JUMEAUX NUMÉRIQUES POUR LA SOUS-SURFACE

Le défi des incertitudes et leurs propagations

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Vendredi 10 Mars 2023

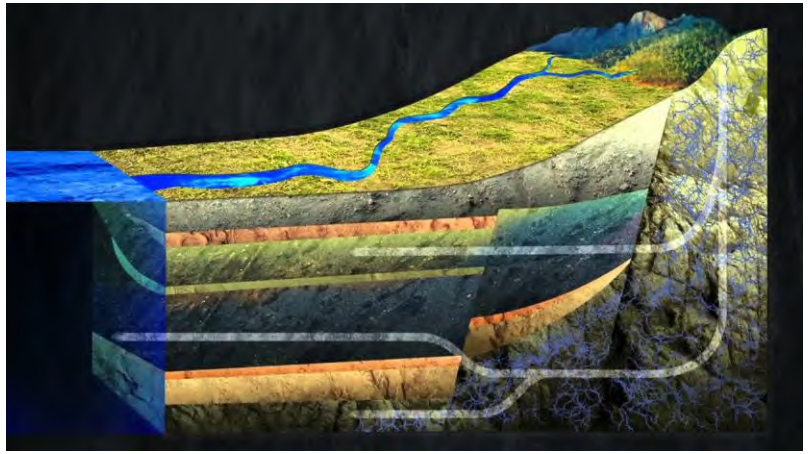
Jumeaux numériques et environnement – séminaire CoVAllEnvi et Cap Digital

Context

- Energy transition
- Energy sovereignty (national and European)
- Risk assessment and simulation/design of counter measure

Need to understand (much) better the subsurface:

- Geothermal
- Hydrogeology
- CO2 Storage
- Groundwater contaminant transport
- Gas storage
- Nuclear waste storage
- Transitional energy



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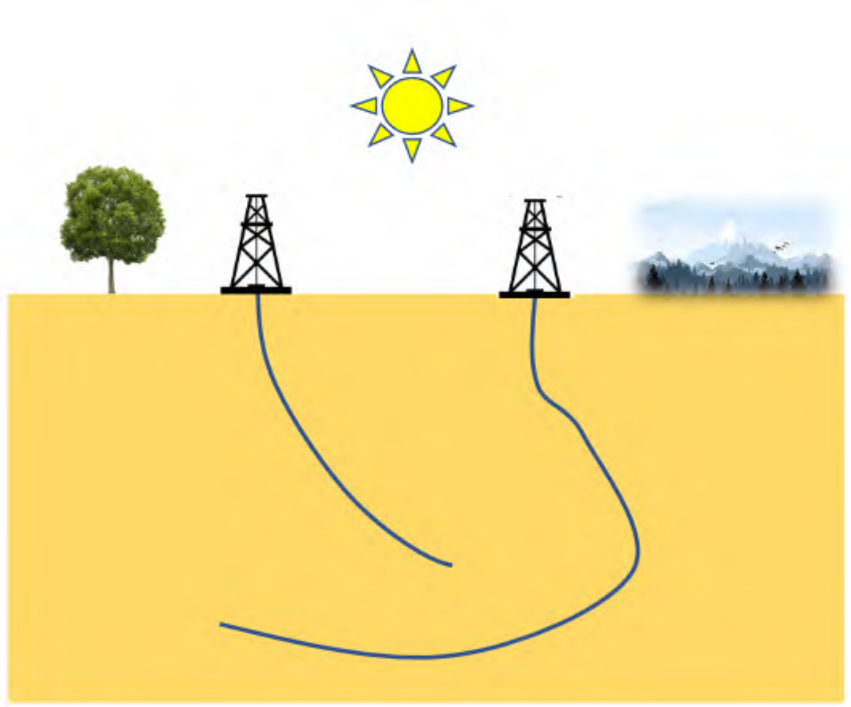
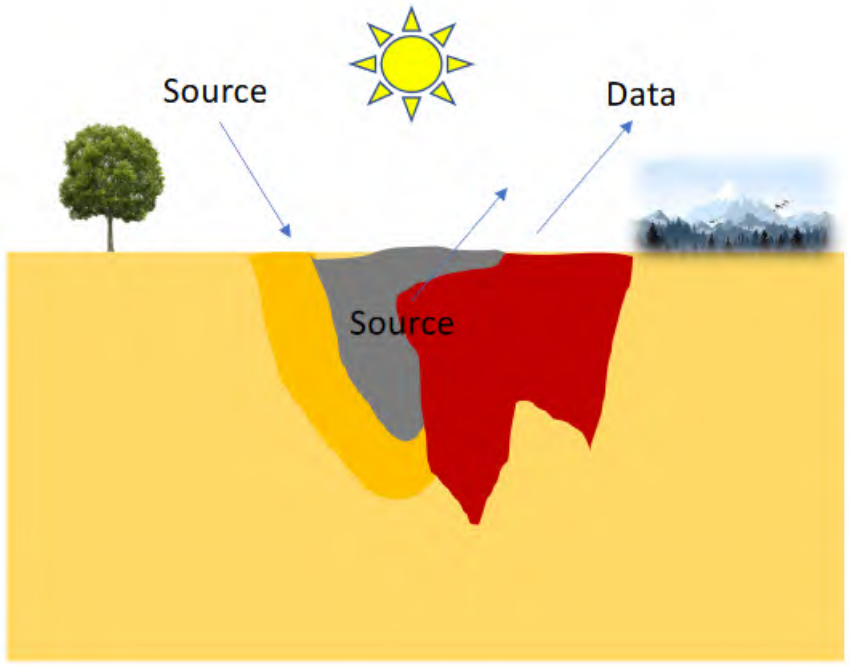


