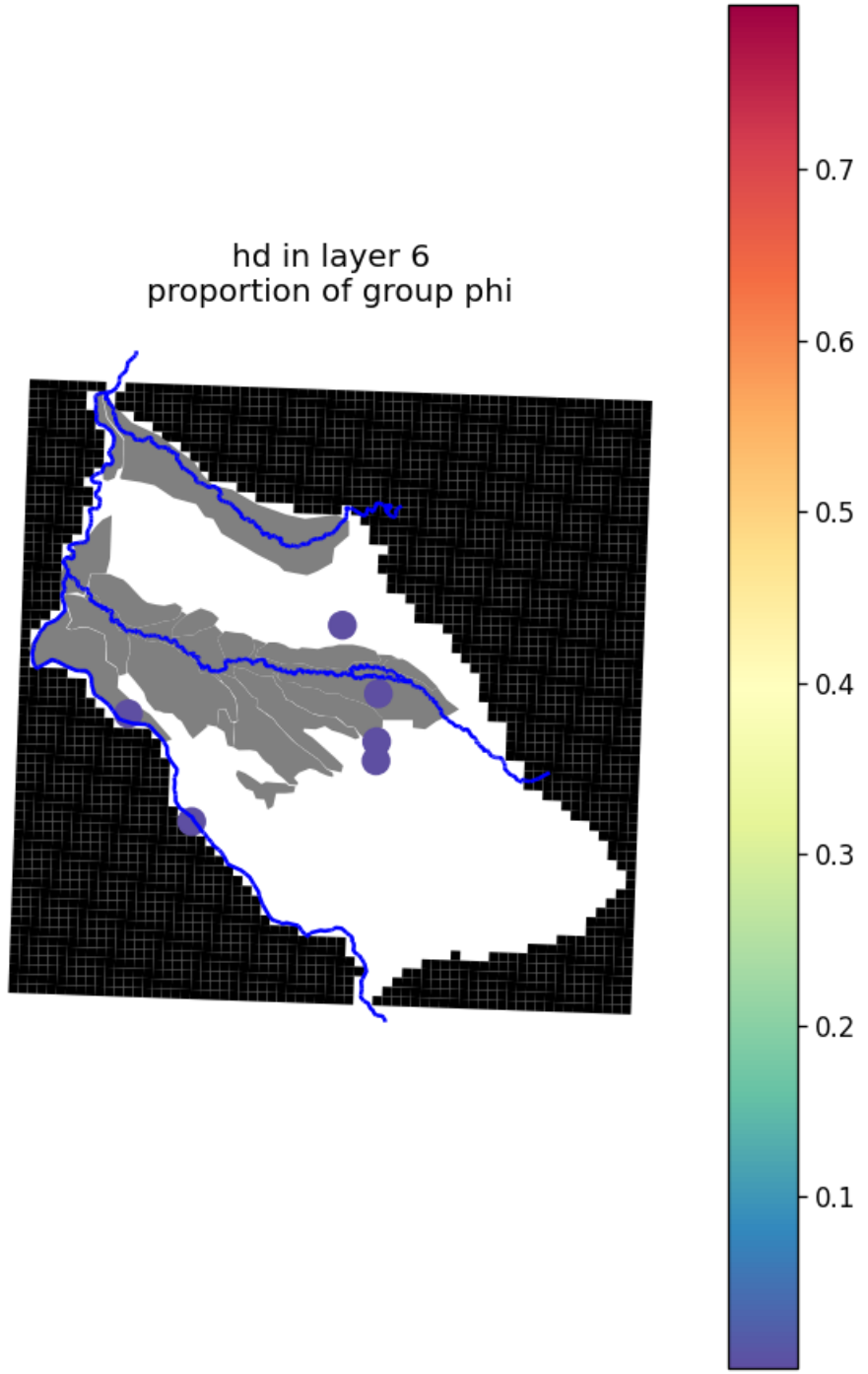

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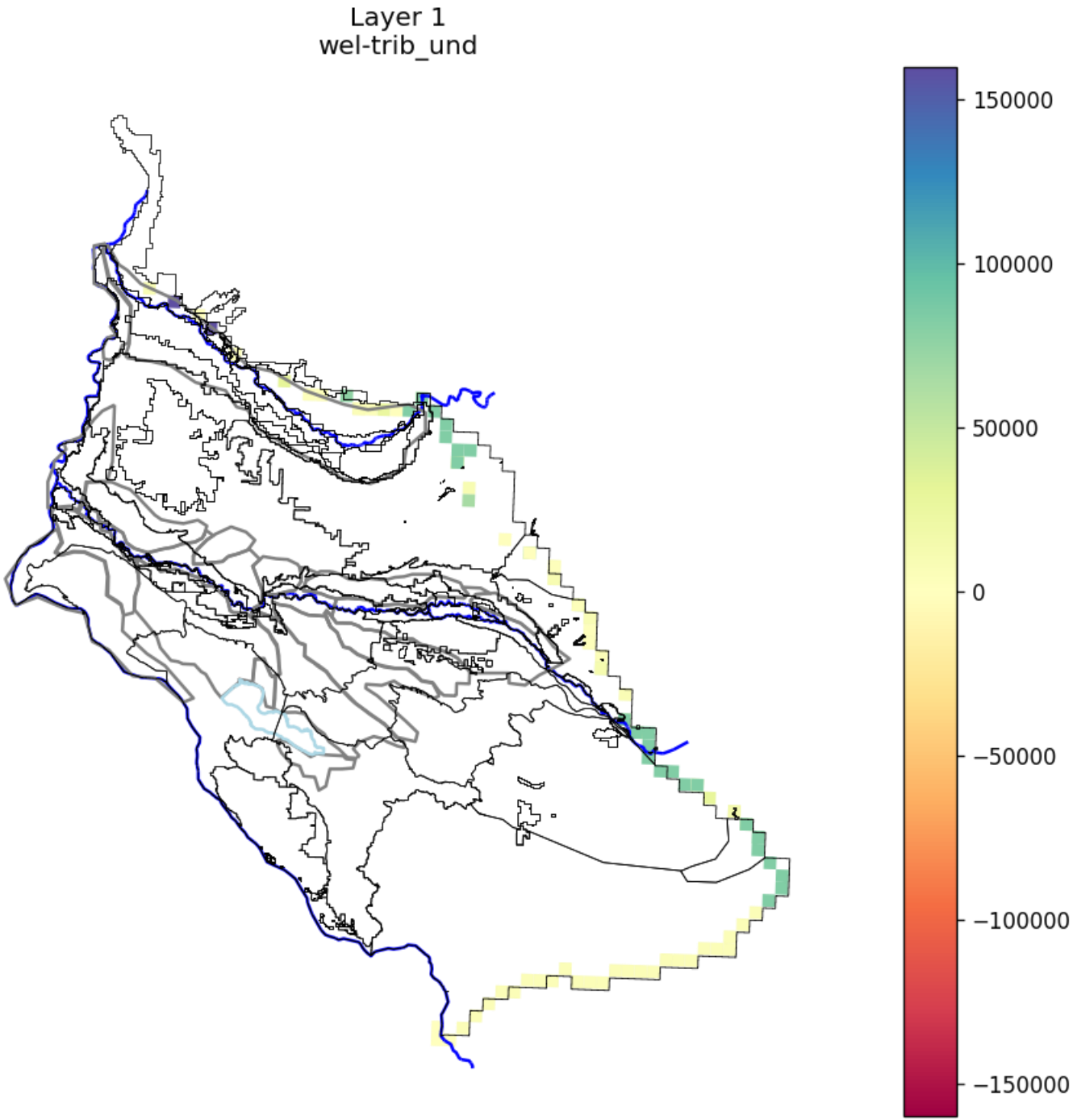
Causes?



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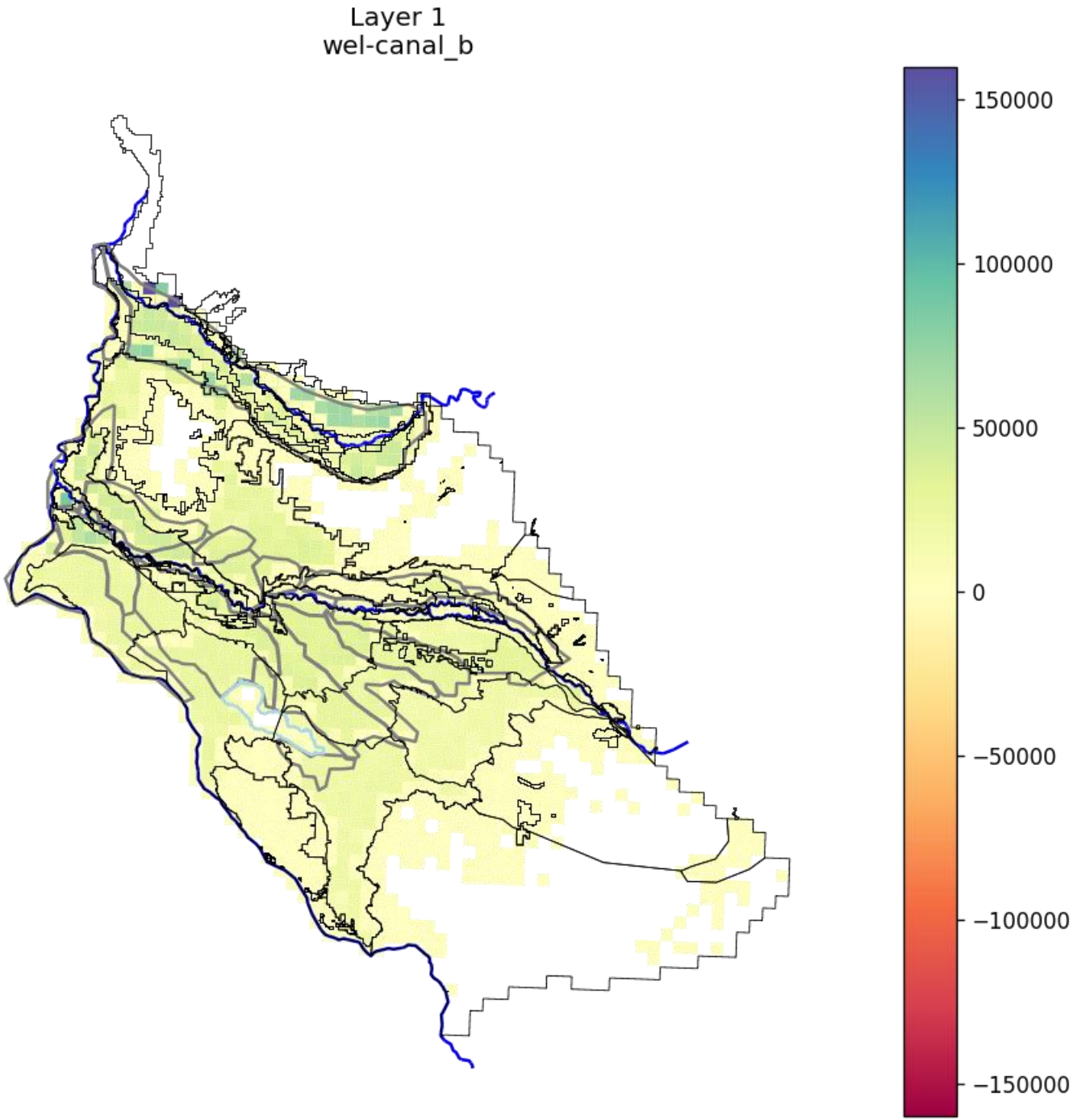

