HAS Tools:

application of numpy and matplotlib

September 16, 2024

Your third assignment:

- The there is an assignment posted on D2L, but as before, all your work will be done on GitHub
- Homework notebook that you will modify is in `homework_submissions/hw3_*.ipynb`
- 10 points overall - 1 point for correctness of each answer and 3 points for general completion.
- No action/submission needed on D2L - I can see when you made commits/pushes on GitHub directly.
- Due Sept 23, but pretty open to extensions.

In [1]:
```
# This script contains exercises on
# manipulating arrays with numpy
import numpy as np
x = np.arange(0, 3**3)
```

1. What is the length of x?

In [ ]:
```
# Your code here
```

2. How do you get the first value out of x?

In [ ]:
```
# Your code here
```

3. How do you get the last value out of x?

In [ ]:
```
# Your code here
```

4. How do you get the first 5 values out of x?

In [ ]:
```
# Your code here
```

5. What about the last 5 values of x?

In [ ]:
```
# Your code here
```

6. How do you get every other value out of x?

In [ ]:
```
# Your code here
```

7. Get the first 9 values of x, and reshape them to a 3x3 matrix. Assign this matrix to the variable `y`

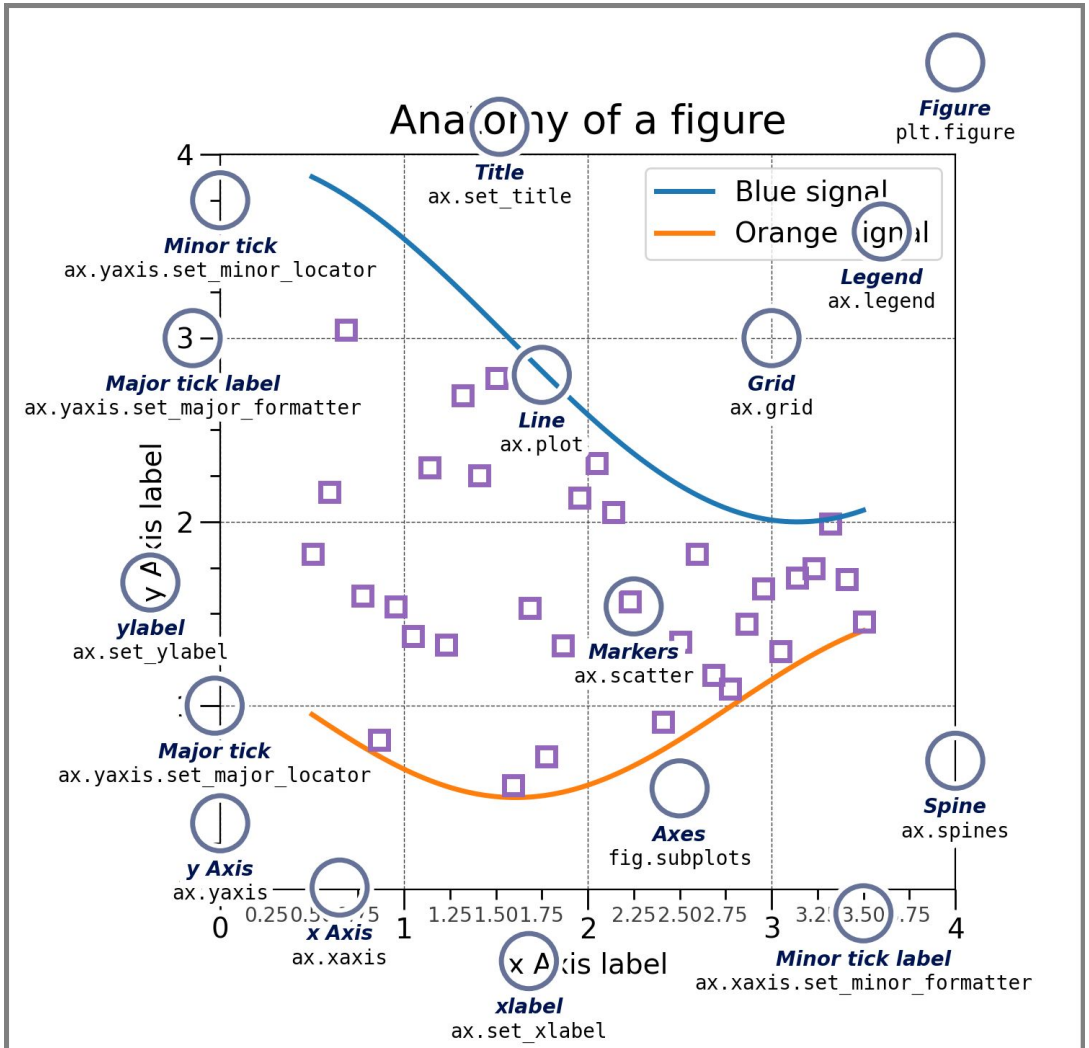
In [ ]:
```
y = None # Your code here
```

8. How do you get the middle value out of y?

In [ ]:
```
y = np.array([
    [0, 1, 2],
    [3, 4, 5],
    [6, 7, 8],
])
# Your code here
```

Anatomy of a matplotlib plot

https://matplotlib.org/stable/gallery/showcase/anatomy.html



Matplotlib figures can have multiple axes!

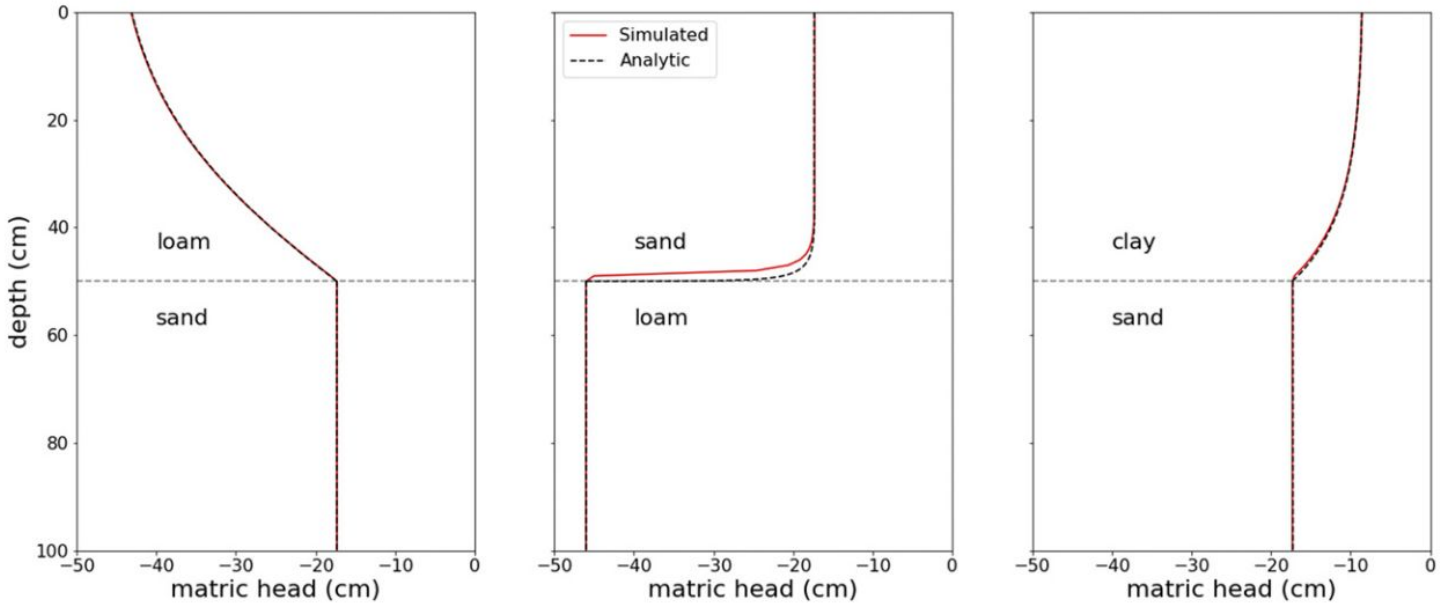


FIG. 4. Solution of the three test problems from Vanderborght et al. (2005), showing the vertical profiles of pressure head at steady state. The solid red lines are the model simulations, and the dashed black lines are the analytical solutions.

