

# Challenges

## monitoring Geological CO<sub>2</sub> Storage in Saline Aquifers

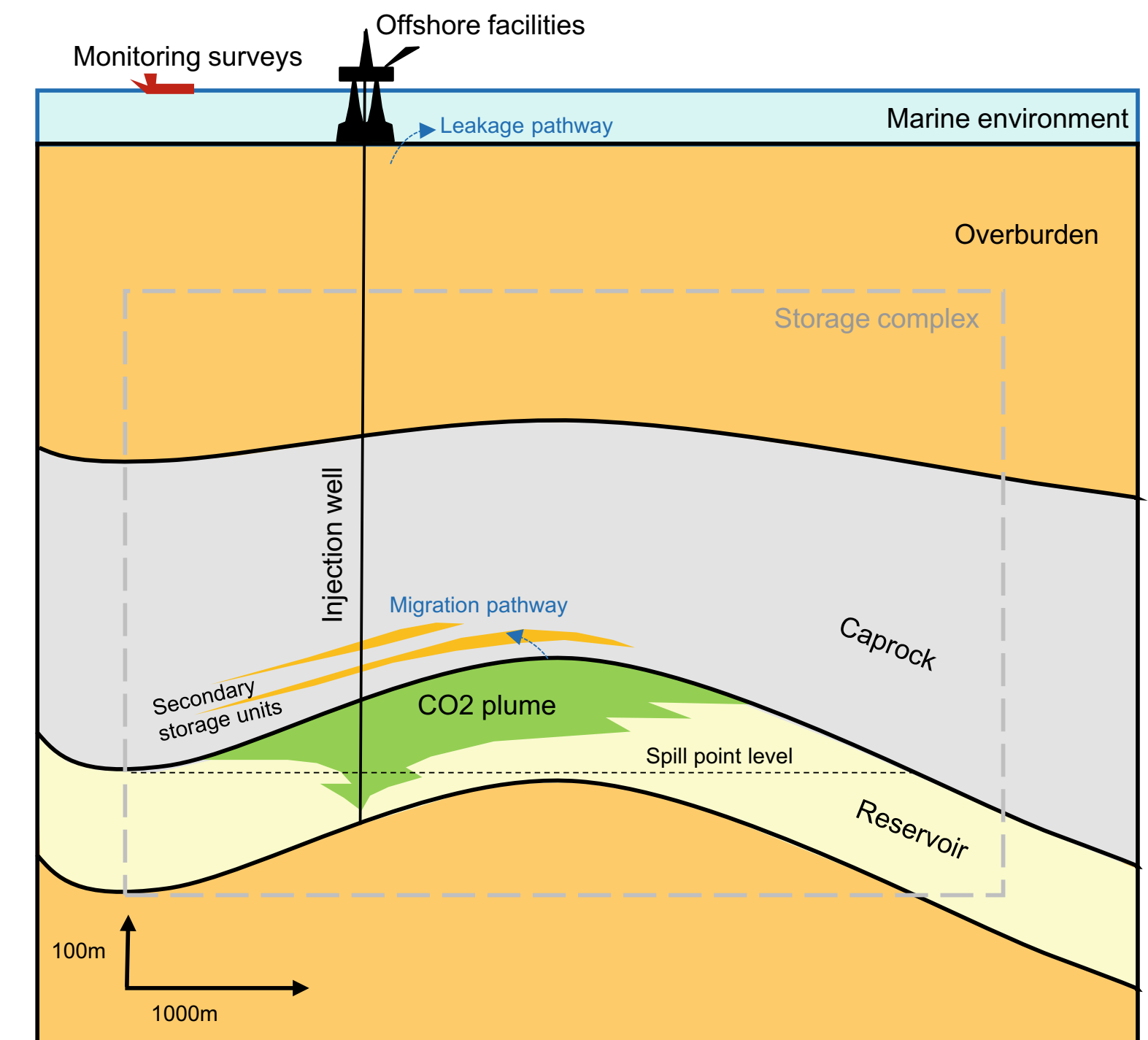
**Regulators & general public require transparency & assurances that *supercritical* CO<sub>2</sub> stays put in the *storage complex***

- ▶ *reservoir* simulations alone are *uncertain* due to large *variability* permeability
- ▶ risk profile storage & containment highest at start & at end
- ▶ there is a need for *reproducibility* for *transparency*

**Develop low-cost monitoring & control system for CO<sub>2</sub> plumes**

- ▶ that is uncertainty aware
- ▶ maximally captures information collected over many decades
- ▶ attains accuracy needed to detect early onset leakage
- ▶ capable of risk mitigation via control

**Systematic assessment of risks using techniques from uncertainty quantification.**



from Ringrose

# Digital Twins

## from concept to reality

According to IBM, “*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.*”

Innovation *accelerating* **open-source software platform** that

- ▶ produces time-lapse data-consistent CO<sub>2</sub> *predictions*
- ▶ makes *data-informed predictions* on future CO<sub>2</sub> plume behavior
- ▶ is *uncertainty aware* & allows for scenario testing & control
- ▶ informs on how much & where to *collect data*, thus *reducing* CCS monitoring costs