

10.10.2024, Copenhagen



Addressing Uncertainties and Benchmarking in EO-based MRV for Carbon Removals

...and most importantly, why should we care

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**What are we talking about when we
talk about ground truth?**



Do we have good data?

Biological variability

- Field heterogeneity
- Environmental factors
- Seasonality

Systematic uncertainties

- Instruments
- Laboratories
- Protocols

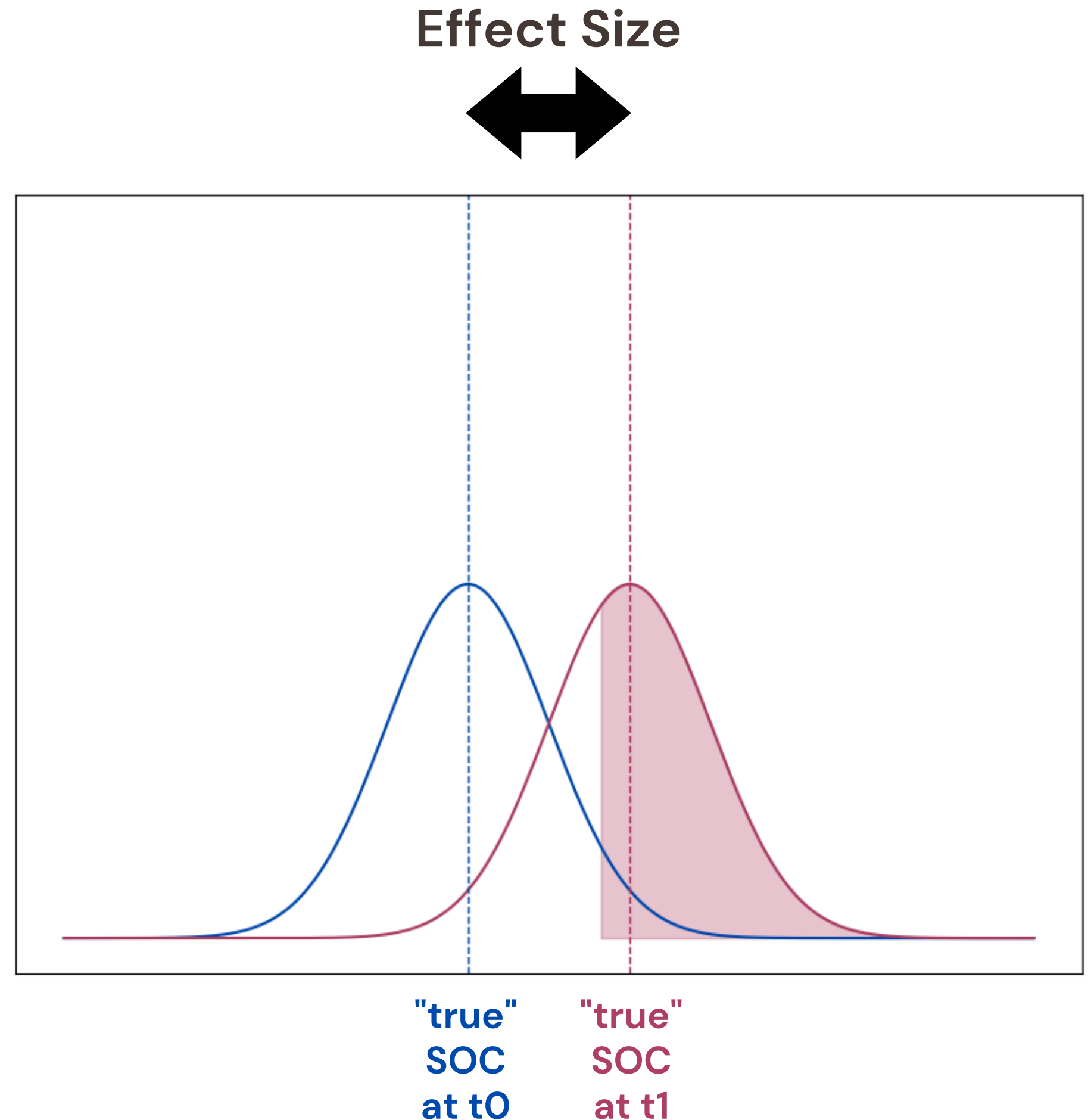
Data availability

- Harmonization
- Privacy
- Ownership



Soil Carbon Monitoring
main objective: detect
differences over time

Uncertainties and Statistical Significance

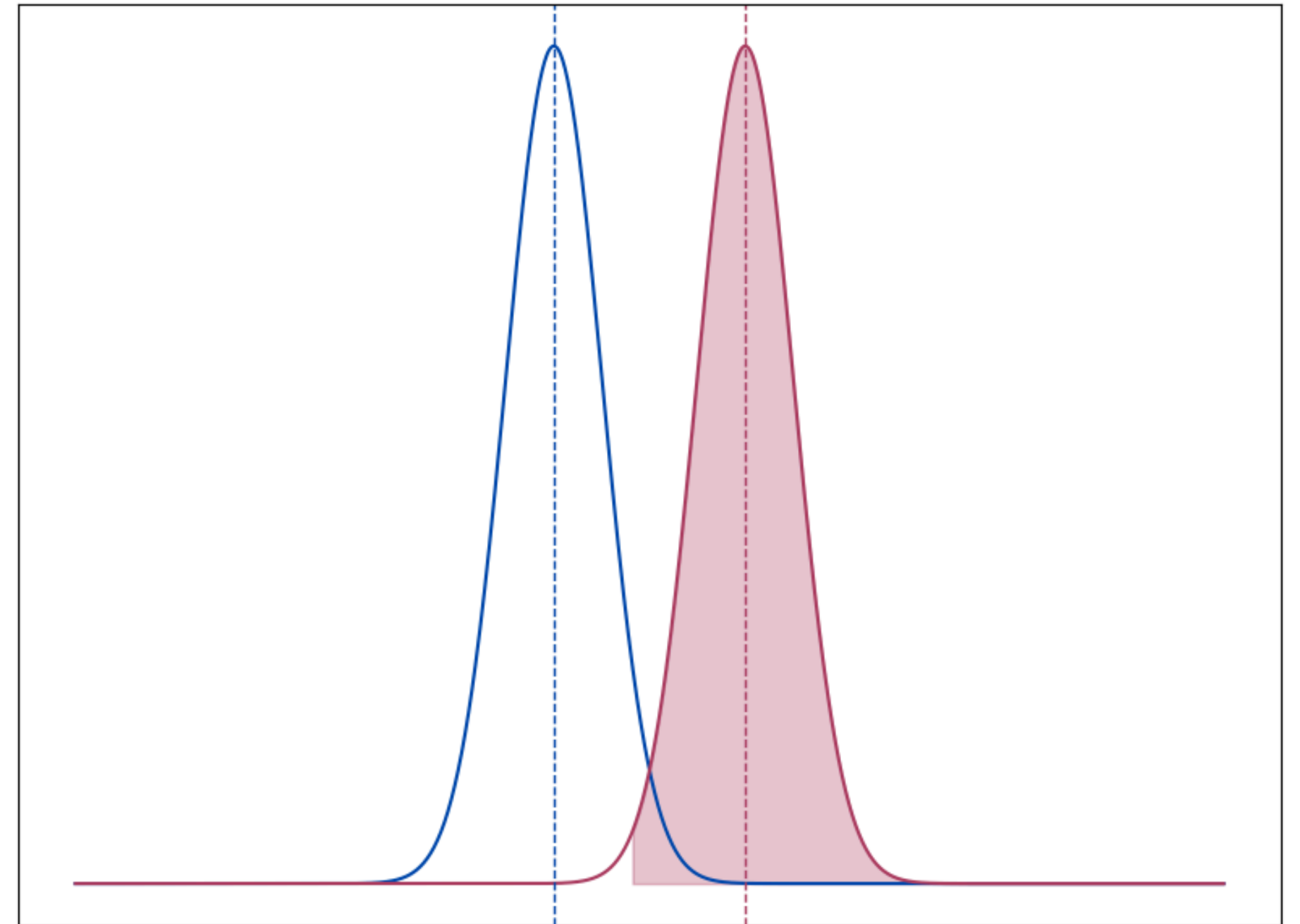


Less measurement uncertainty

=

More statistical power

Soil Carbon Monitoring
main objective: detect
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Uncertainties and Statistical Significance

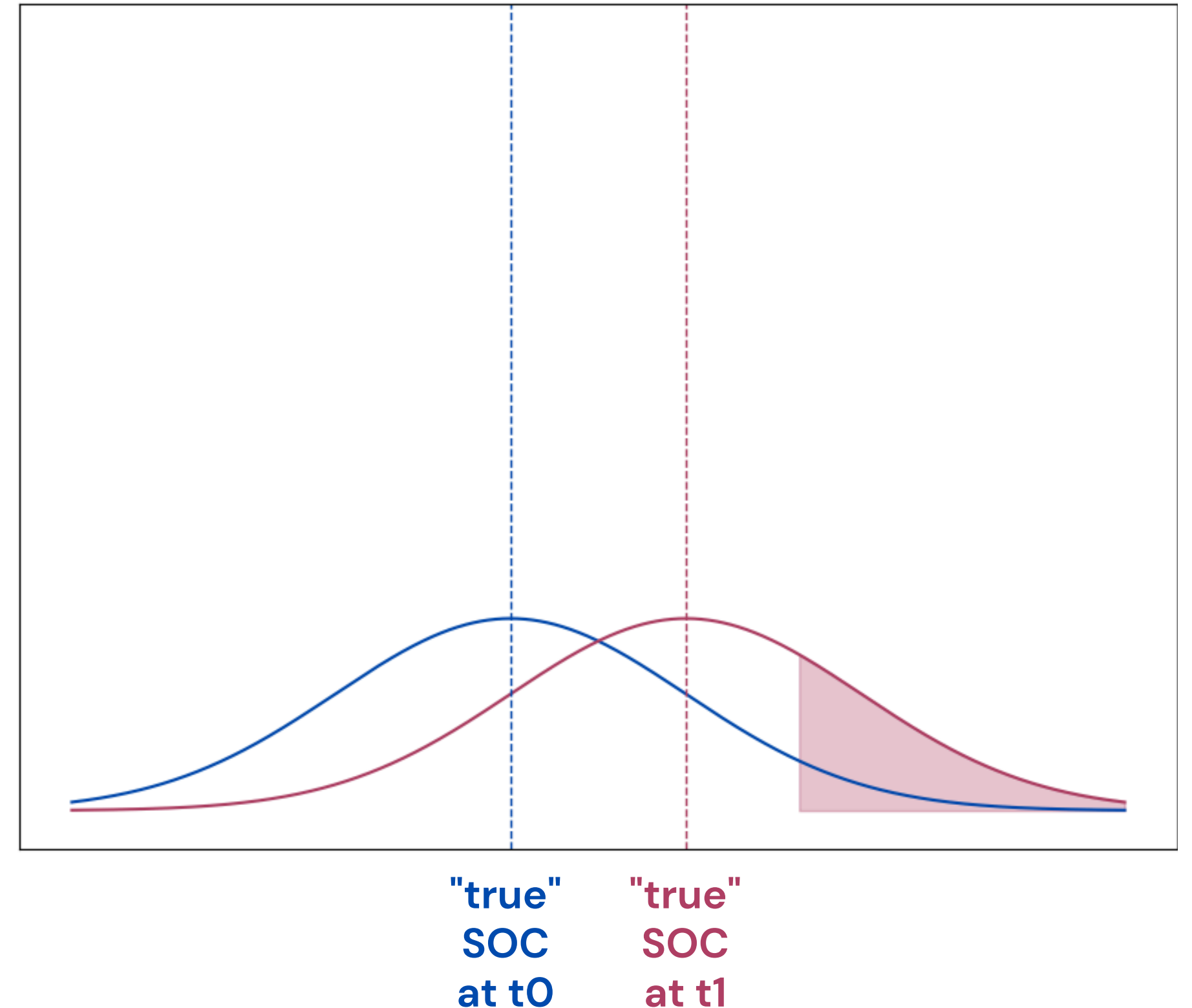
More measurement uncertainty

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Soil Carbon Monitoring
main objective: detect
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Uncertainties and Statistical Significance