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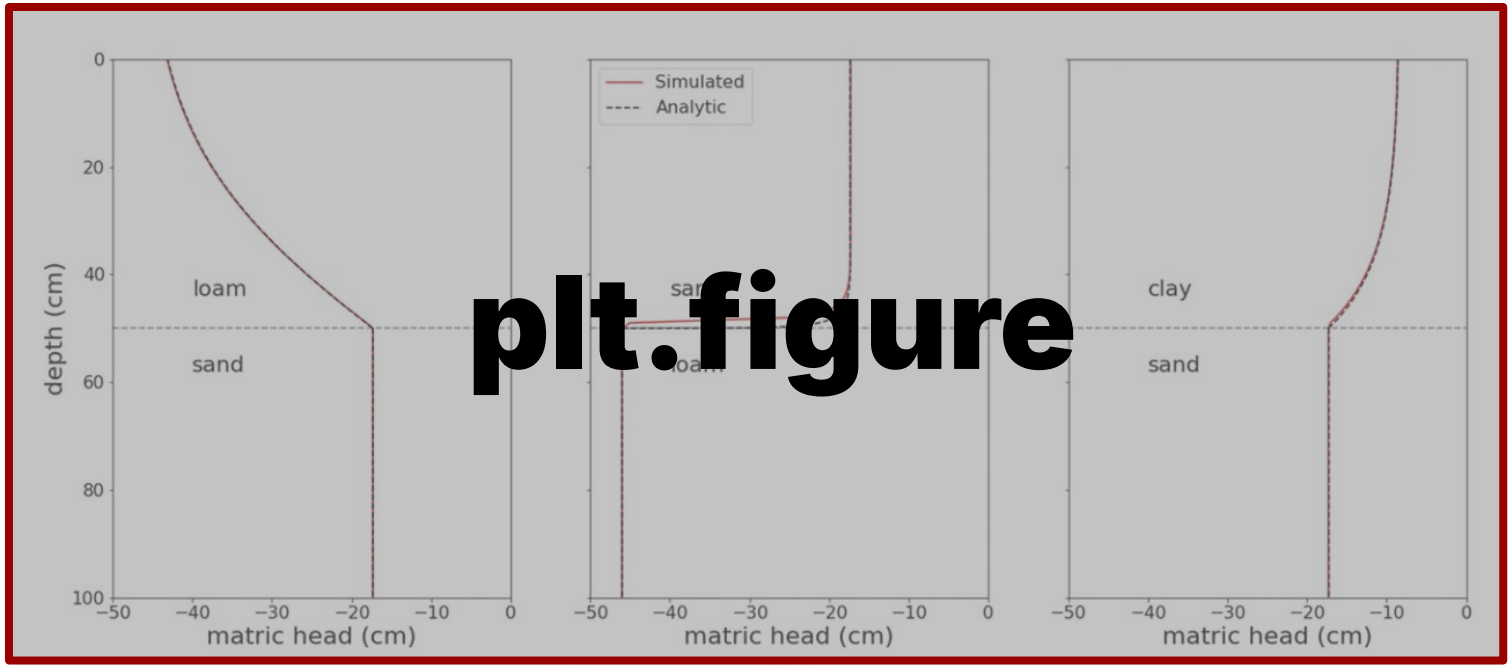

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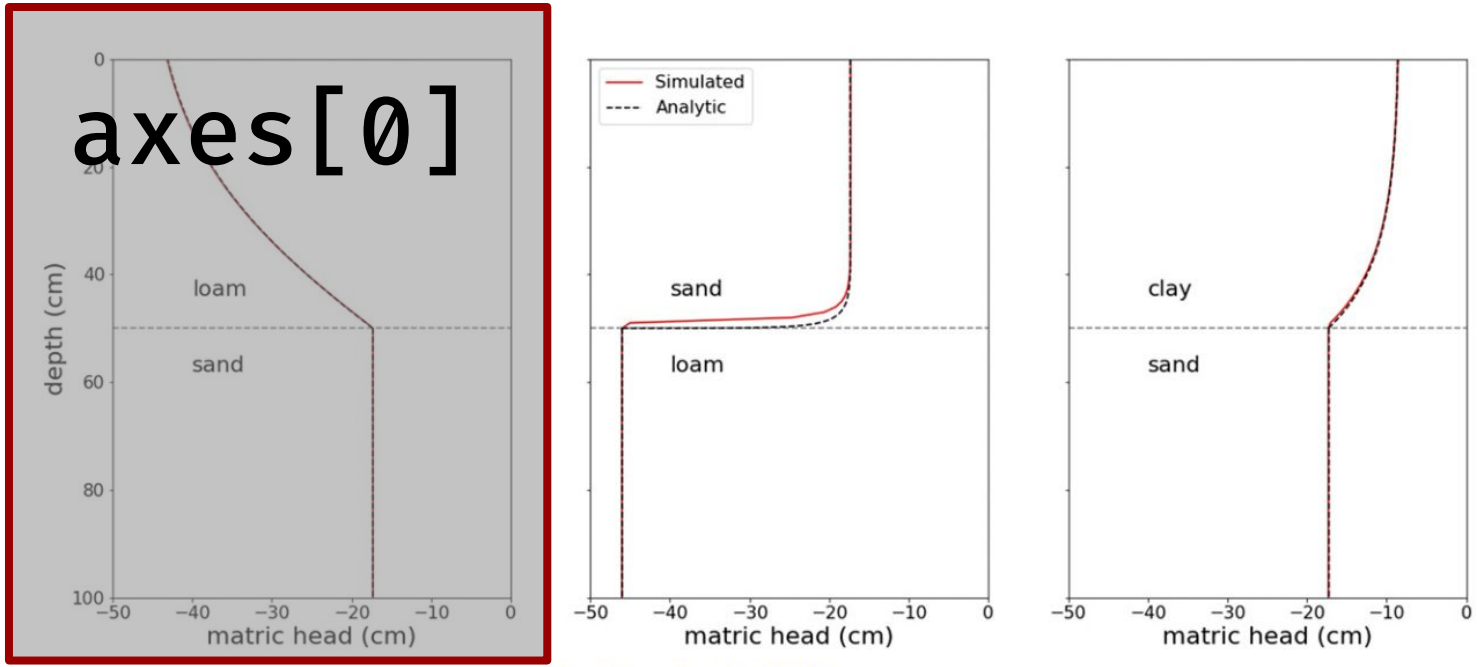