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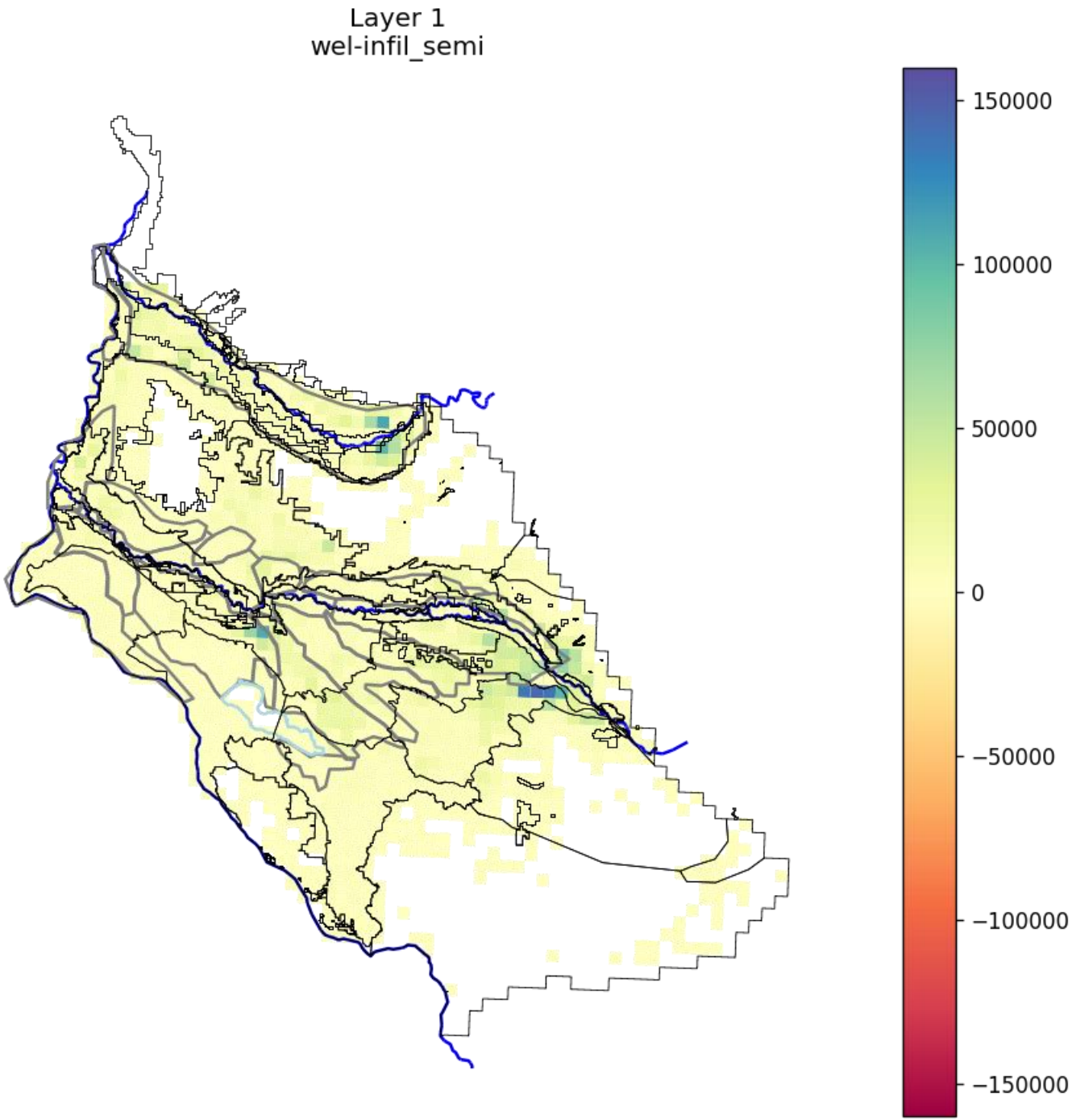

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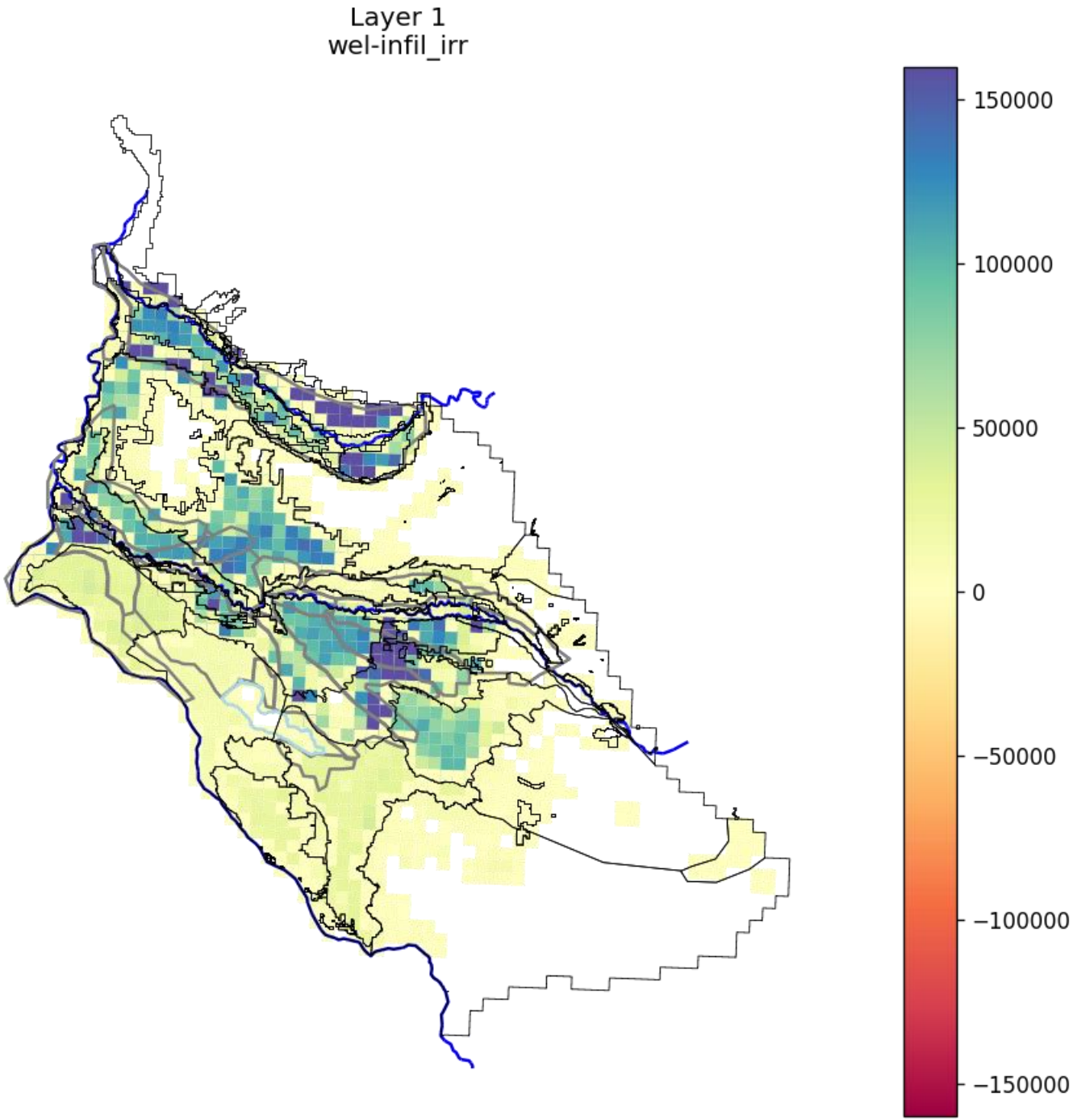

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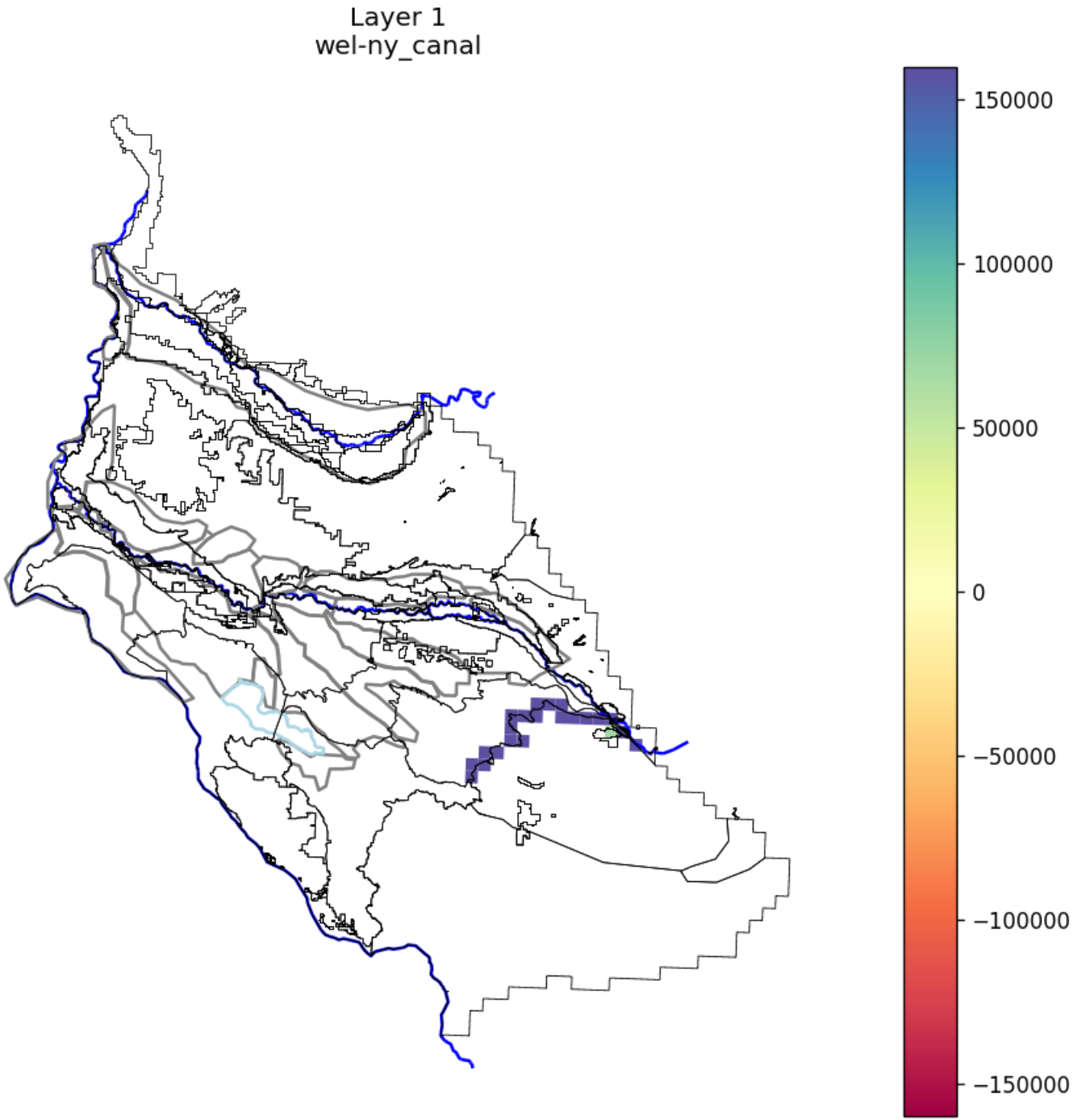