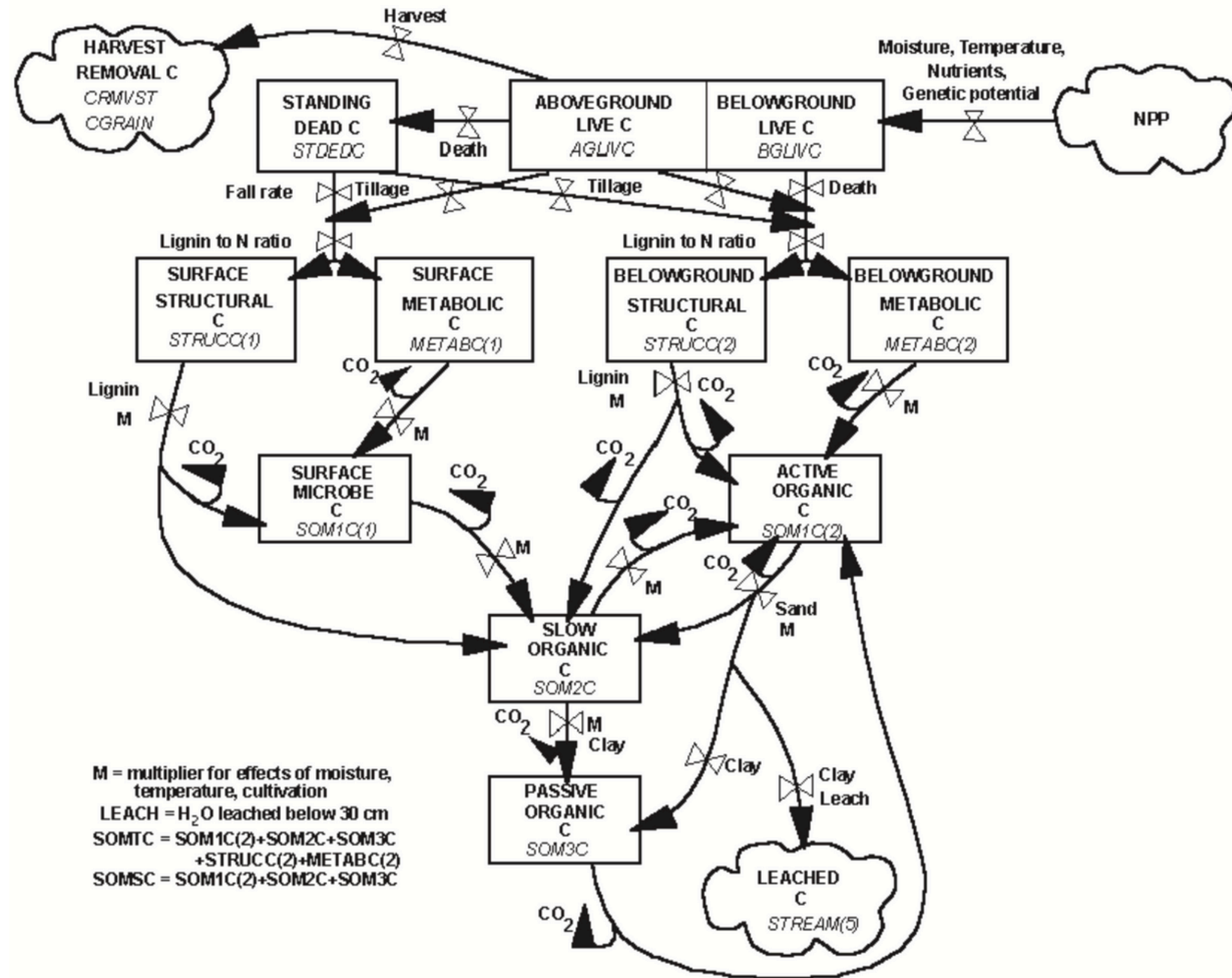
What about model uncertainties?



Model Assumptions

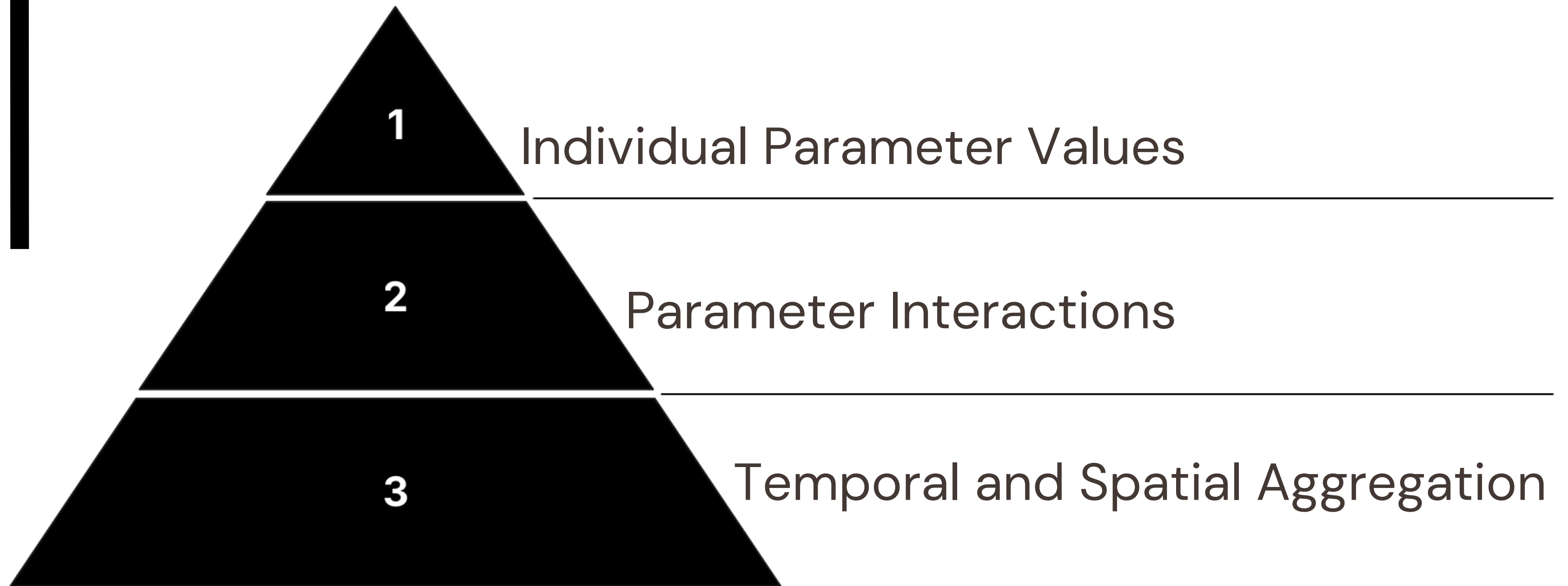
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Structural Uncertainties

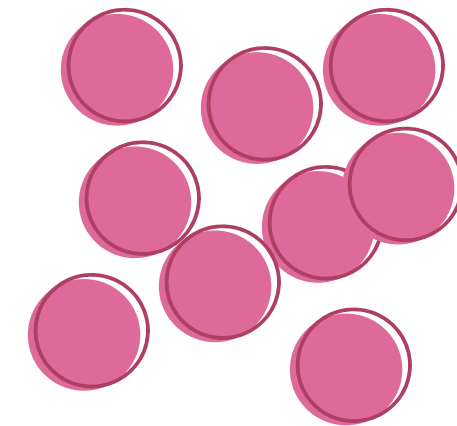


CENTURY (Parton et al. 1992)