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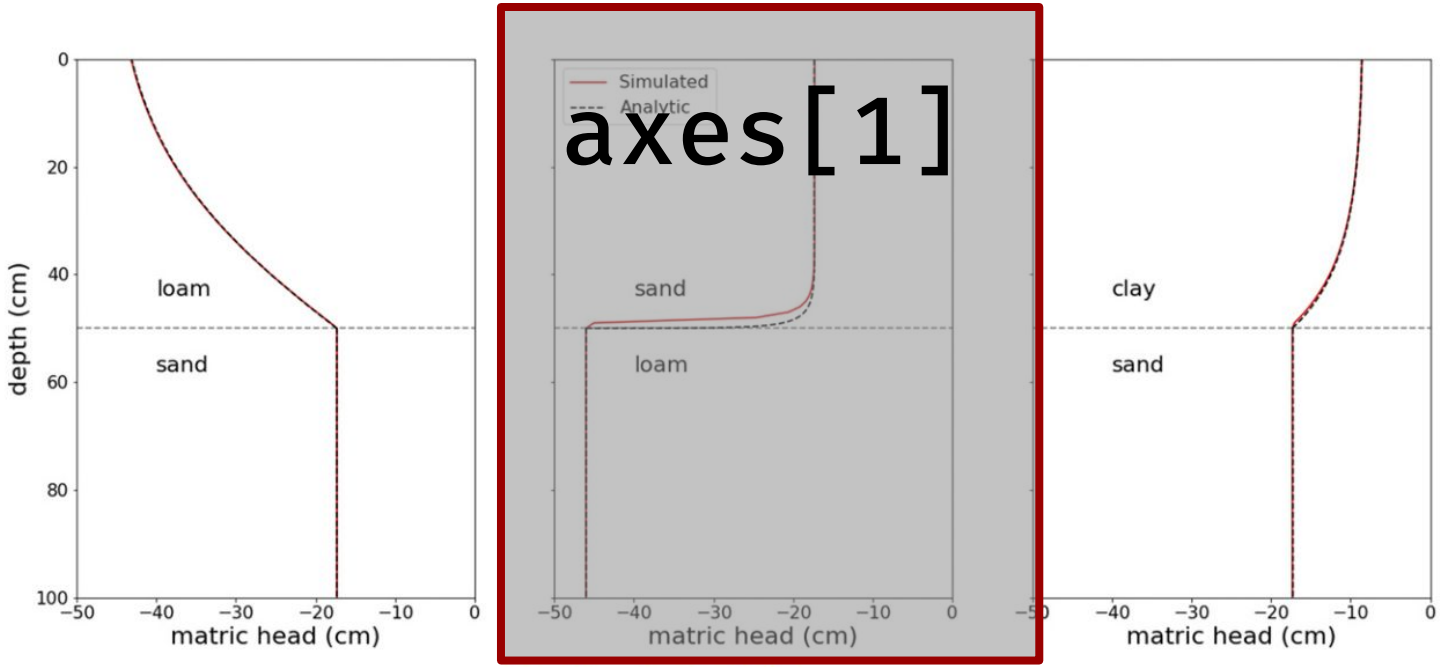

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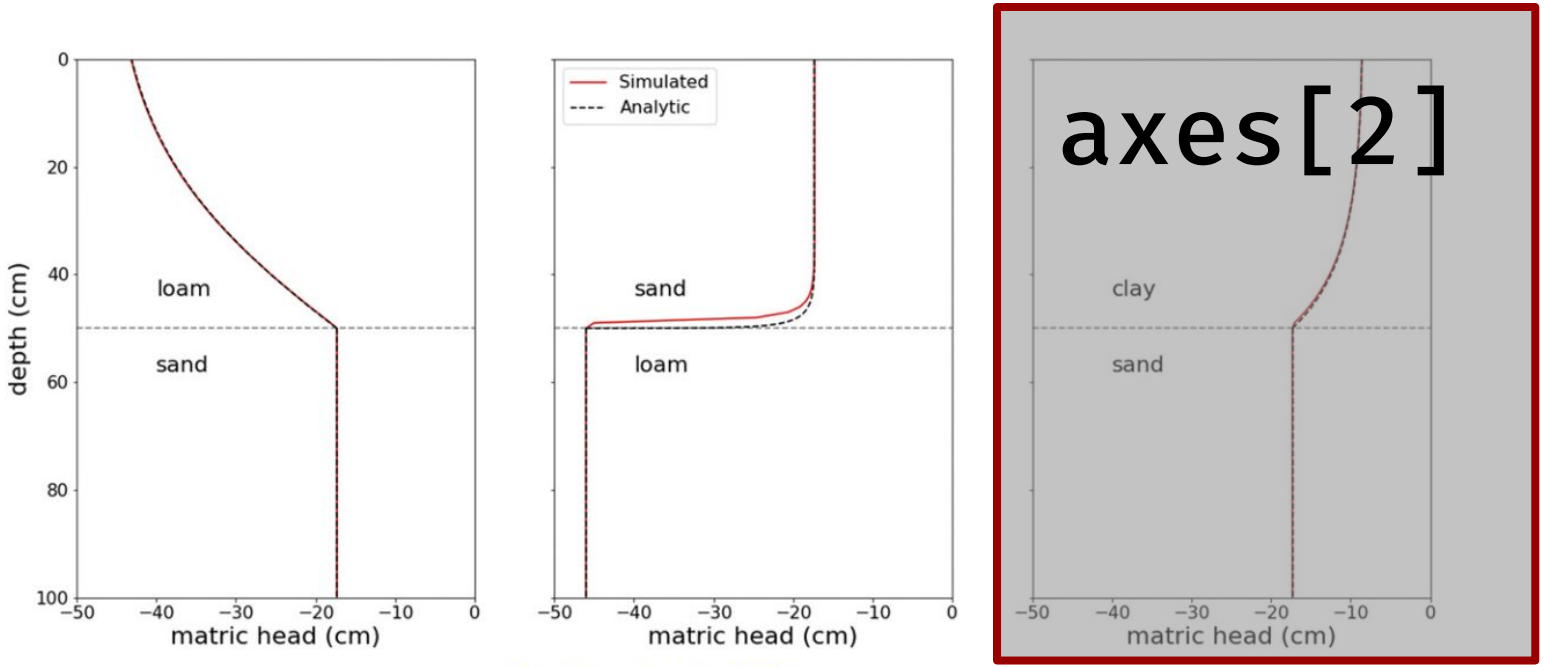

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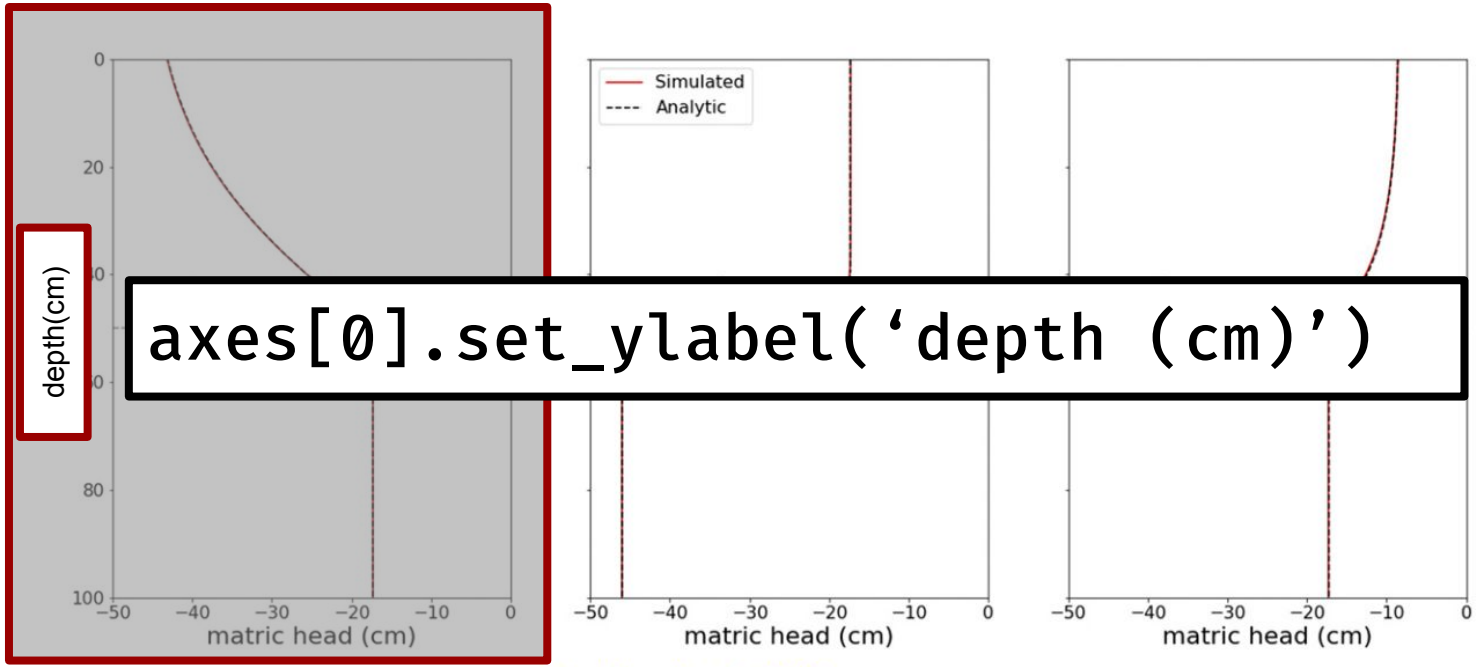