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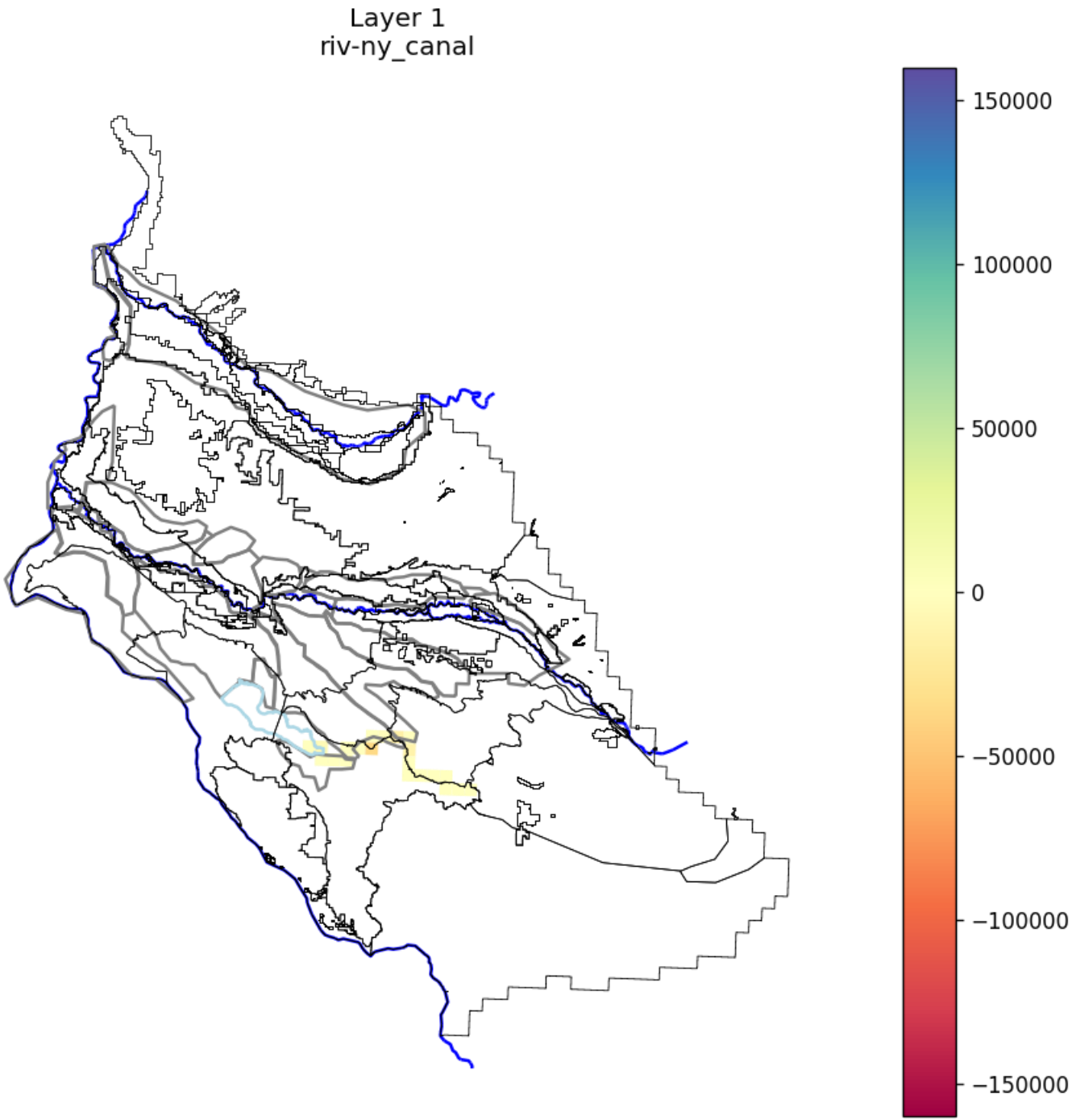

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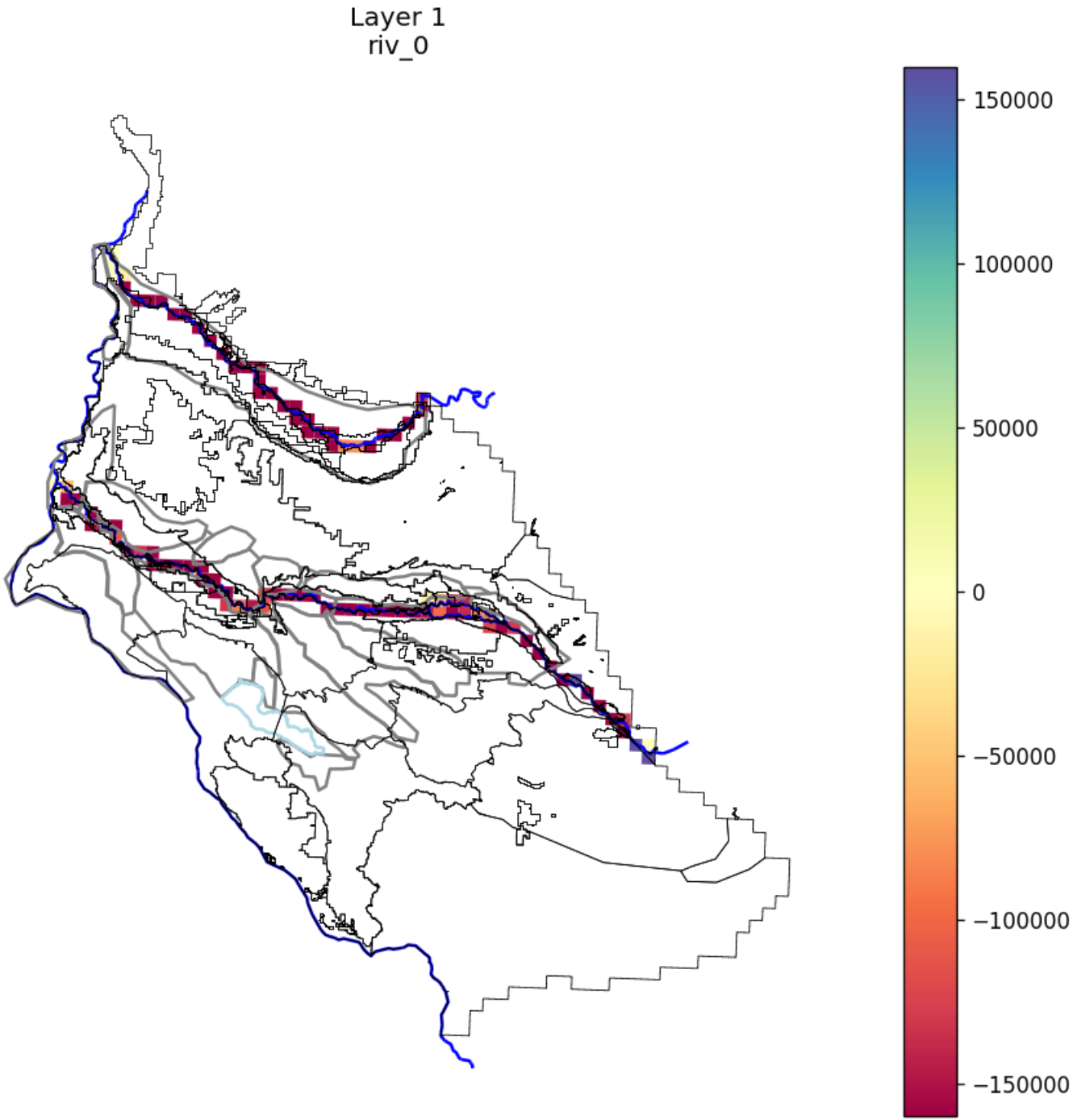

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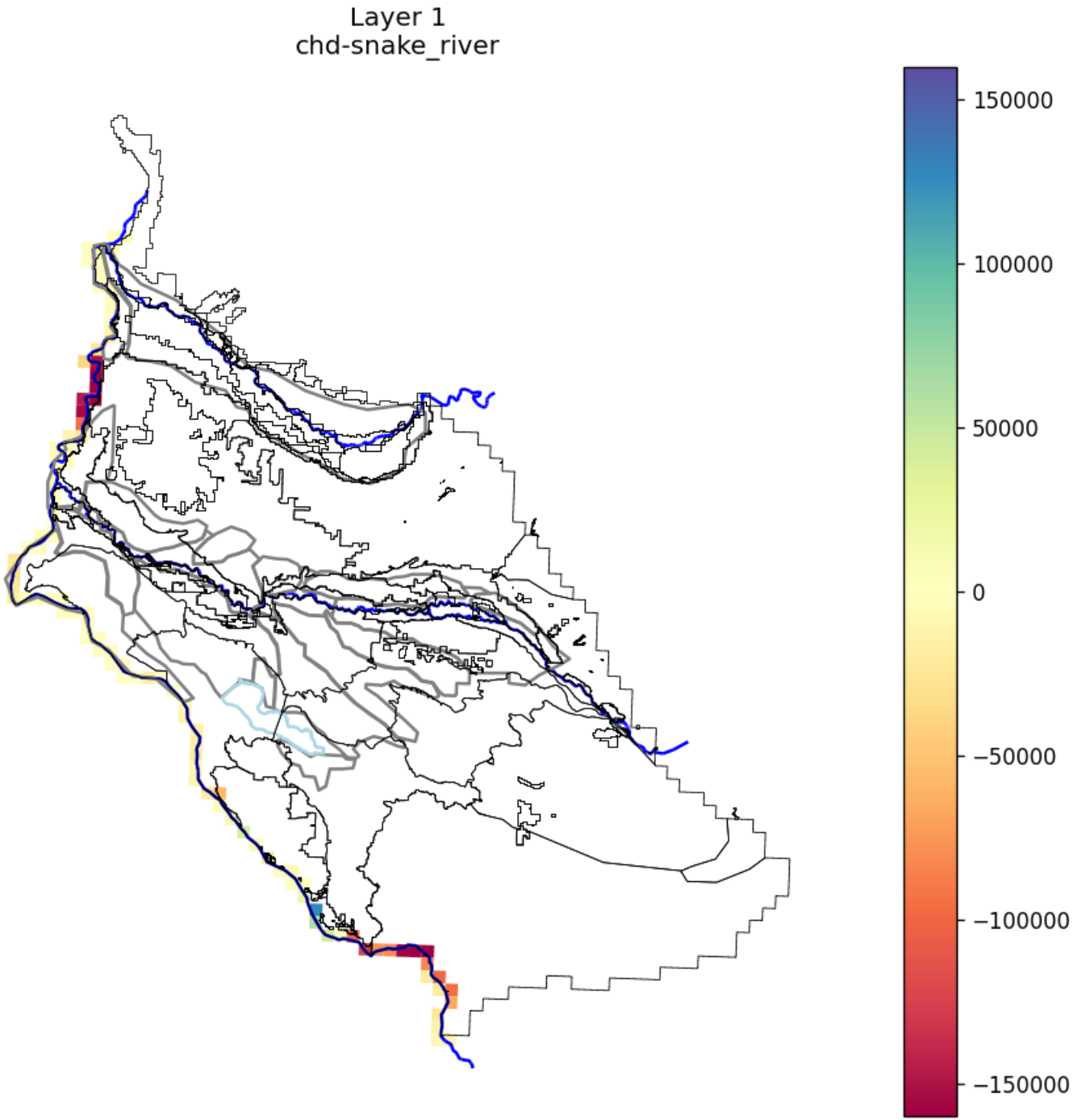
Causes?