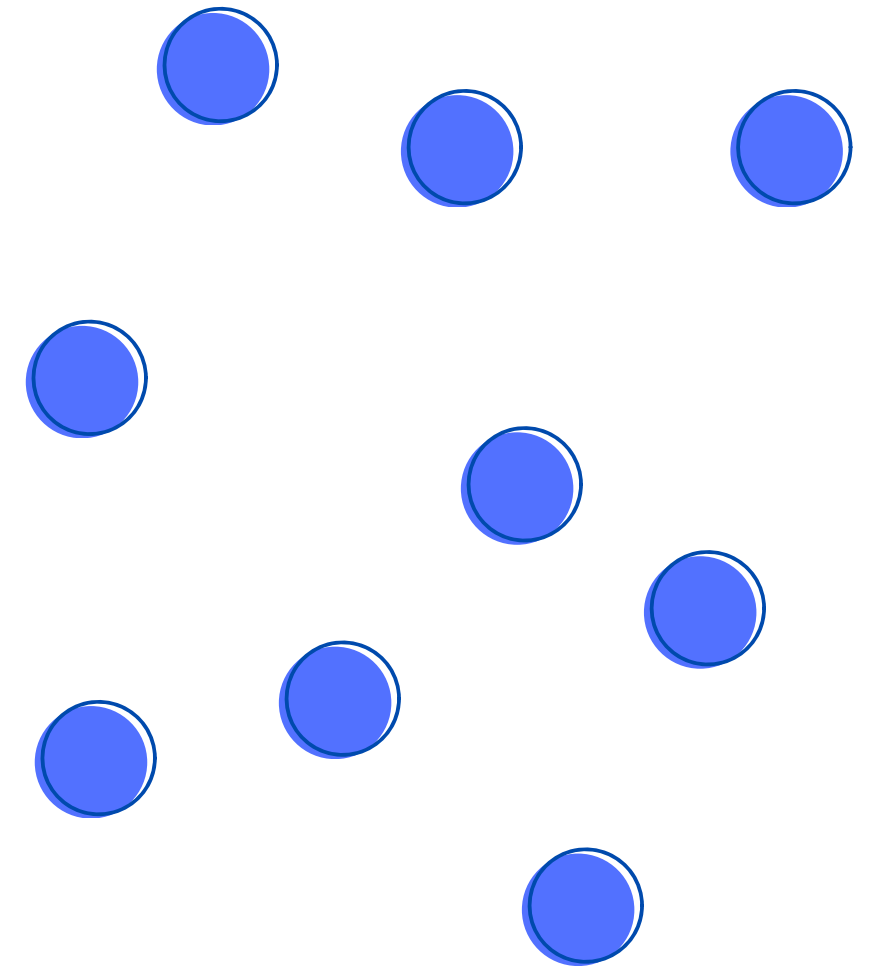
Parameter Uncertainty

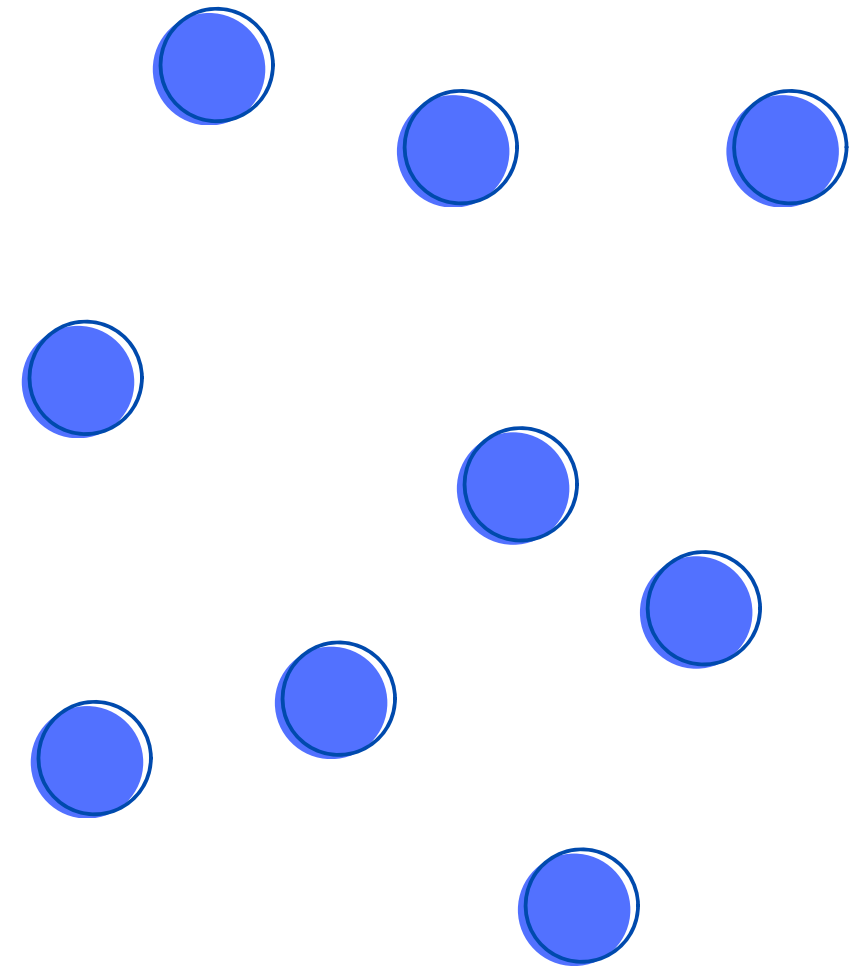
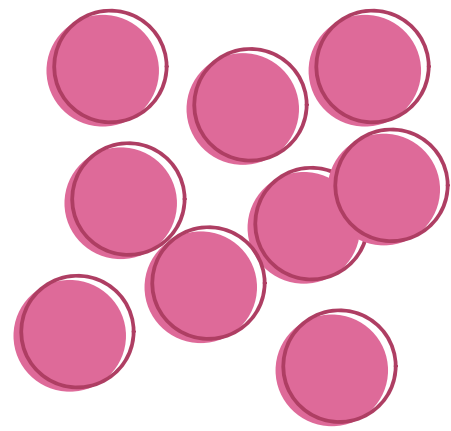