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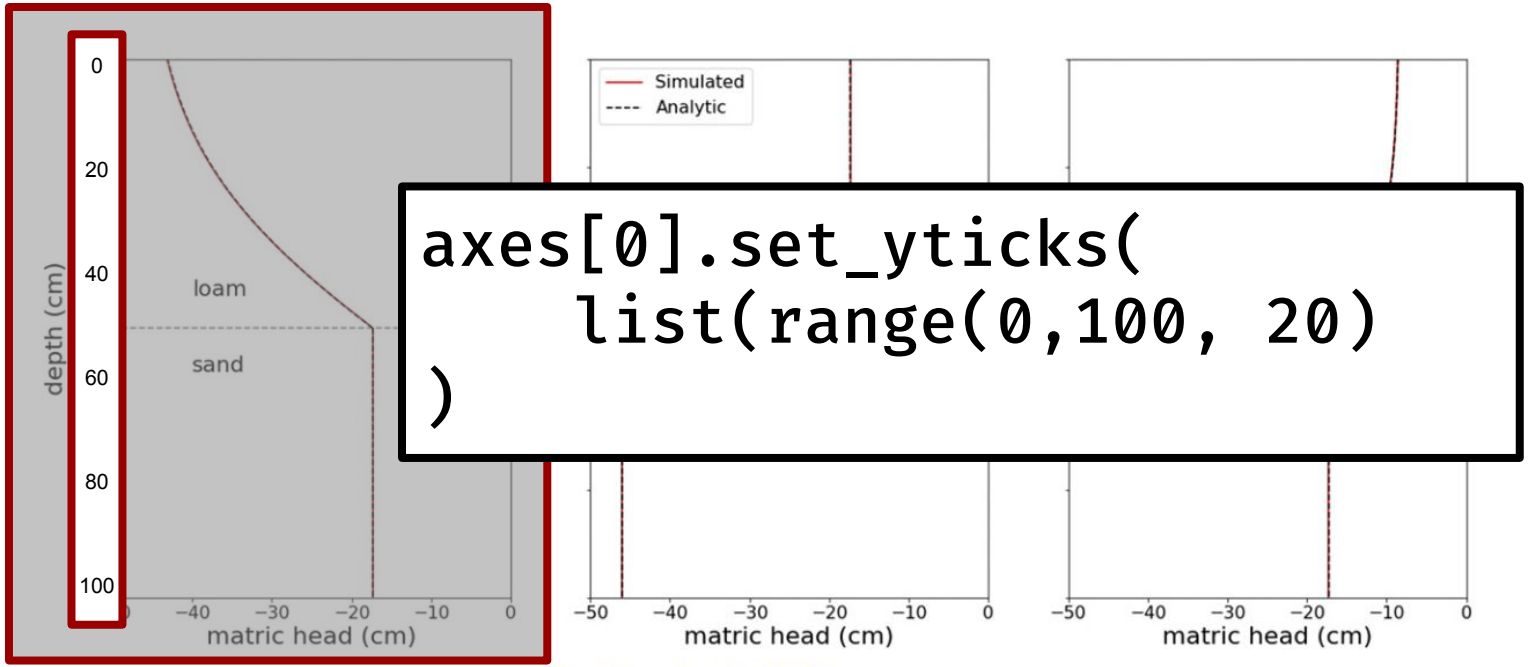


```
axes[0].set_yticks(
    list(range(0,100, 20)
)
```

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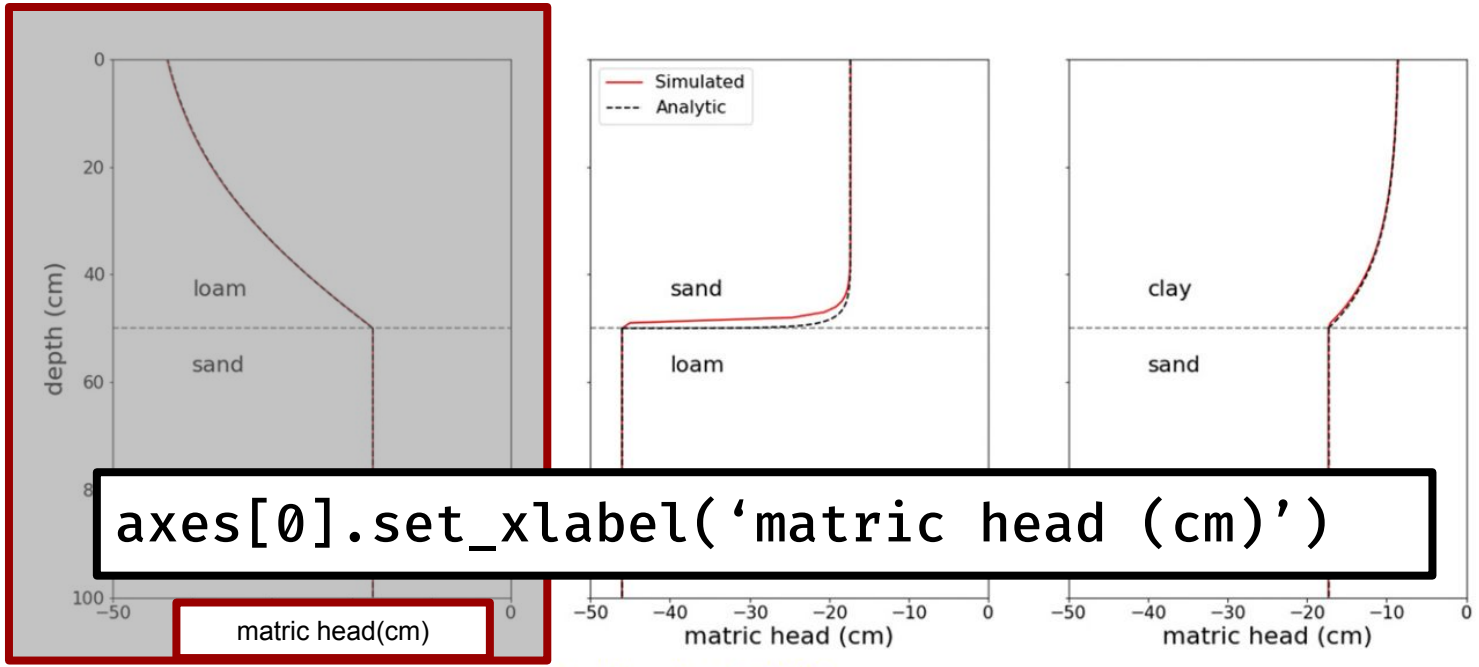