Drill it

What characterise the subsurface challenges ?



Or use geophysics!

properties

What characterise the subsurface challenge ?

In contrast with (for example)

Definition, words matter

« A digital twin is a virtual representation of an object or system that spans its lifecycle, is updated from real-time data, and uses simulation, machine learning and reasoning to help decision-making ». (IBM)

This is the definition I will use in the rest of the presentation.

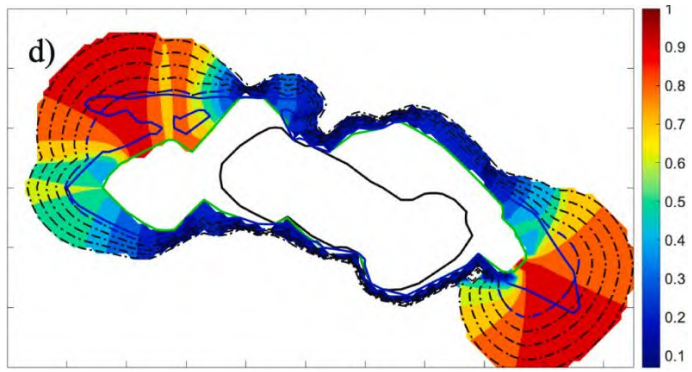
In other words, it is data assimilation.

How representative is the twin is domain dependent.

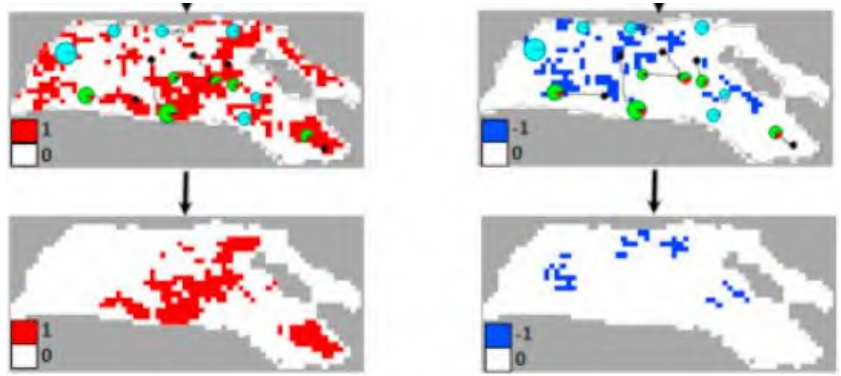
The subsurface domain – Take away message

- Uncertainty in the model(s) (numerical errors, missing physics)
- Uncertainty in the data (aquisition, processing, interpretation)
- Unertainty in the data assimilation (Optimisation, Objective functions, metrics)
- Final decision making ?

- Some ways out
  - Better characterisation of the uncertainty
  - Targetted assimilation



Chassagne et al., 2020



Obidegwu et al., 2017


Time for
Questions