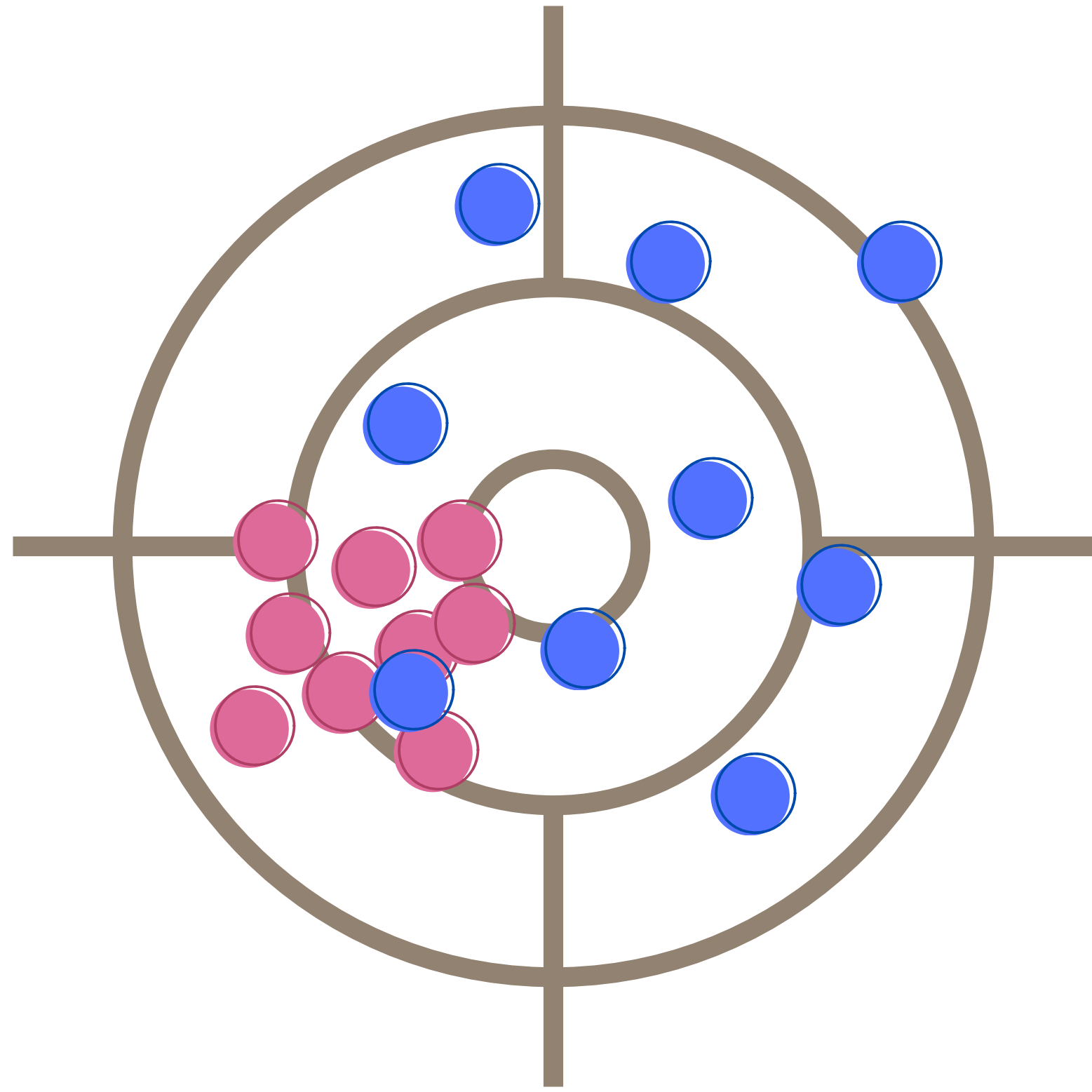
Do we get
good —
predictions?