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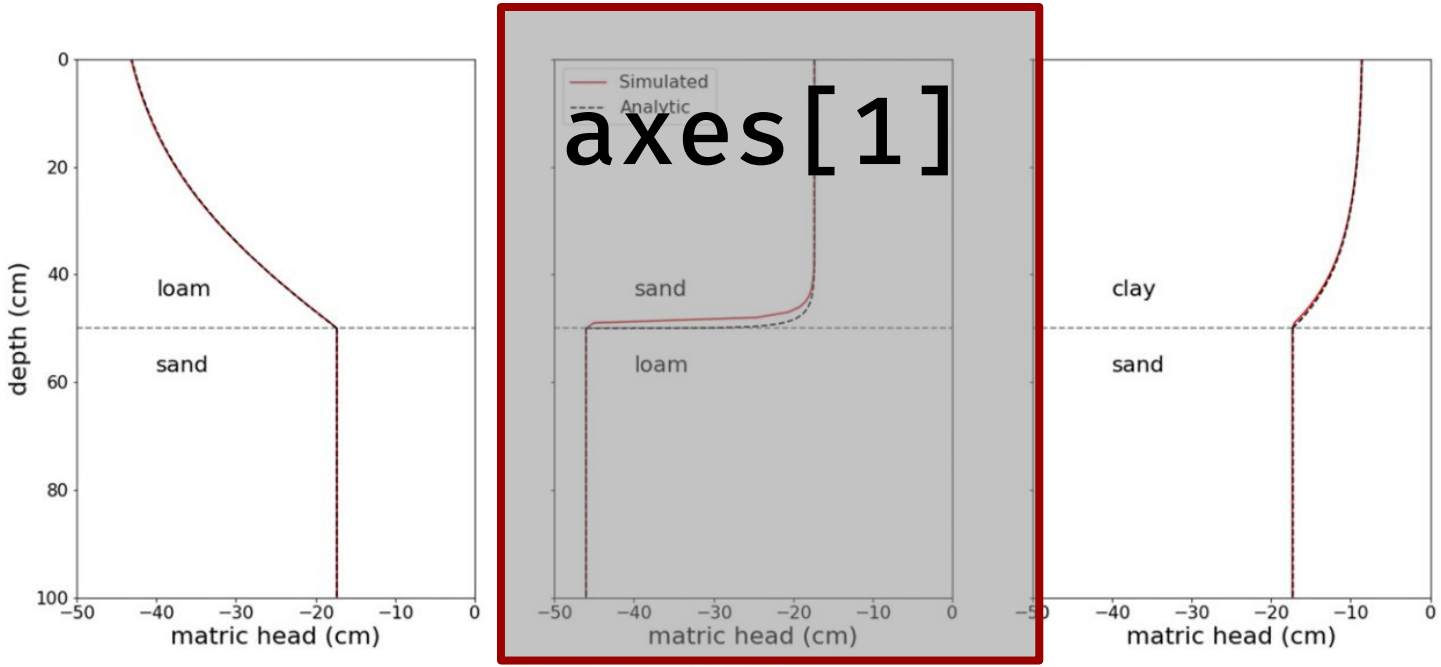

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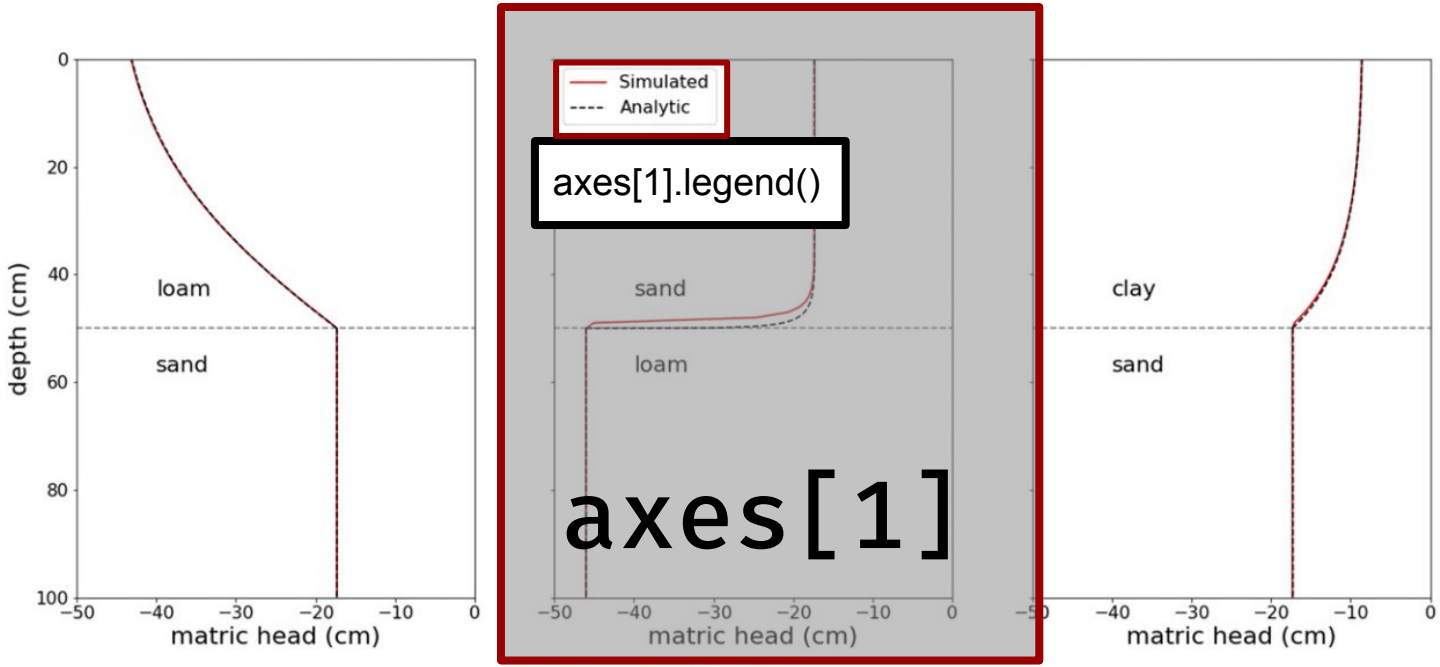

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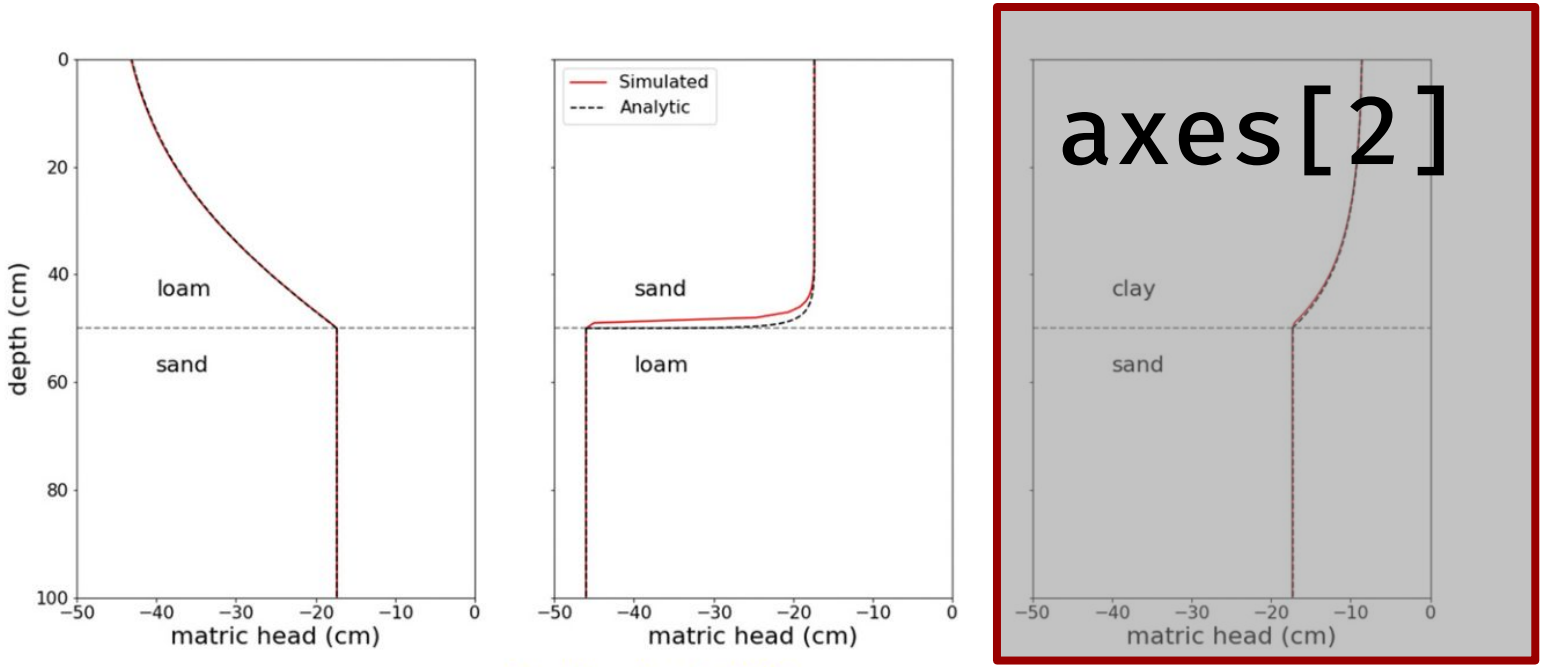