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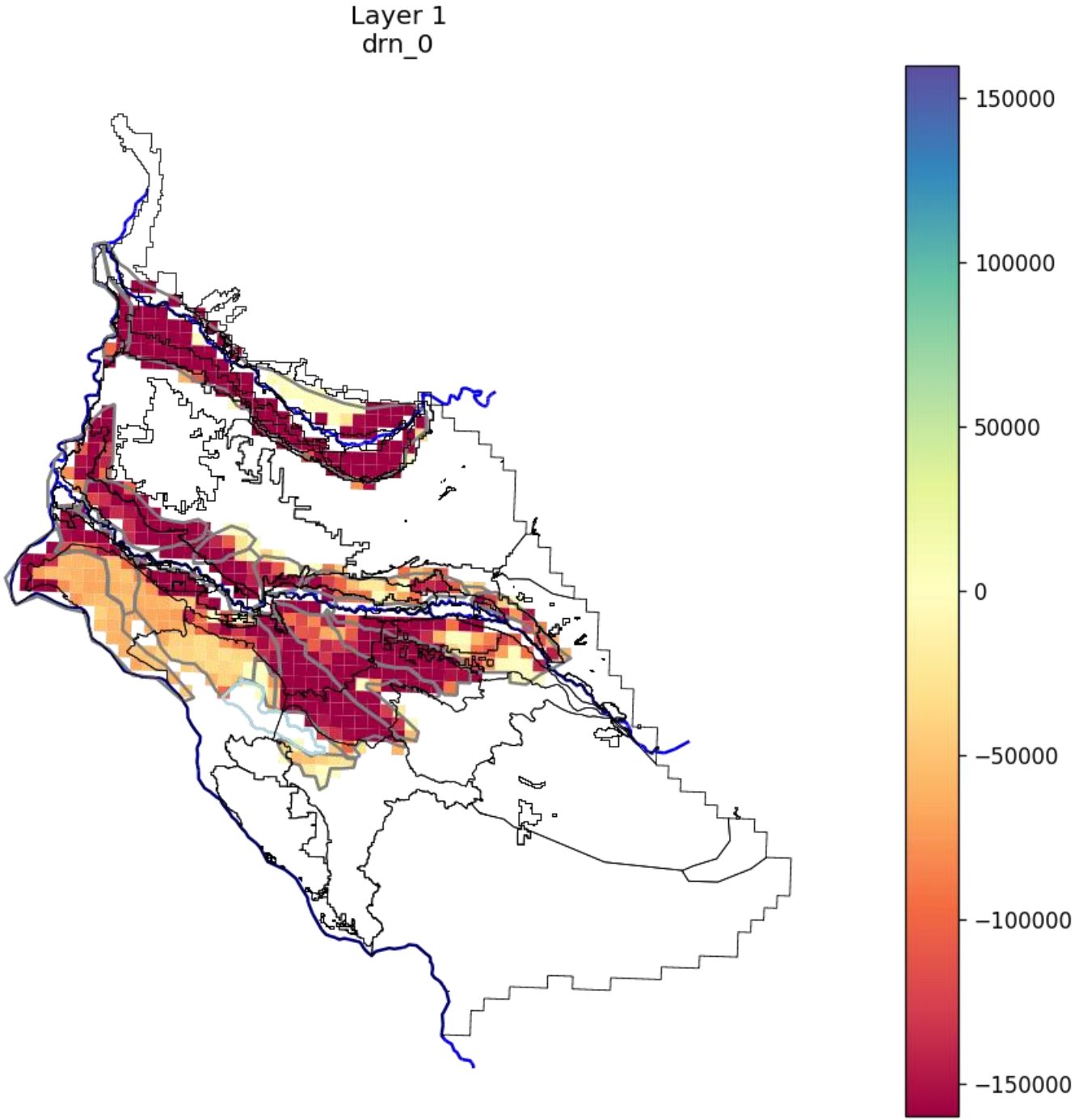

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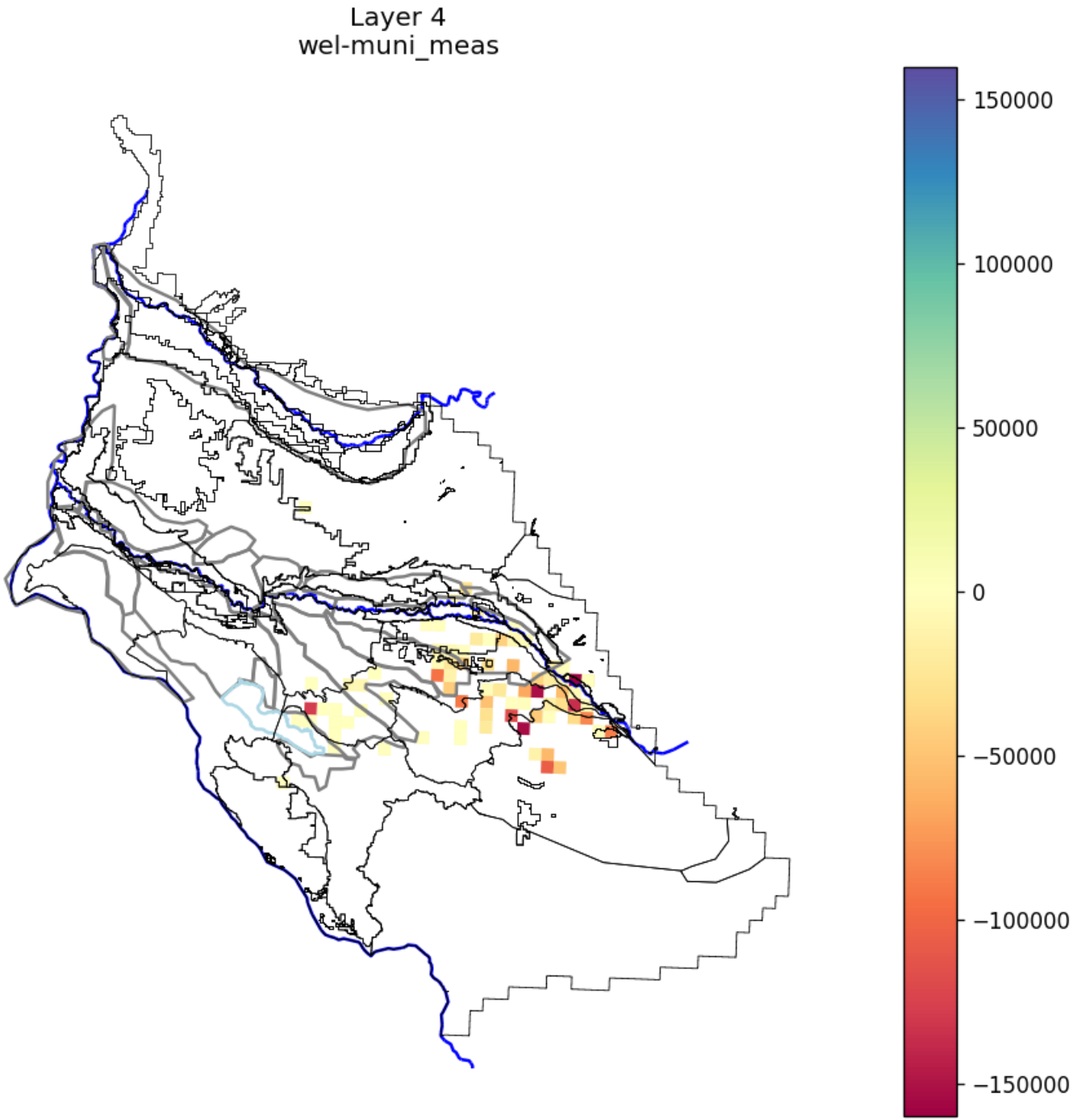

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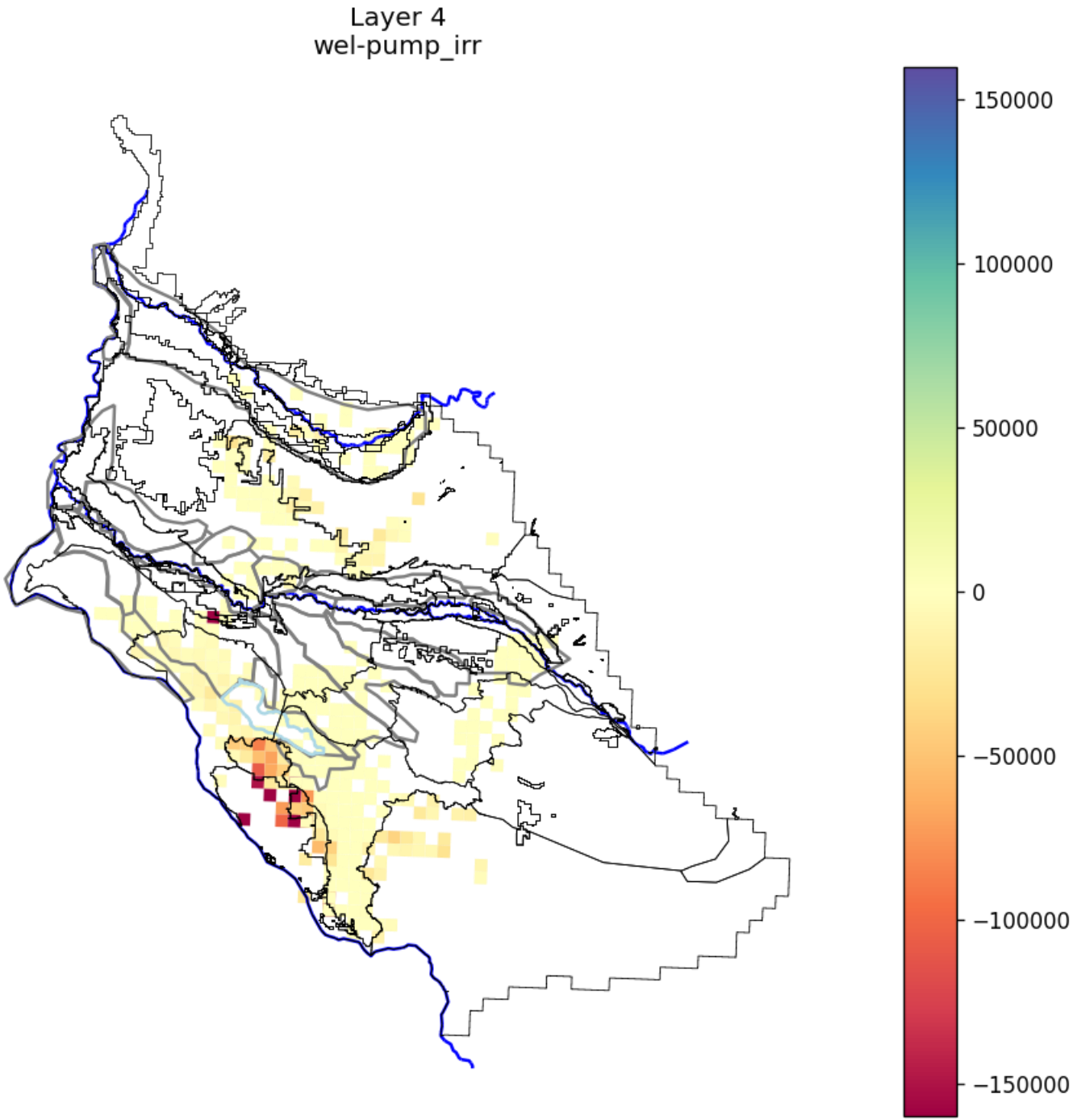