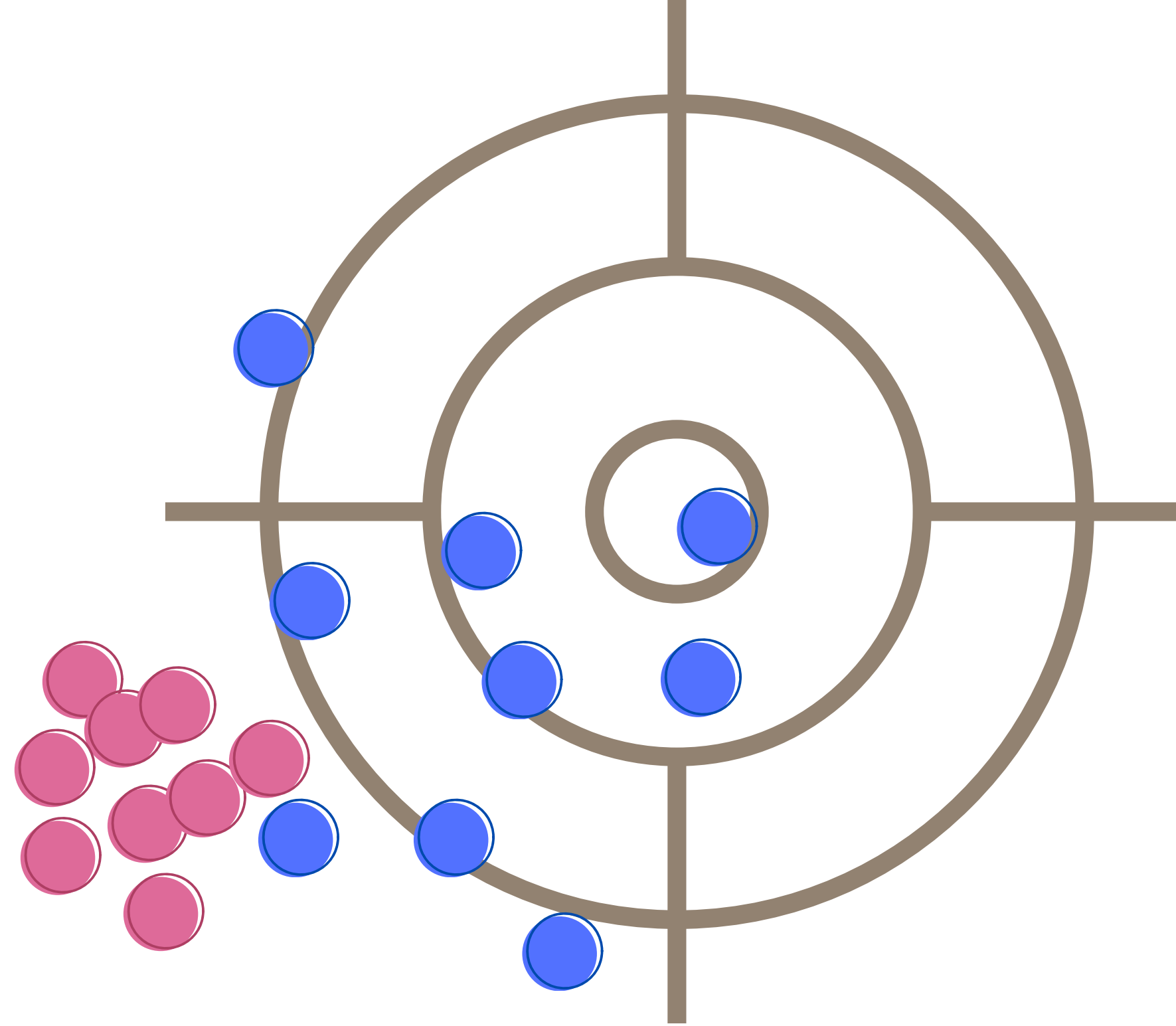


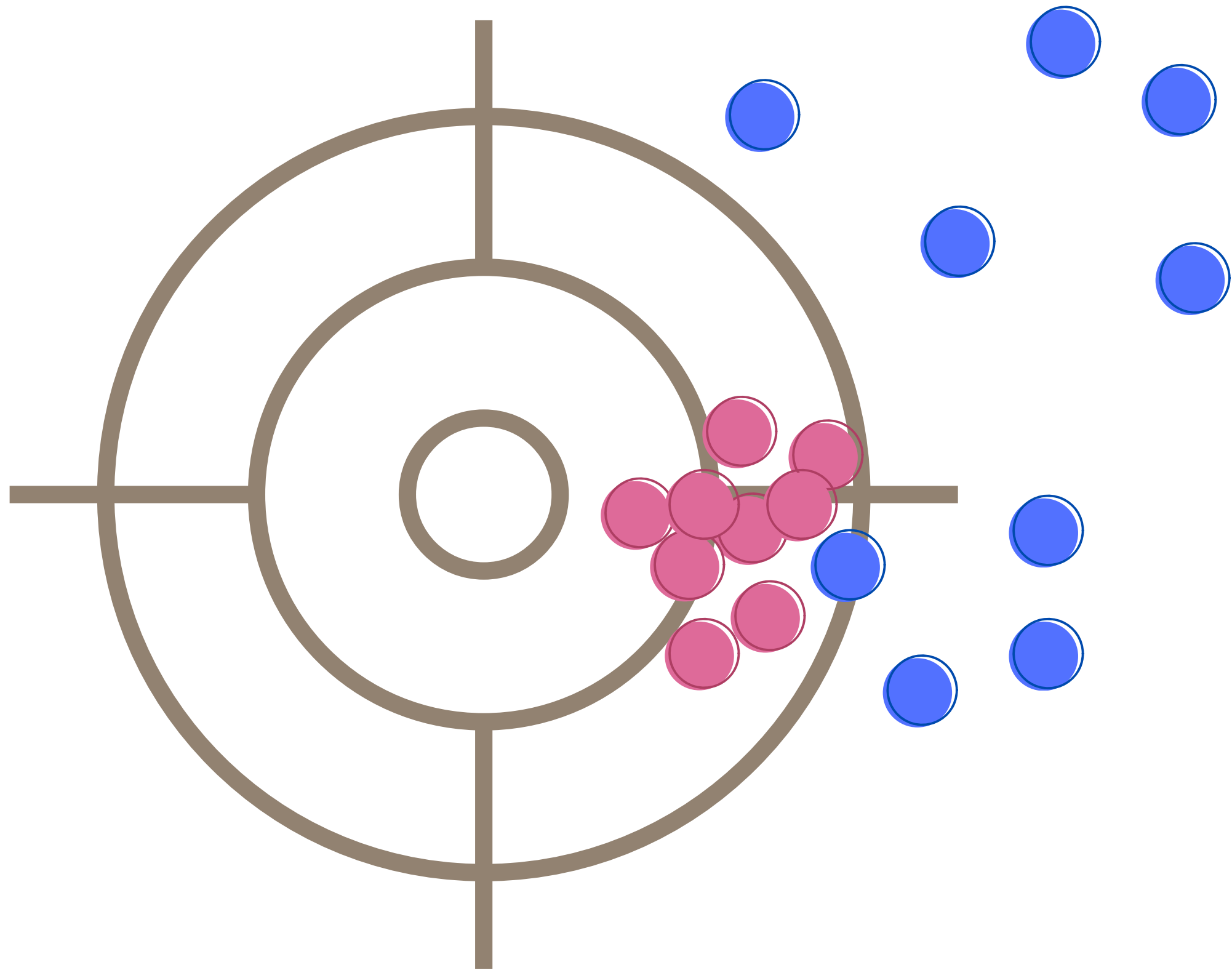
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