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It can get way more complicated…

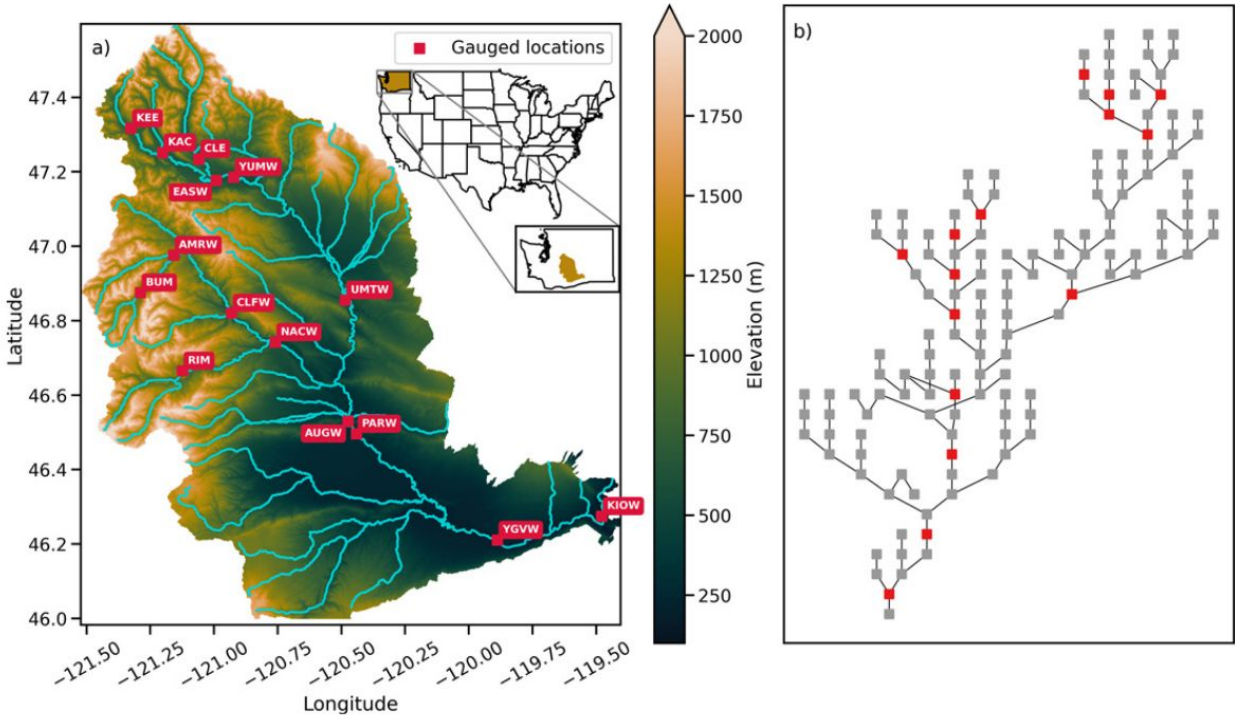

FIG. 2. (a) Yakima River basin map. Gauged sites are shown in red and are labeled with their stream gauge abbreviations. (b) The stream network topology, with gauged locations highlighted in red.

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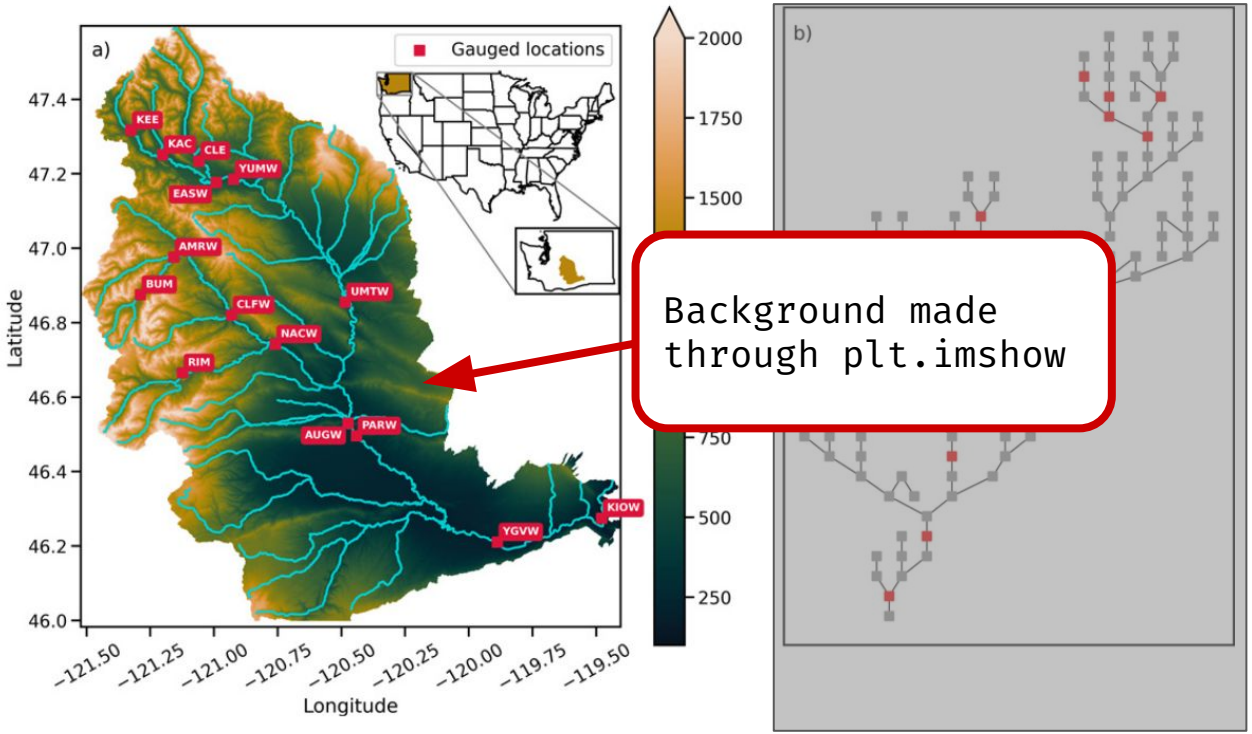