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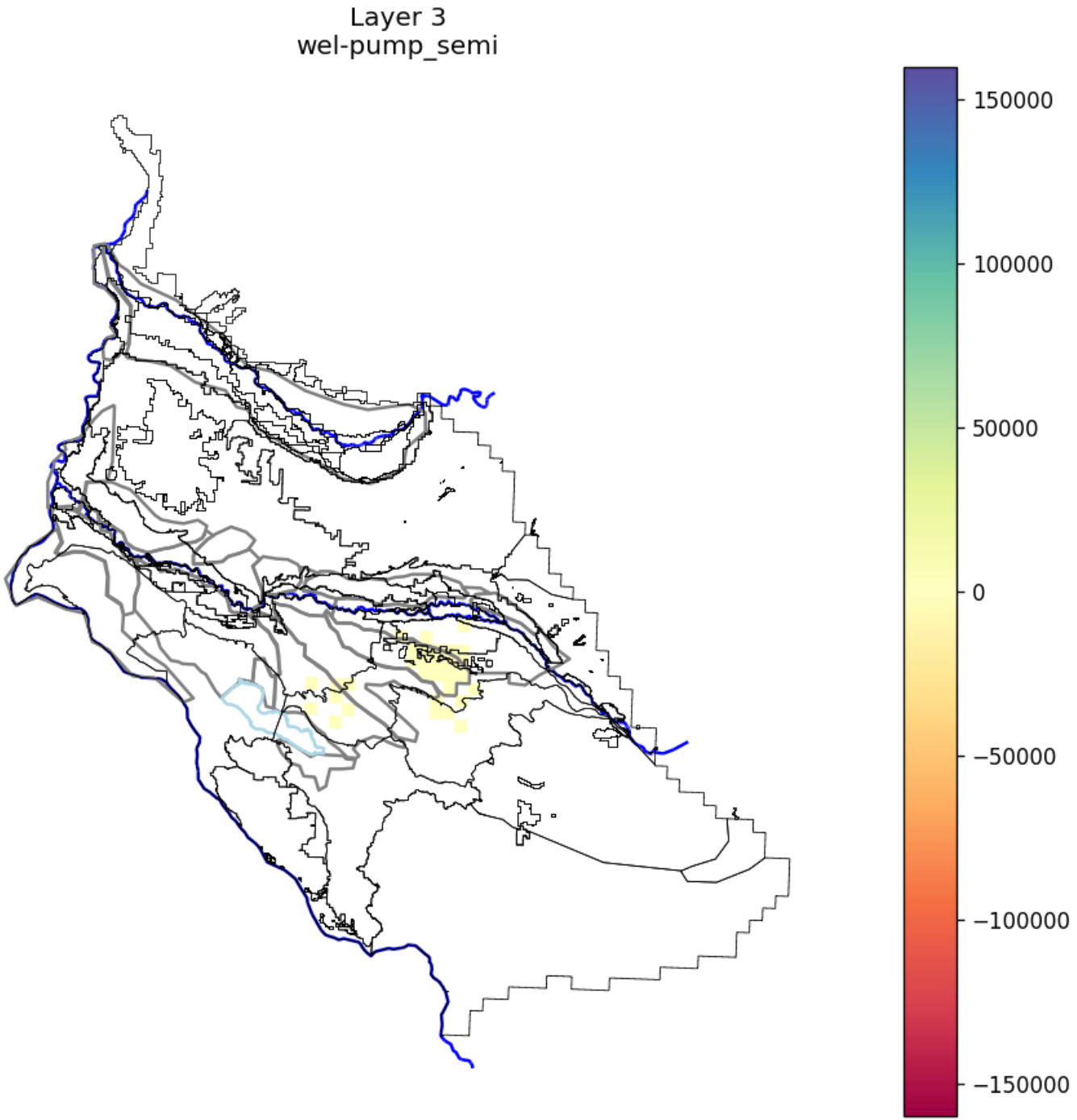

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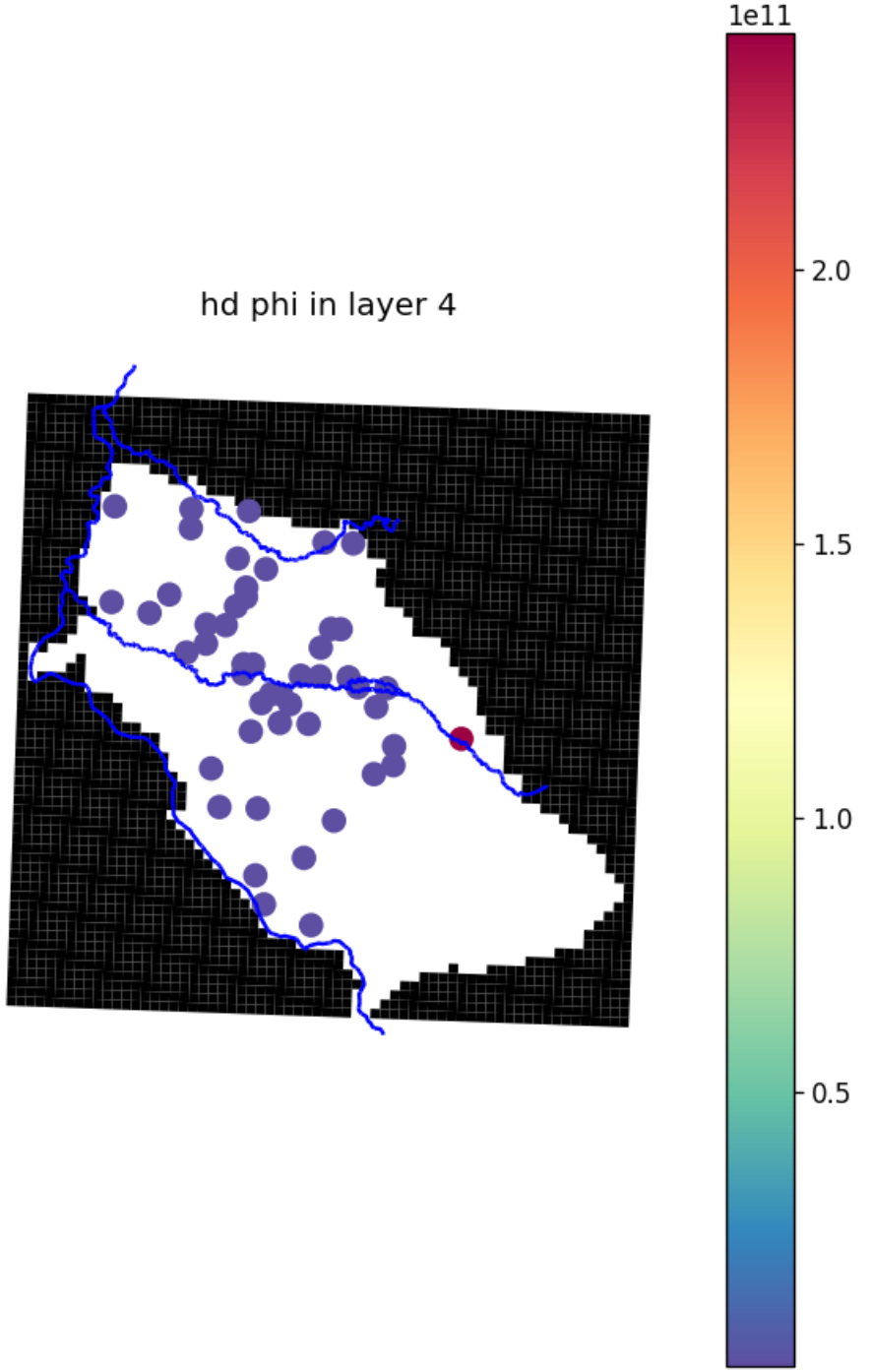
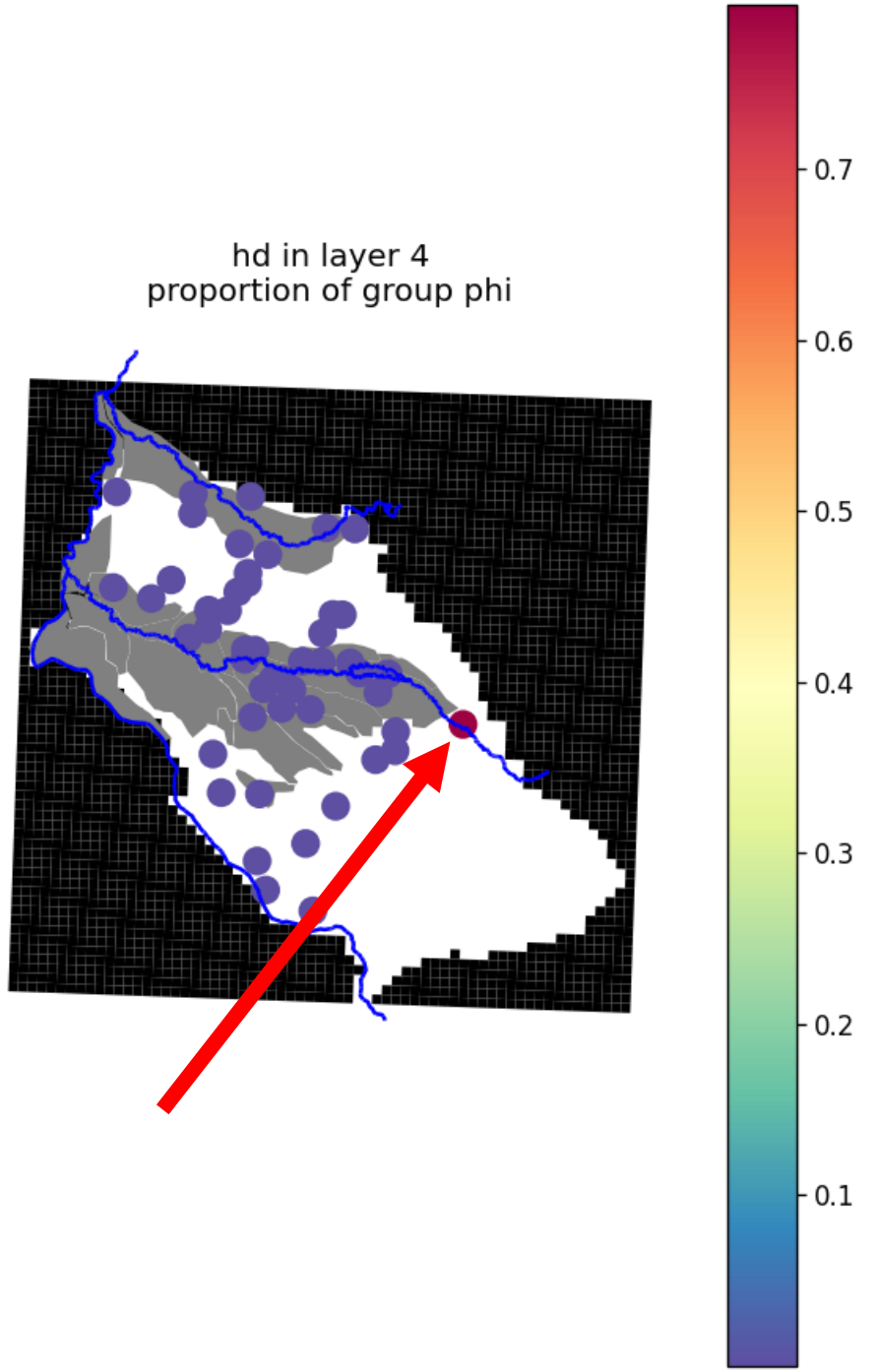
Upcoming efforts