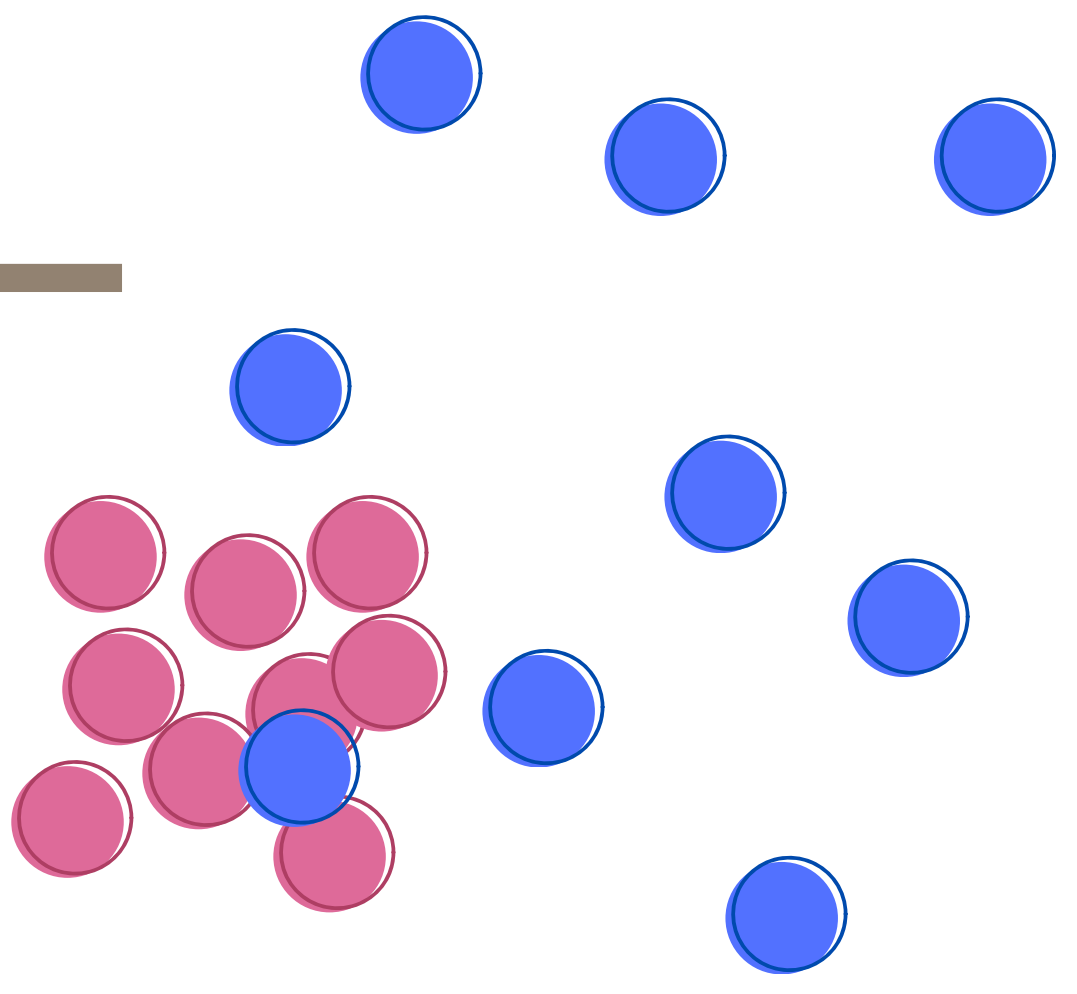
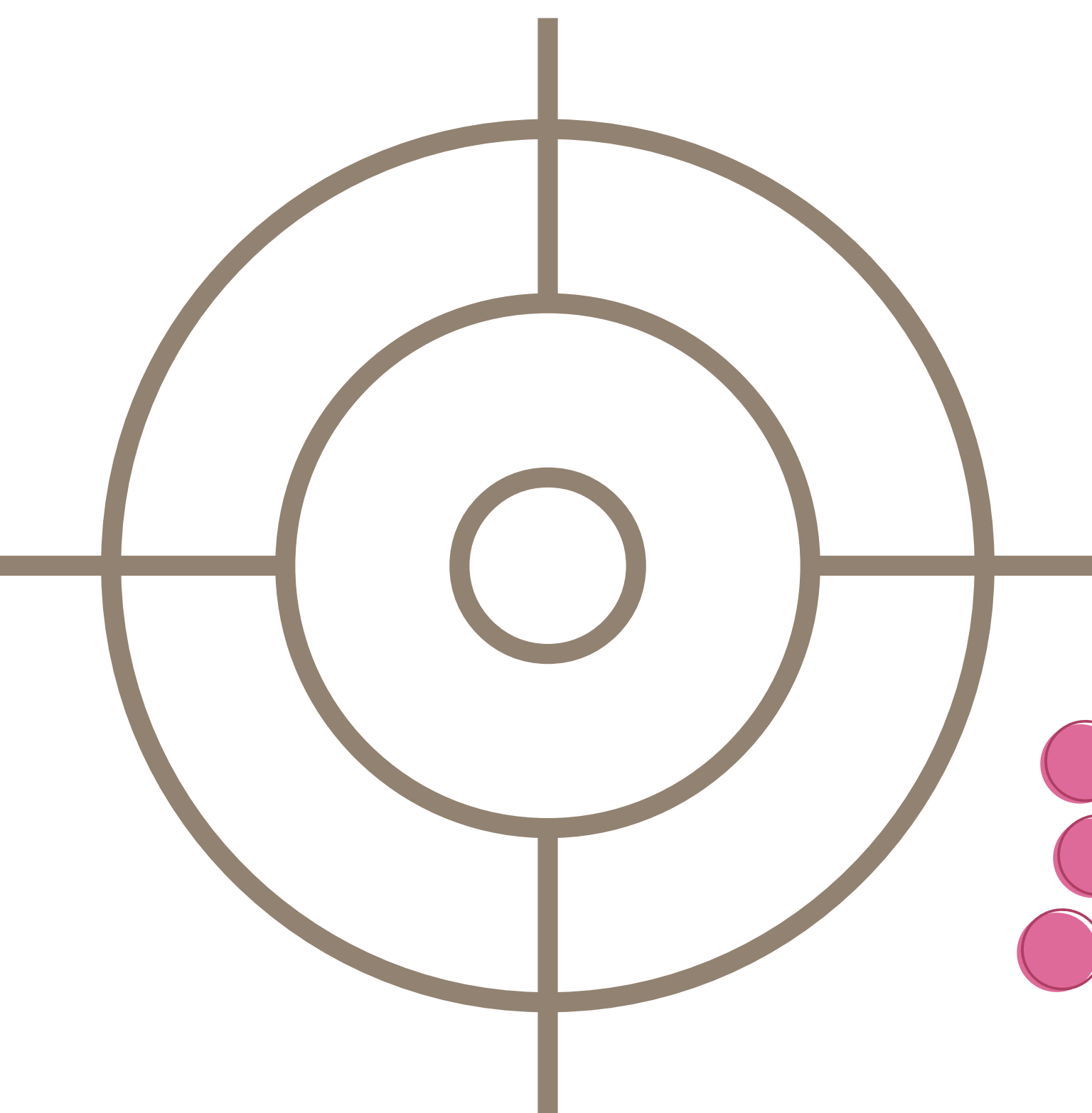