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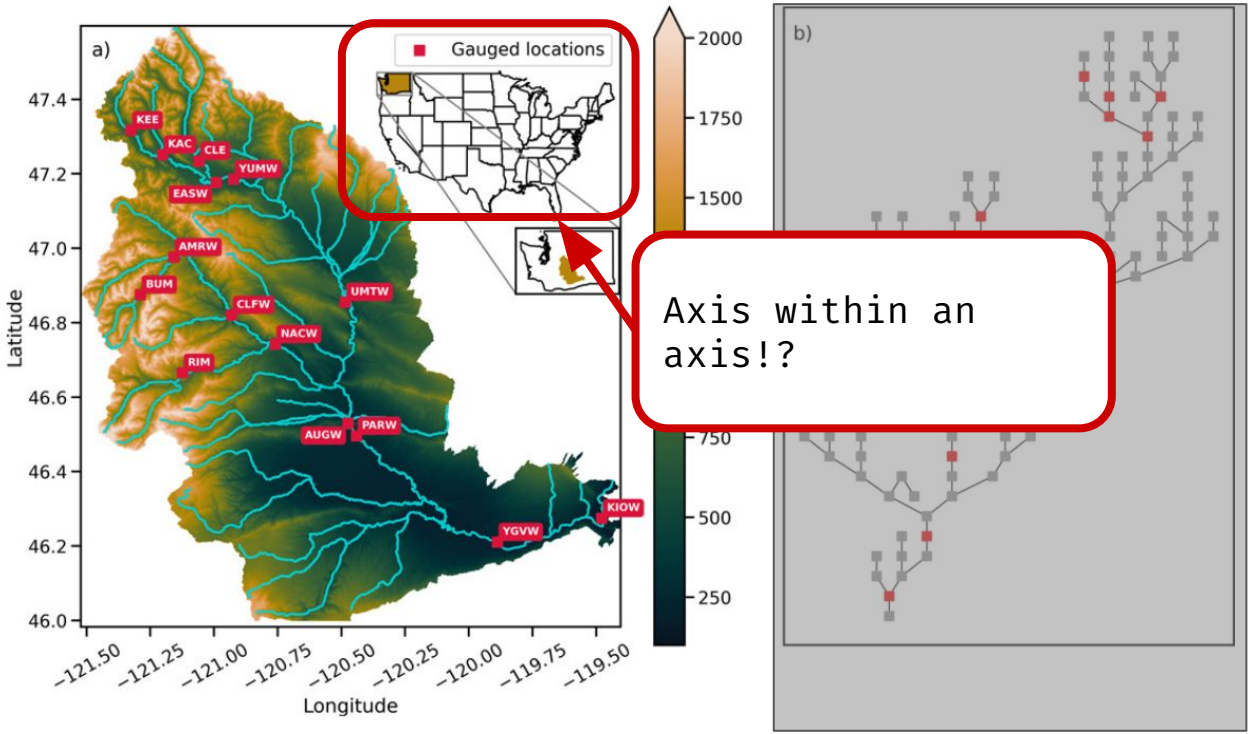

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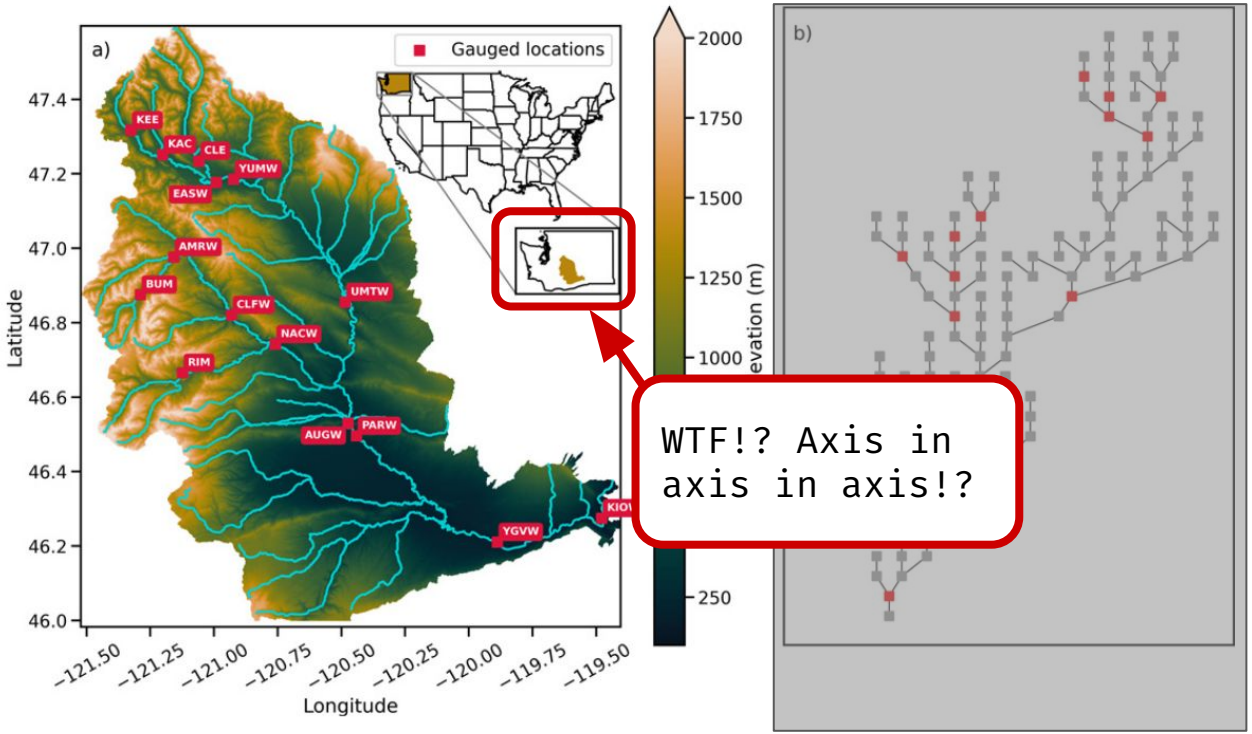

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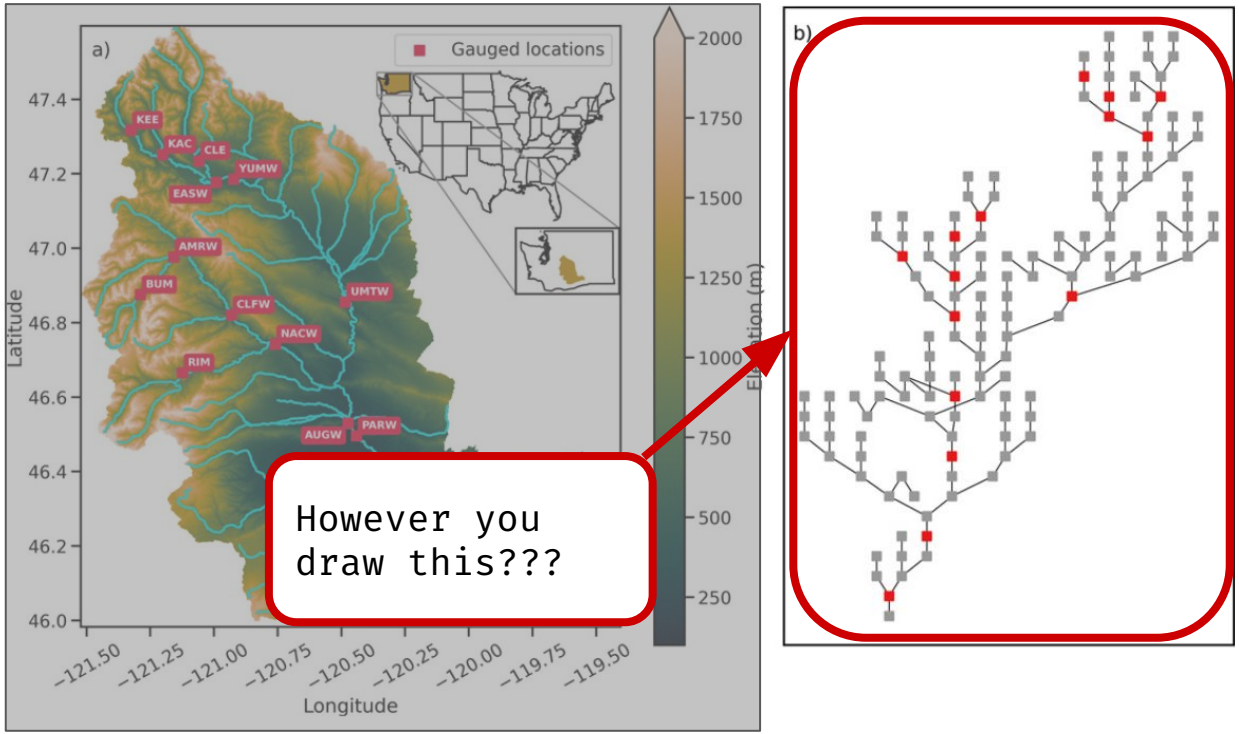

