

Apsu – a new compact surface NMR system



Denys Grombacher, Jakob Juul Larsen, Lichao Liu, and Esben Auken
Hydrogeophysics Group, Department of Geoscience, Aarhus University
WATEC – Aarhus University Center for Water Technology

Outline

1. **NMR background – What is it? Why use it?**
2. **Challenges with NMR**
3. **Apsu – a new light weight robust NMR system**
4. **Apsu looking forward**



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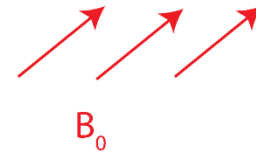
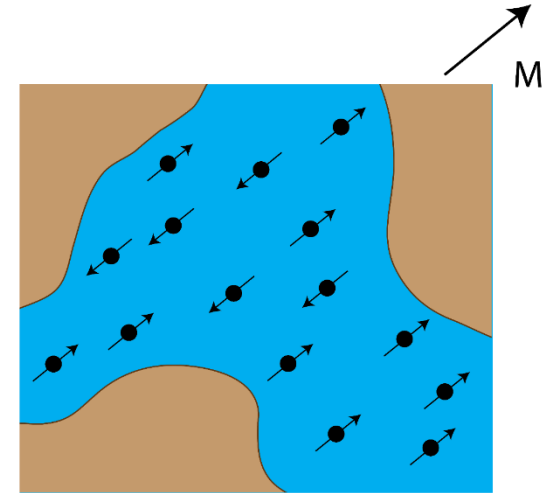
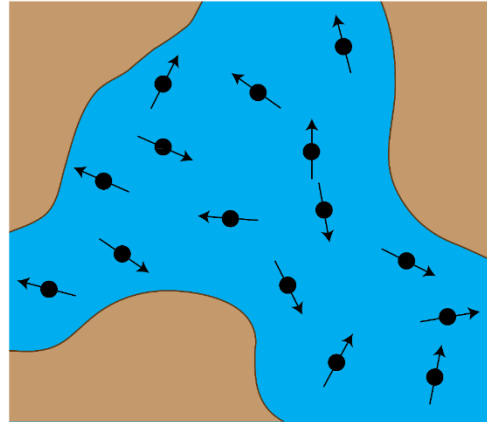
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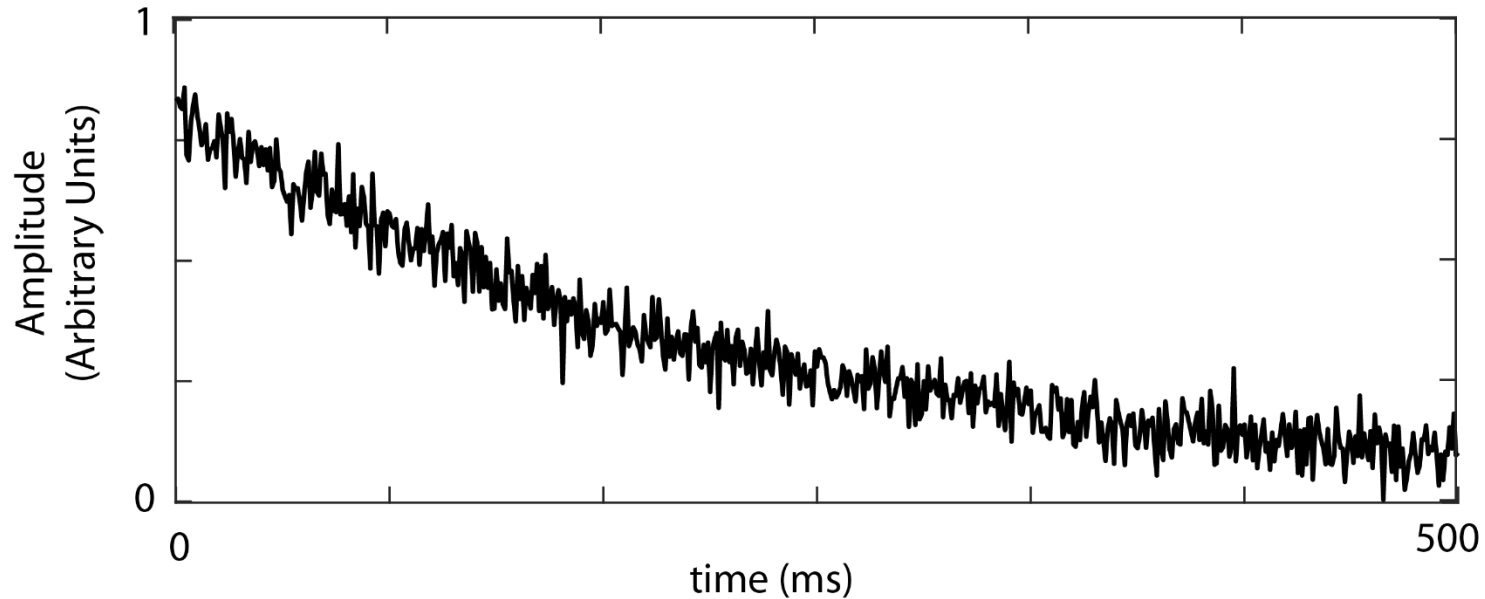