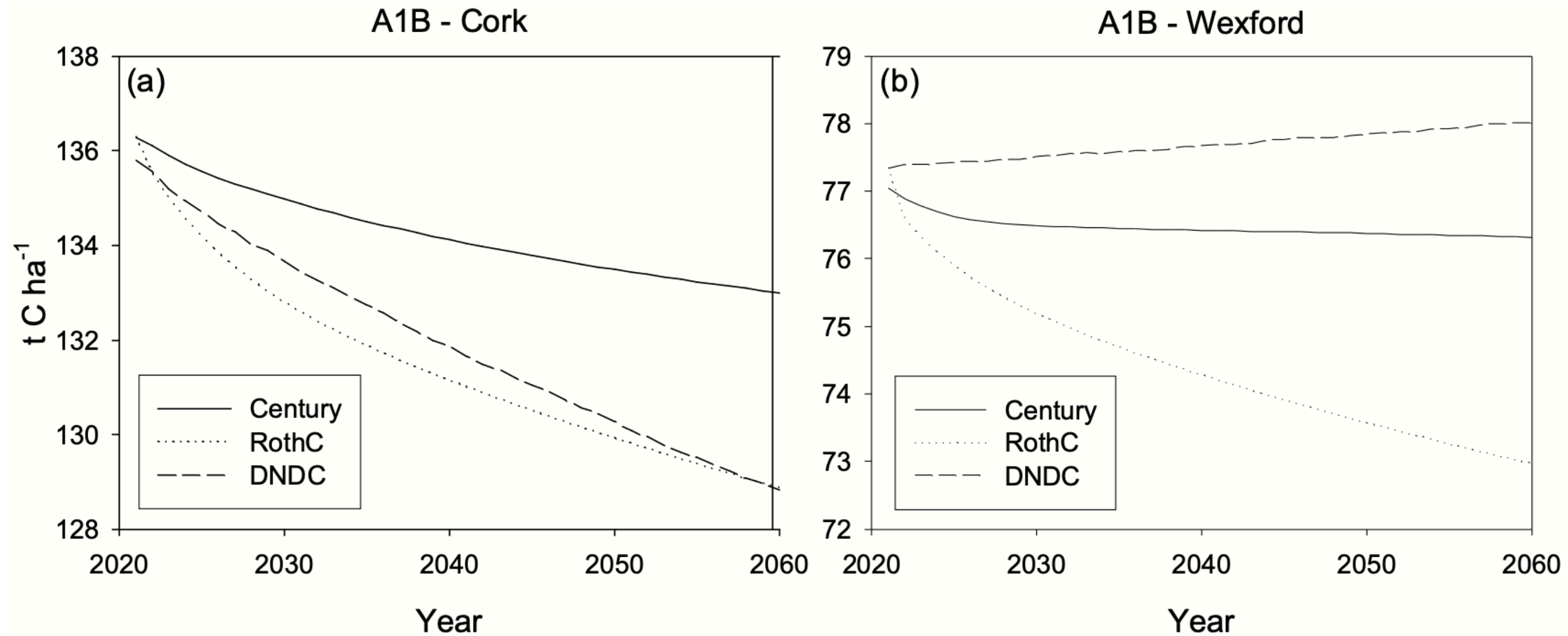




How to compare (and trust) models?