Check Observation Validity (manually)





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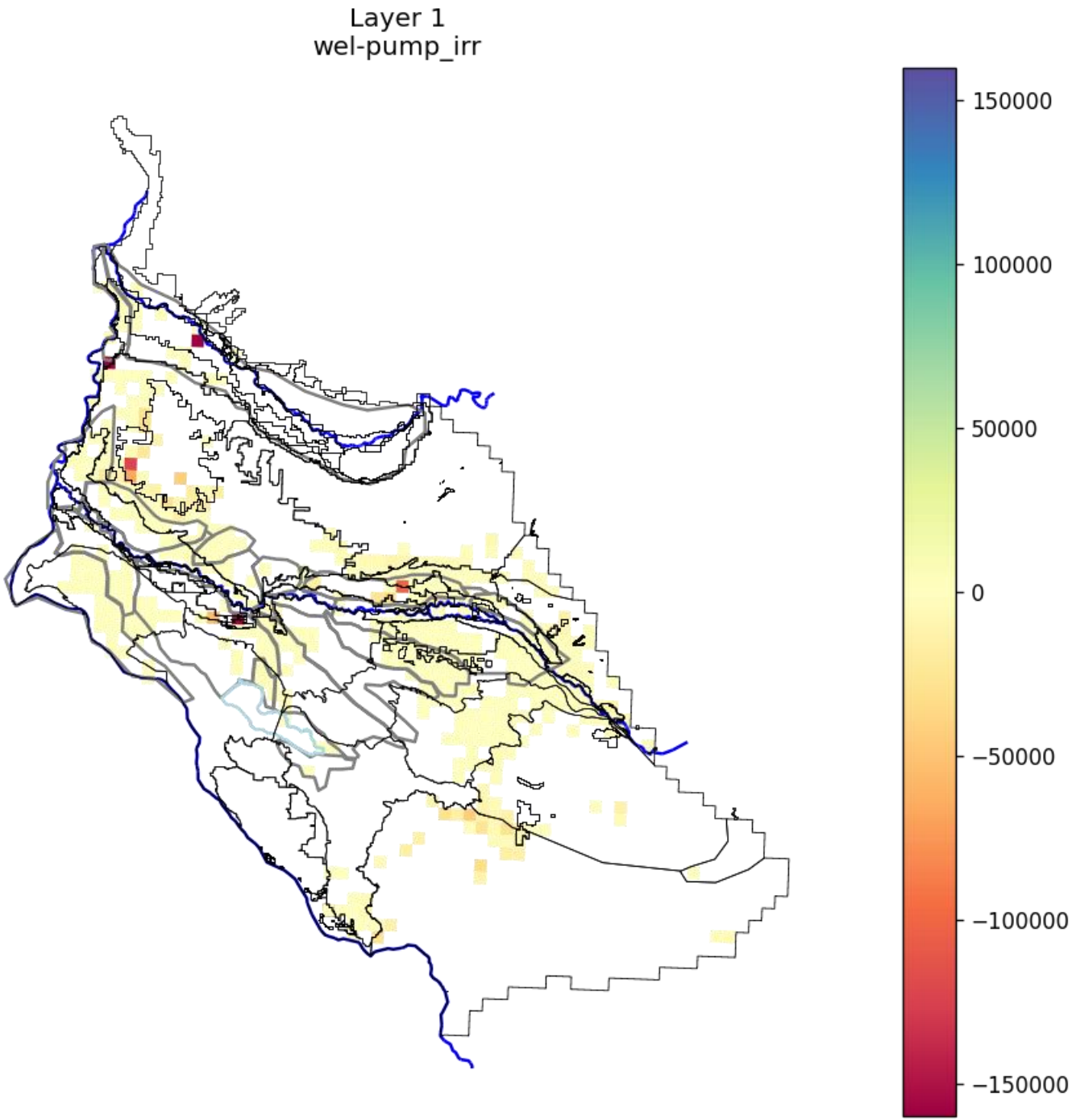
Troubleshoot Model Structure



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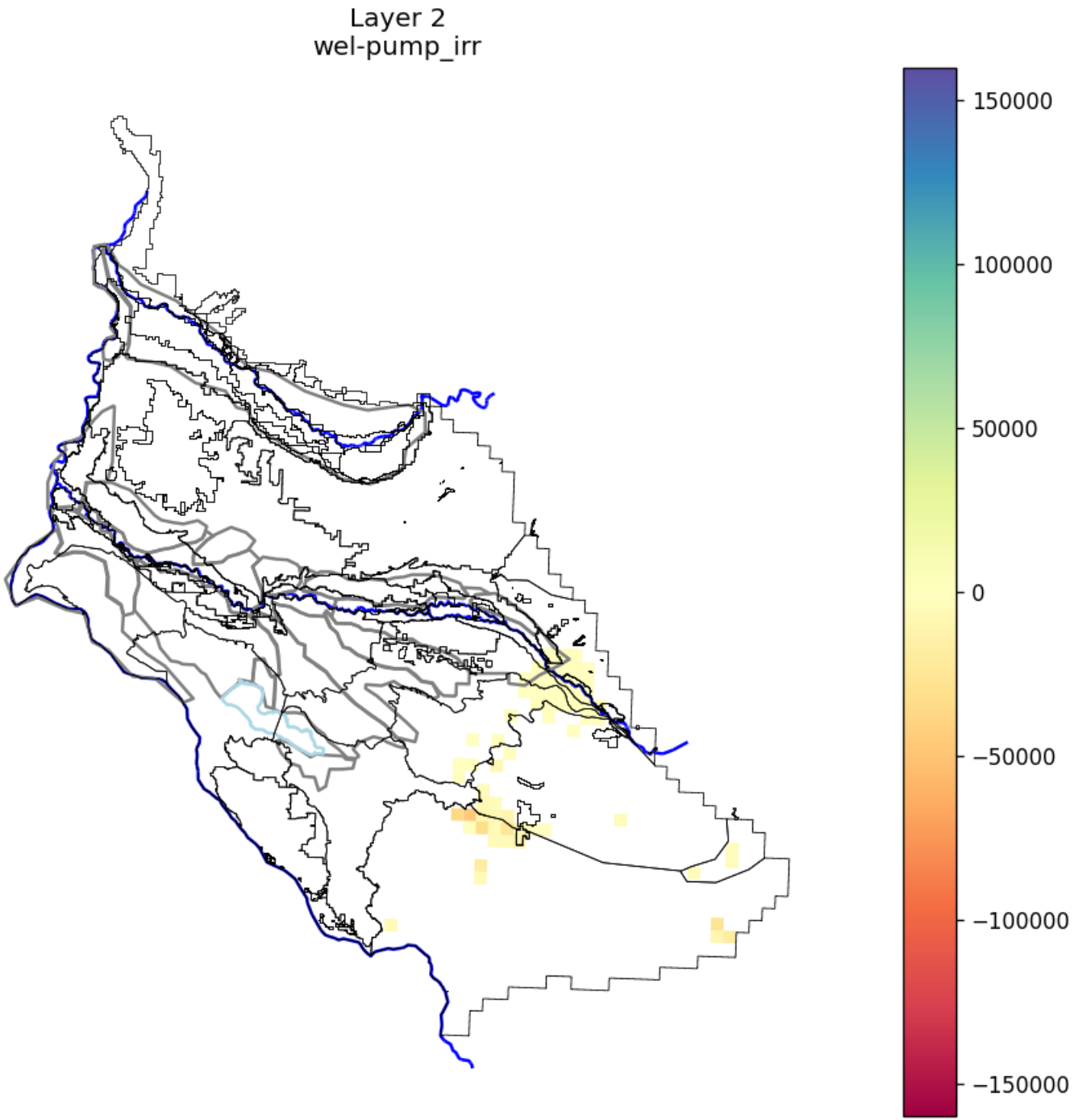
Troubleshoot Model Structure



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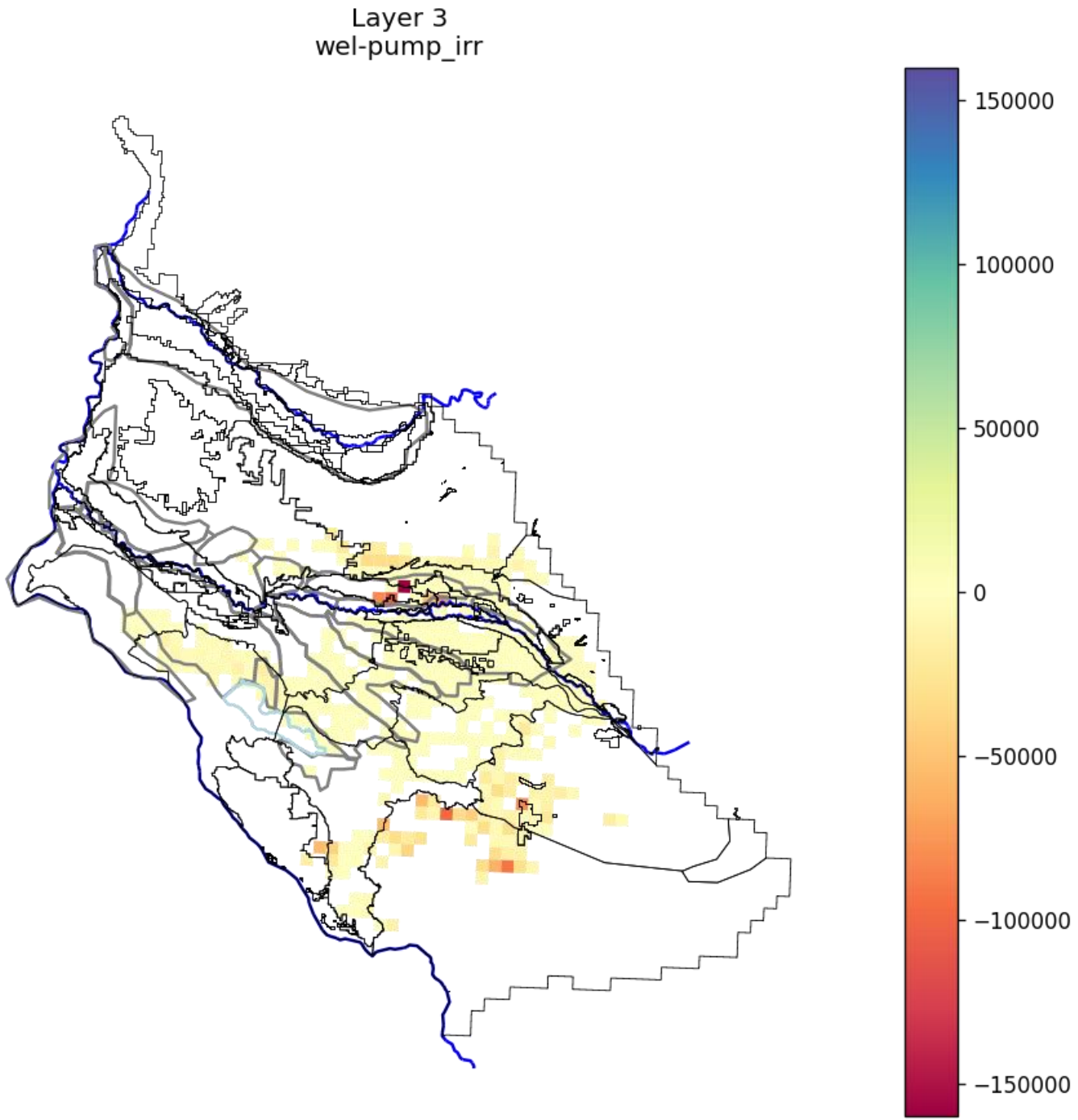
Troubleshoot Model Structure



