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# Where To Draw The Line?

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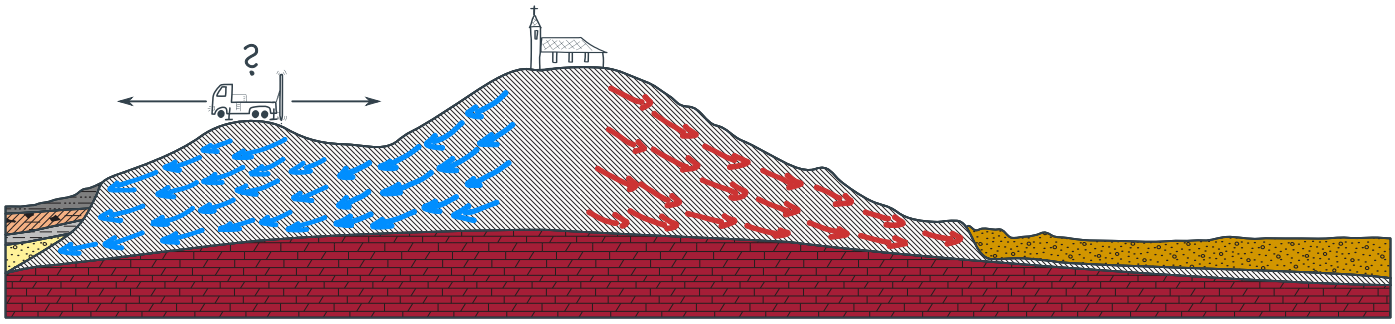
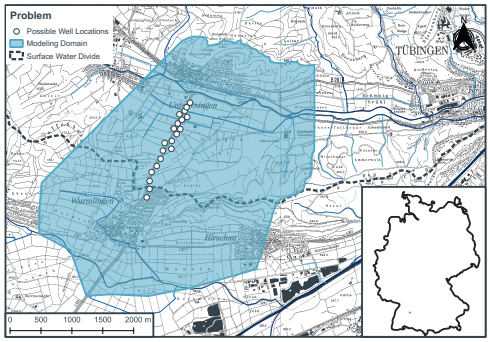
## What Is the Optimal Placement of Wells to Delineate the Groundwater Divide?




## Problem: Delineation of Groundwater Divide

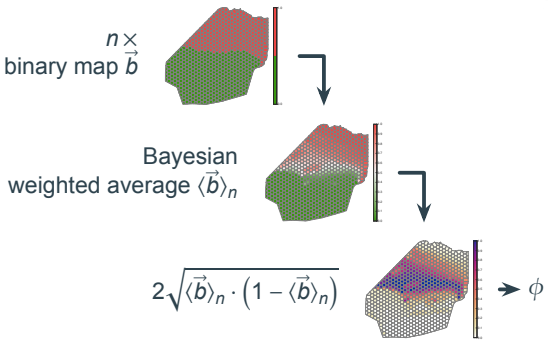
- **high-*K*** domain
- $\Delta z$ between valleys
- ❓ where is GW divide?
- ➔ use *h* data
- not many wells ☹

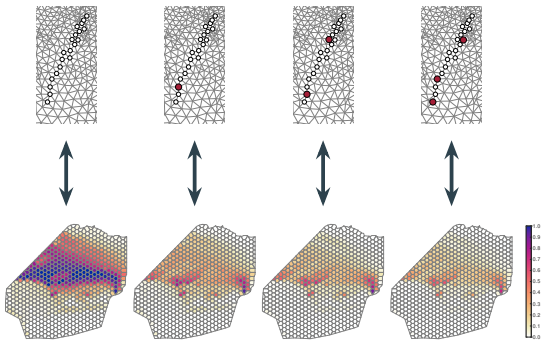
- ➔ drilling of **new wells**
- due to restrictions: 20 possible locations
- only enough 💶 for 3
- ➔ **best configuration?**

## Approach: Optimal Design Code + Forward Model

"How does uncertainty for specific configuration decrease?"

- ➔ forward model **ensemble** (size *n*)
- ➔ *n* flow fields
- ➔ *n* GWDs (**particle tracking**)
- ➔ *n* virtual measurements
- ➔ estimate **avg. data worth**
- ➔ Preposterior Data Impact Assessor (preDIA)
- ➔ Bayesian likelihoods
- ➔ **minimize uncertainty** $\phi$



## Results: Placement Depends on Number of Wells

1. close to surface water divide → 57 % reduction in uncertainty
2. another one in the valley → 70 % reduction in uncertainty
3. another one in between → **77 % reduction in uncertainty**

- ➔ there are good and bad choices
- ➔ method promising
- ➔ **large ensemble** necessary ($n > 15000$)

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**Groundwater Quality**
Liège, September 2019

*Questions? Ask this guy!* ⟶

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