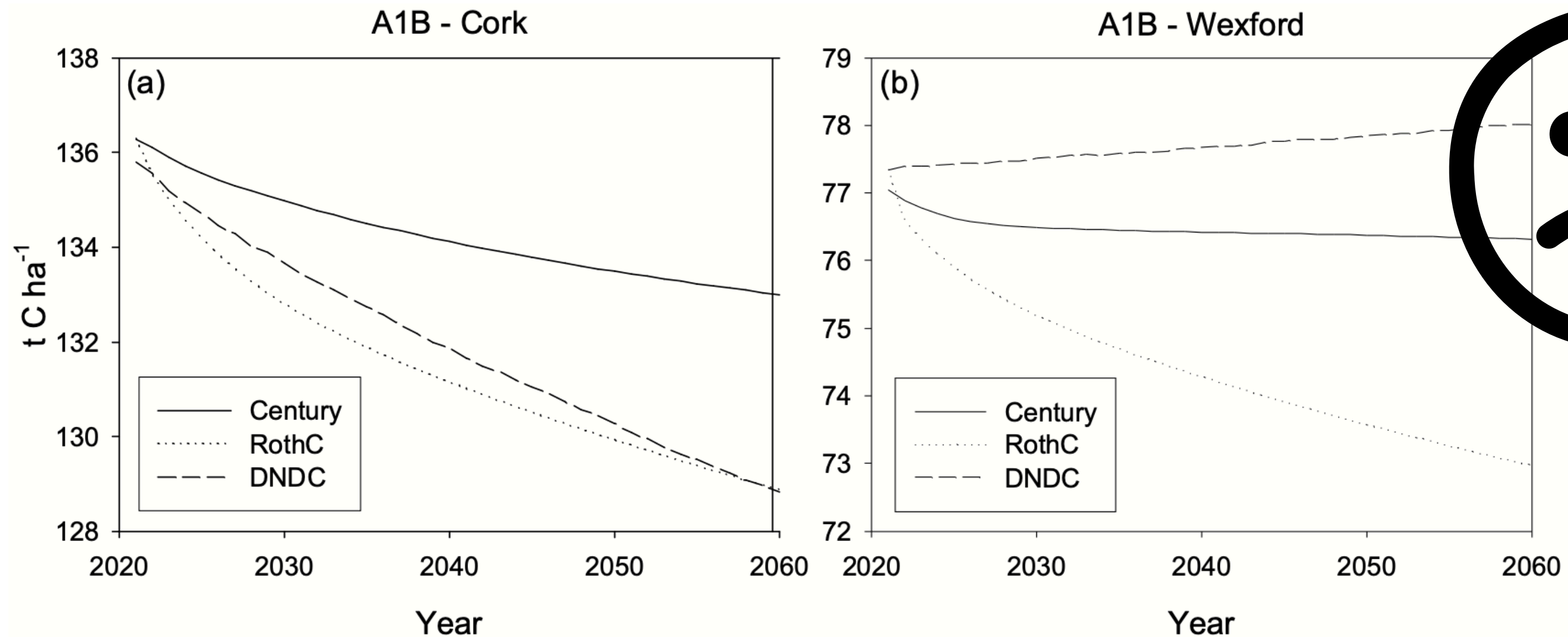


Example



SOC change predicted by Century, RothC, DNDC models in two grasslands sites (Byrne, Kiely, 2008)

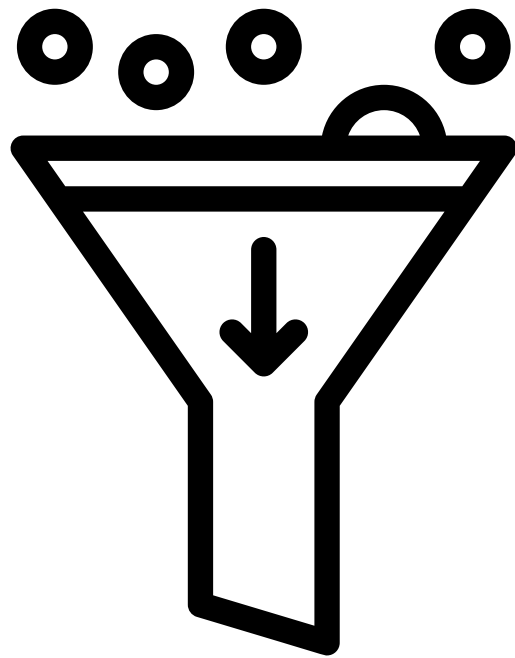
Example



SOC change predicted by Century, RothC, DNDC models in two grasslands sites (Byrne, Kiely, 2008)

Key ingredients

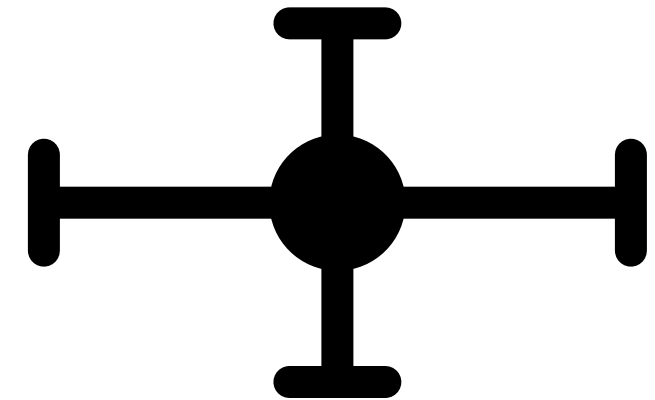
Common harmonized
input conditions



Verified expected
output



Well defined
accepted uncertainty



Today we discuss with ...



Ann Mari Fjæraa – EEA Copernicus in-situ (COINS)

Aleksi Lehtonen – Natural Resources Institute Finland (Luke)

Christopher Anderson – Planet

Engage during the brainstorming...



4-5-6 March 2025

Save the date!

Dublin

Ireland

2nd European Carbon Farming Summit

Call for sessions now open

...and save the date!