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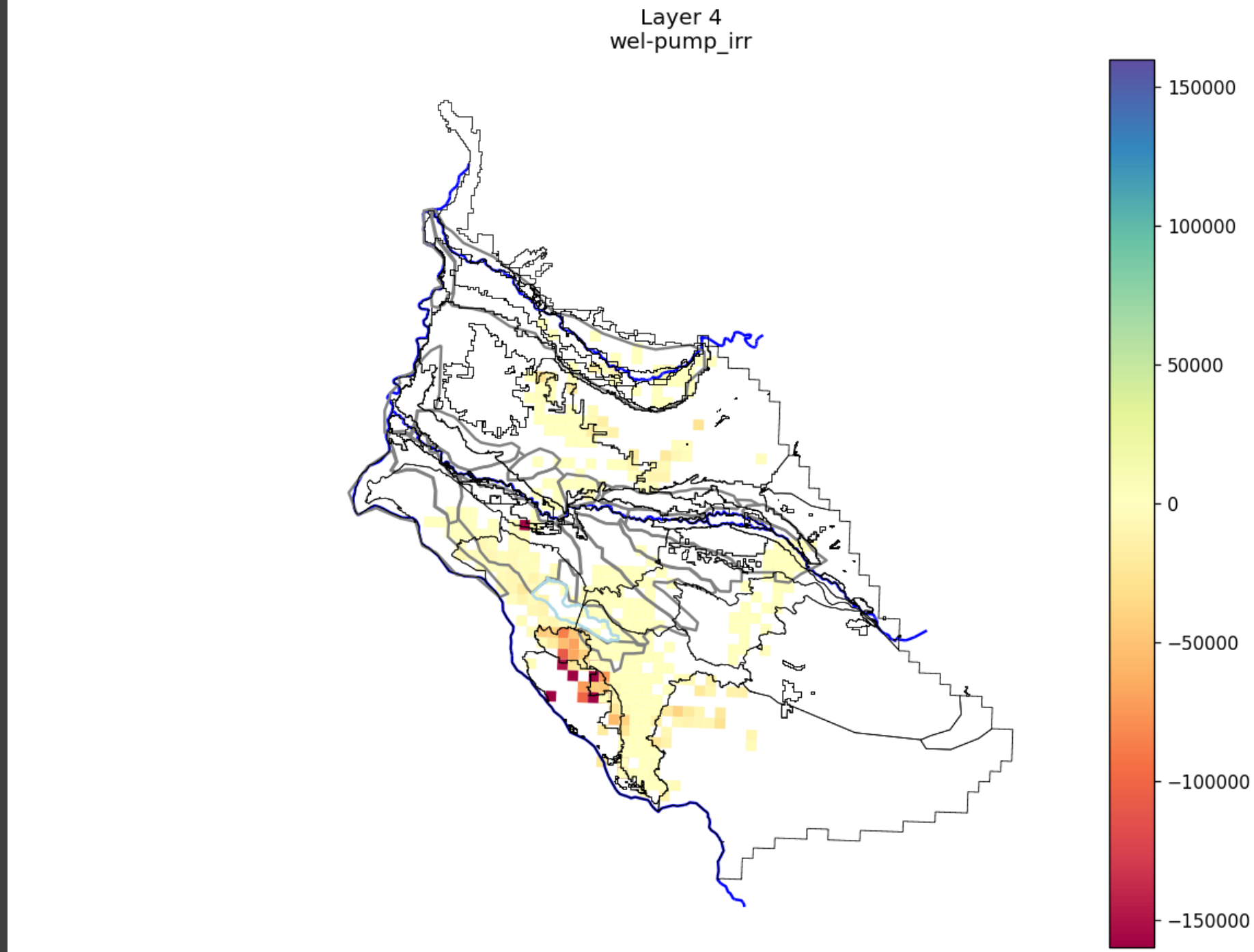
Troubleshoot Model Structure



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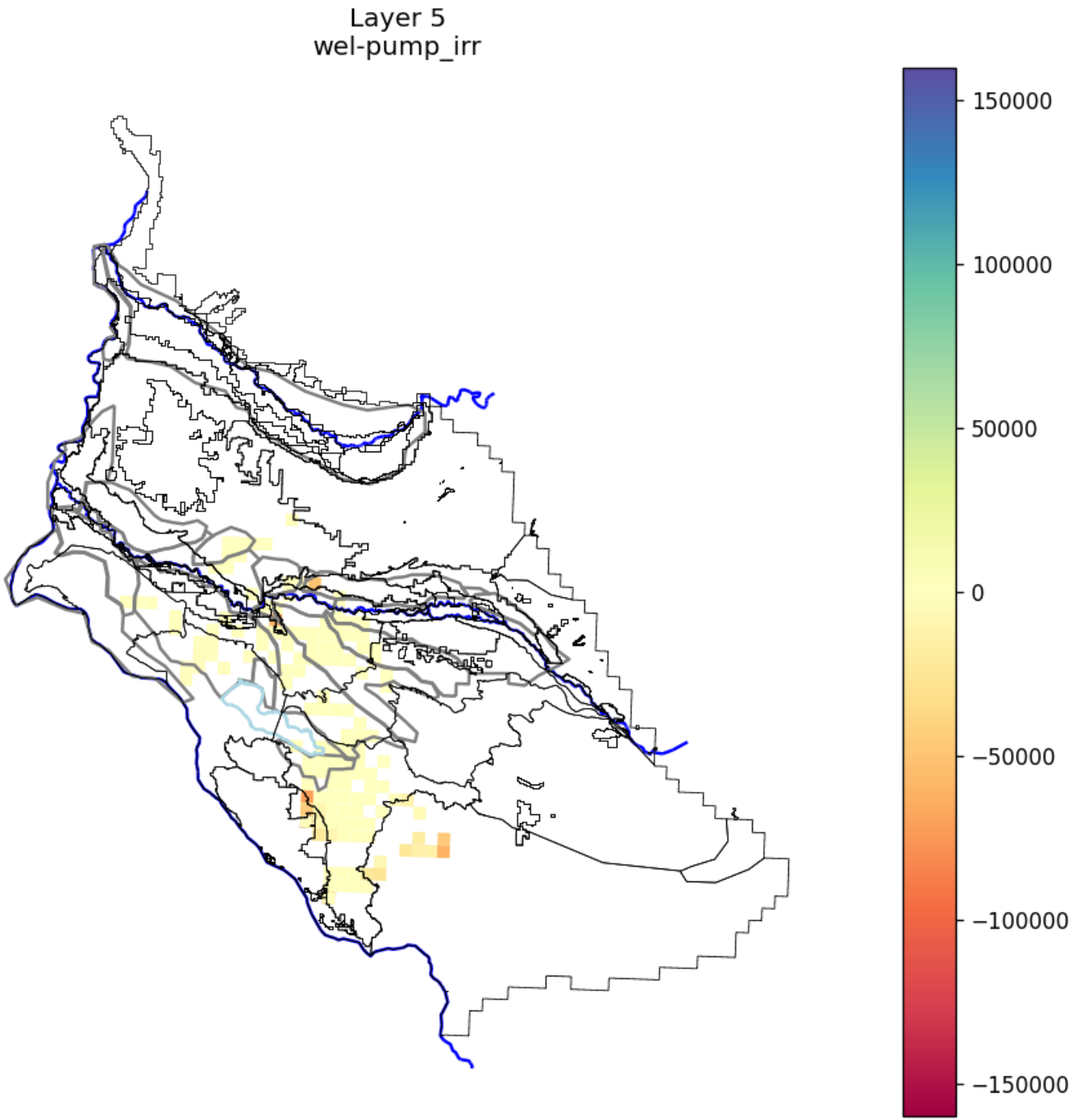

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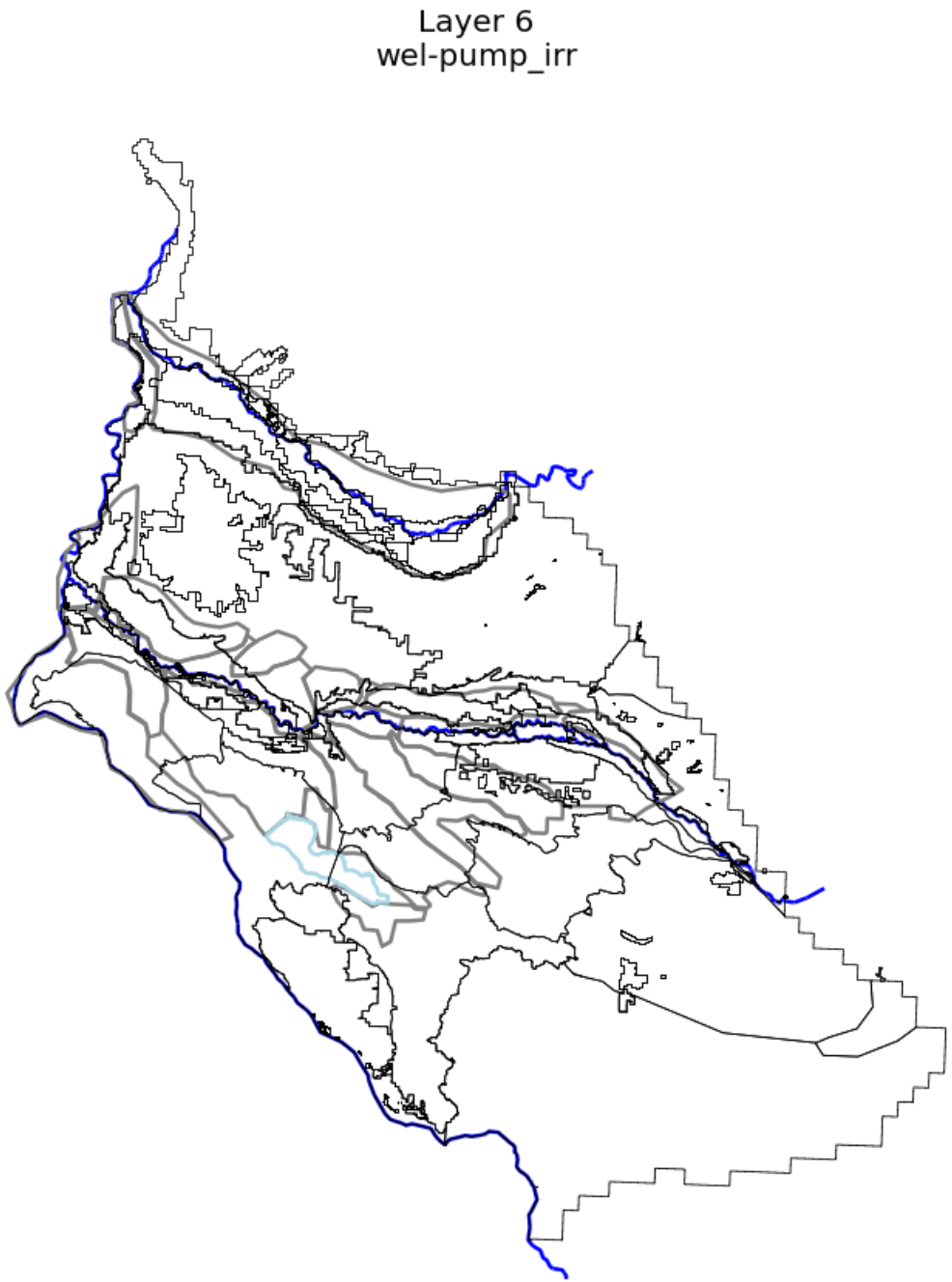