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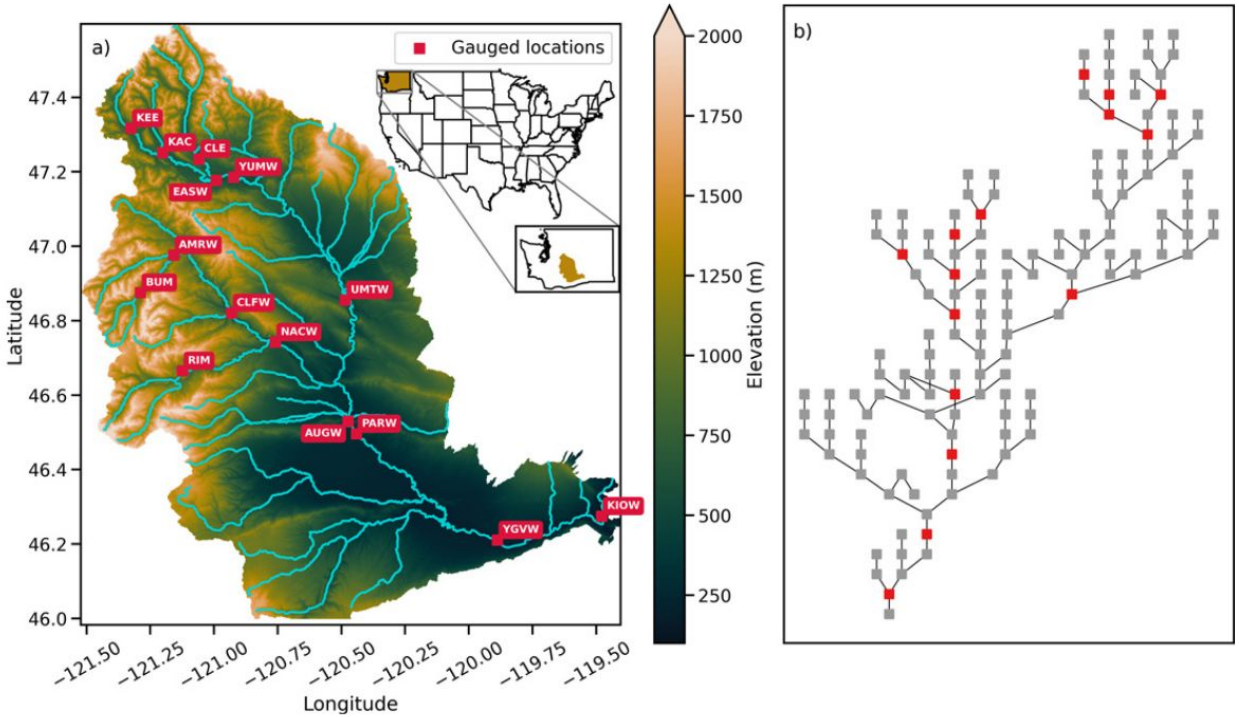

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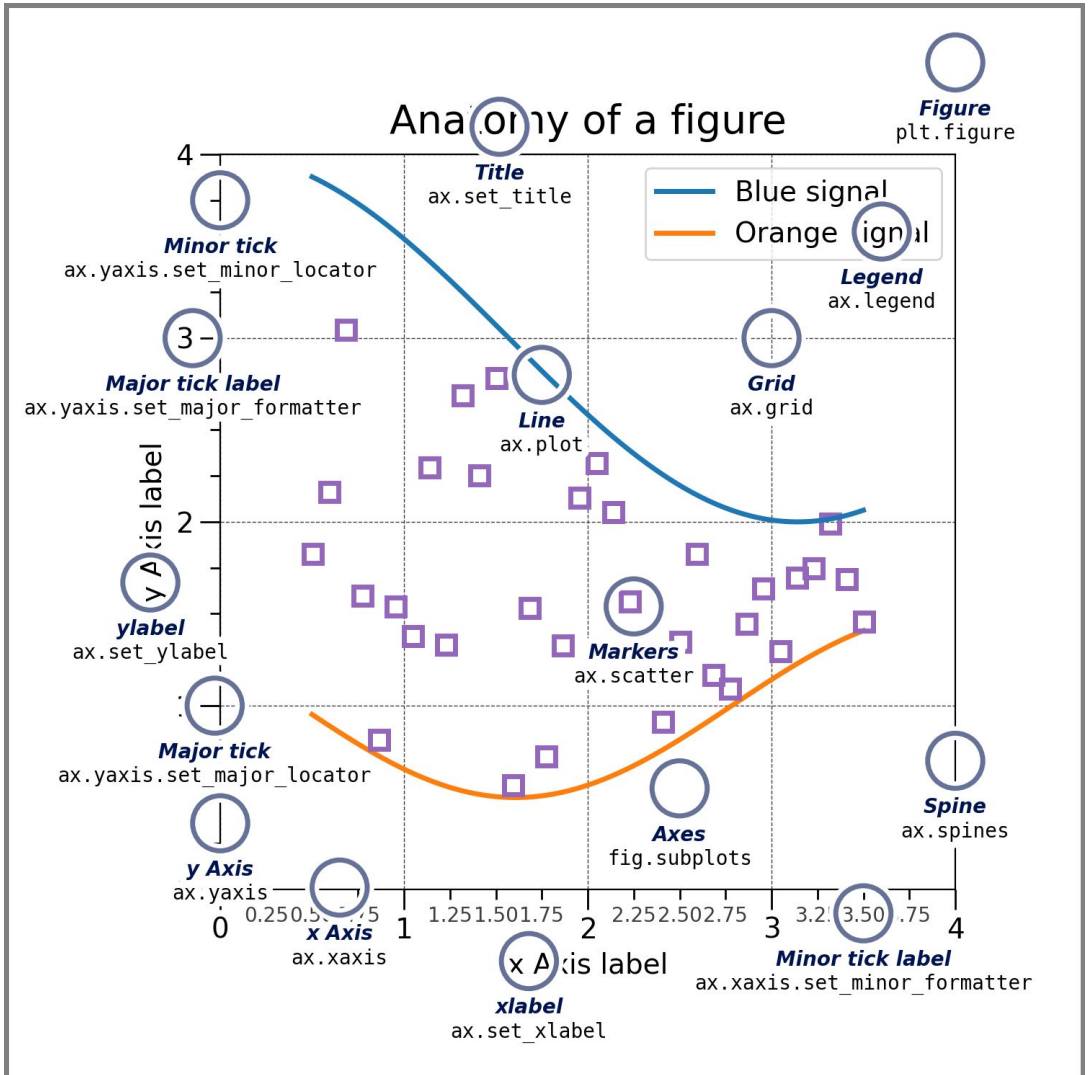

VSCode interactive session – see recording for more