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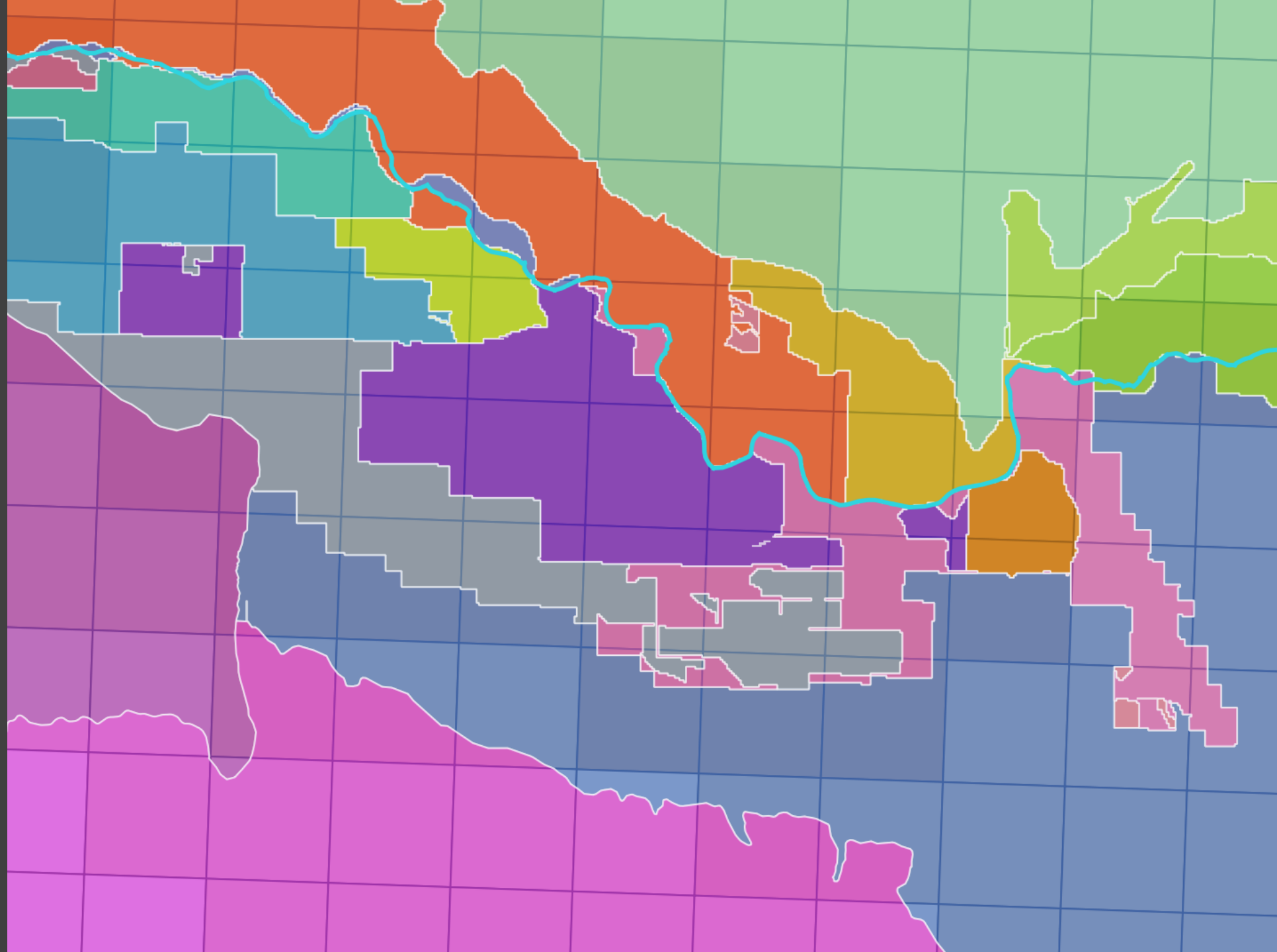
Troubleshoot Model Structure



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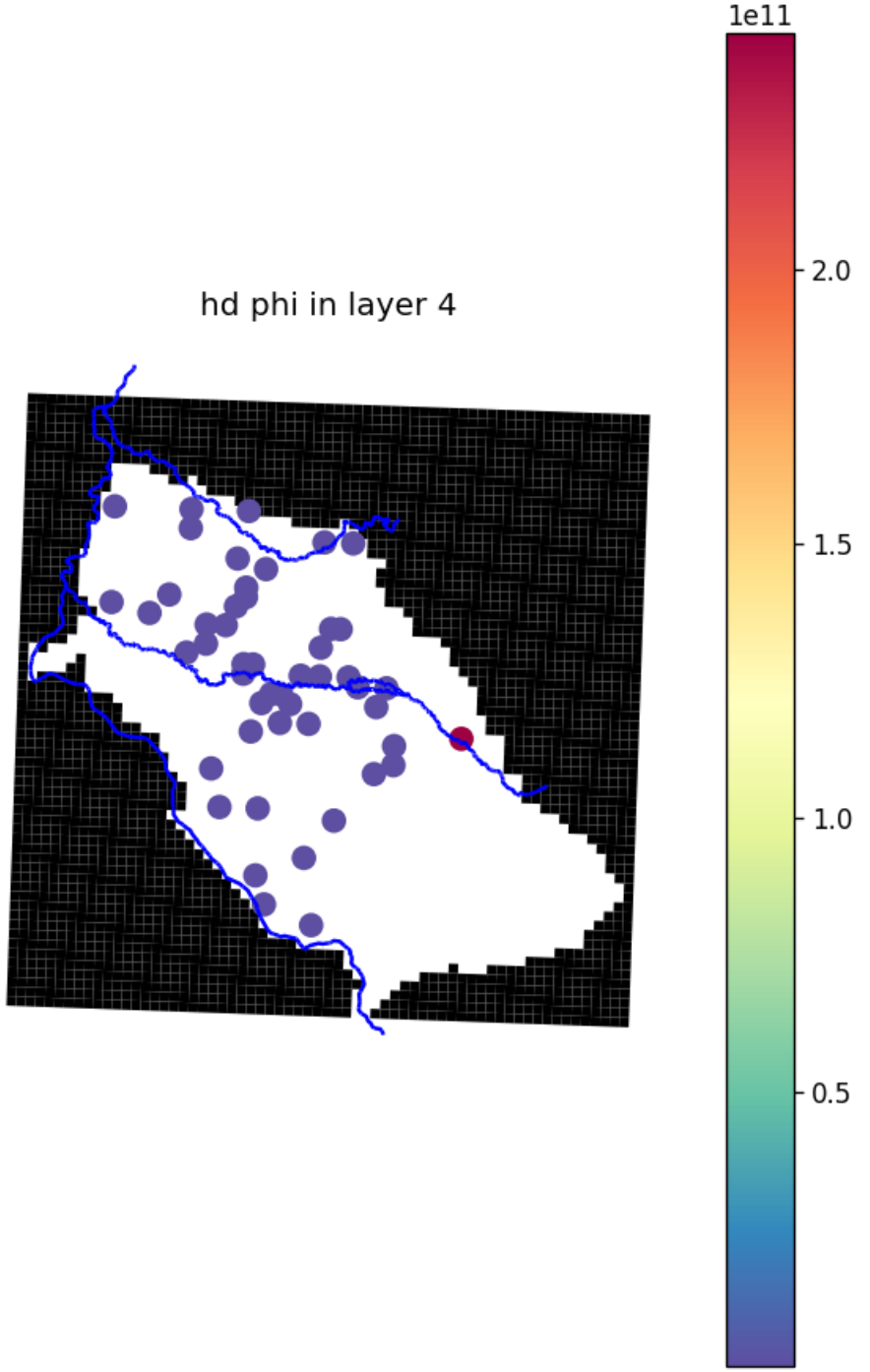
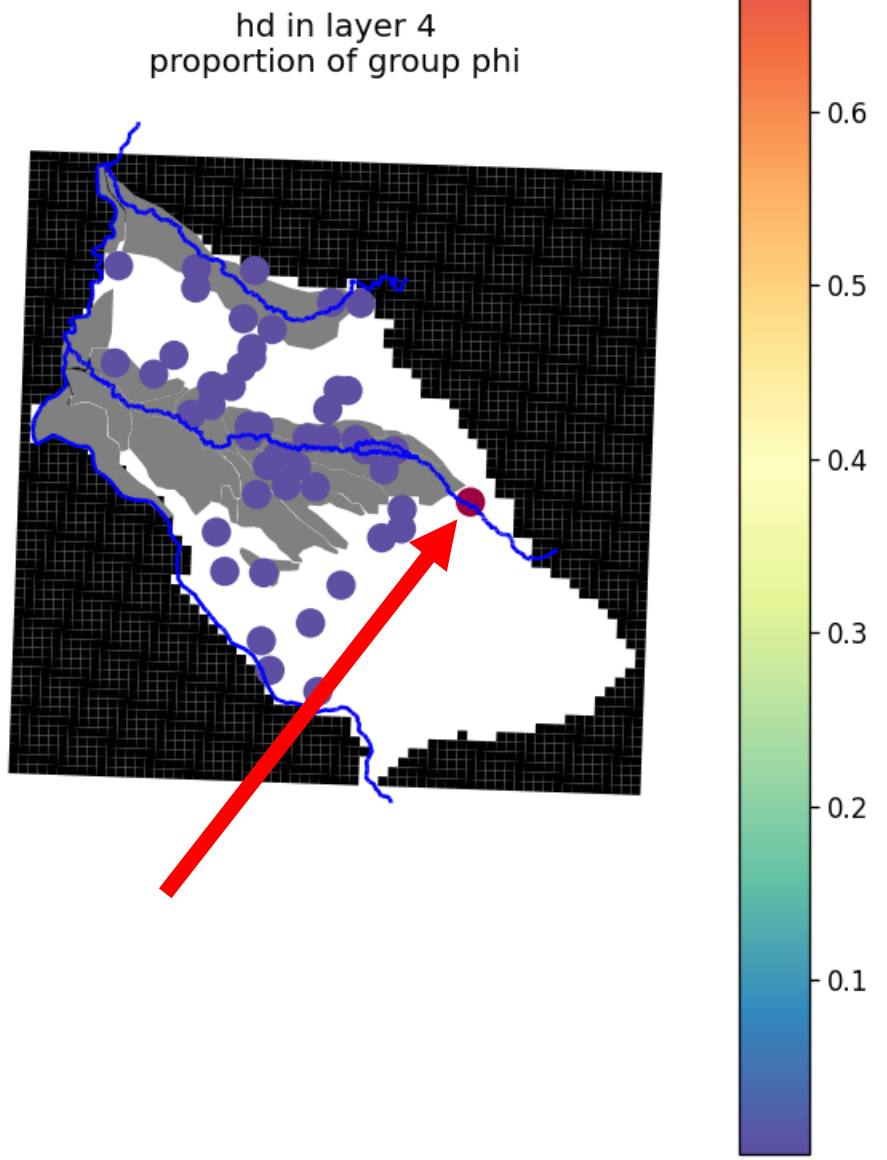
Adjust Weighting





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Add Back Periods and Observations

Observation Type	Approximate Number
Water Levels	10,000 ‘s
Drain Flows	100’s
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*	--

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

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Thanks for listening!

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