Nuclear magnetic resonance

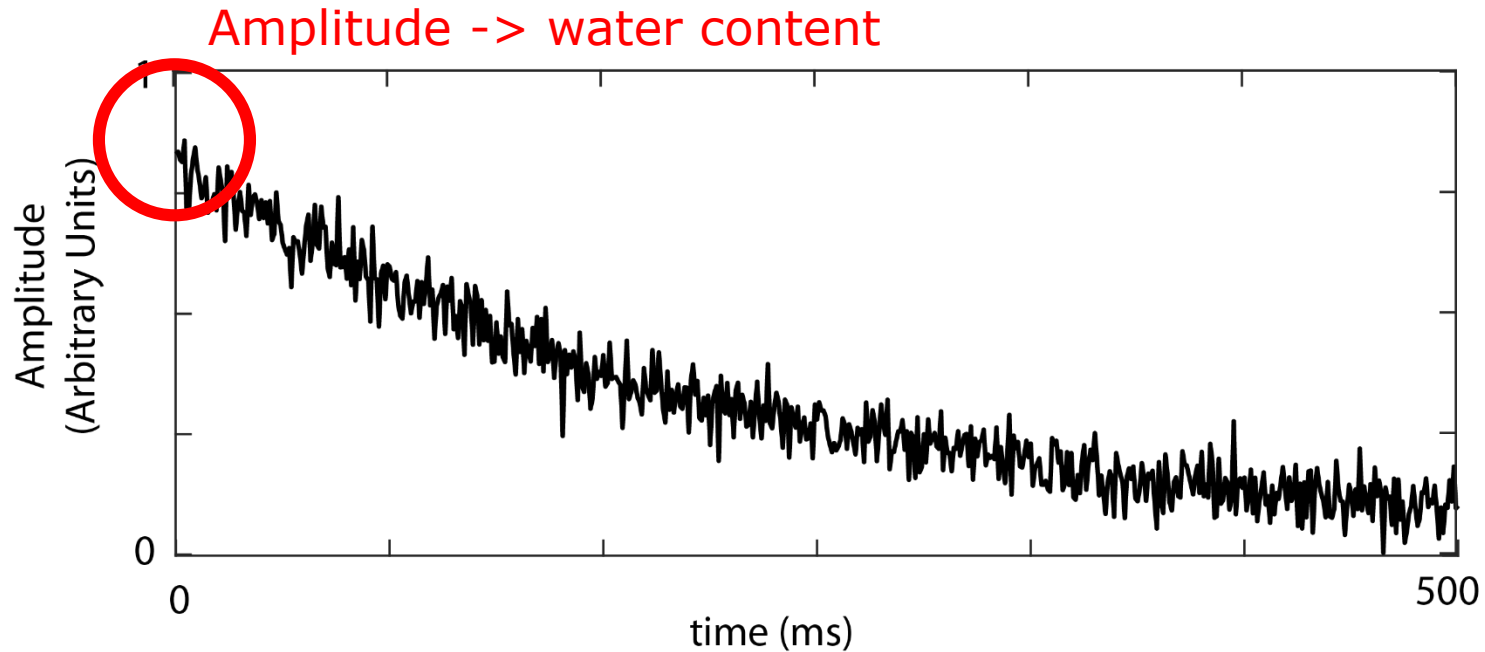
- Signal is directly from hydrogen nuclei



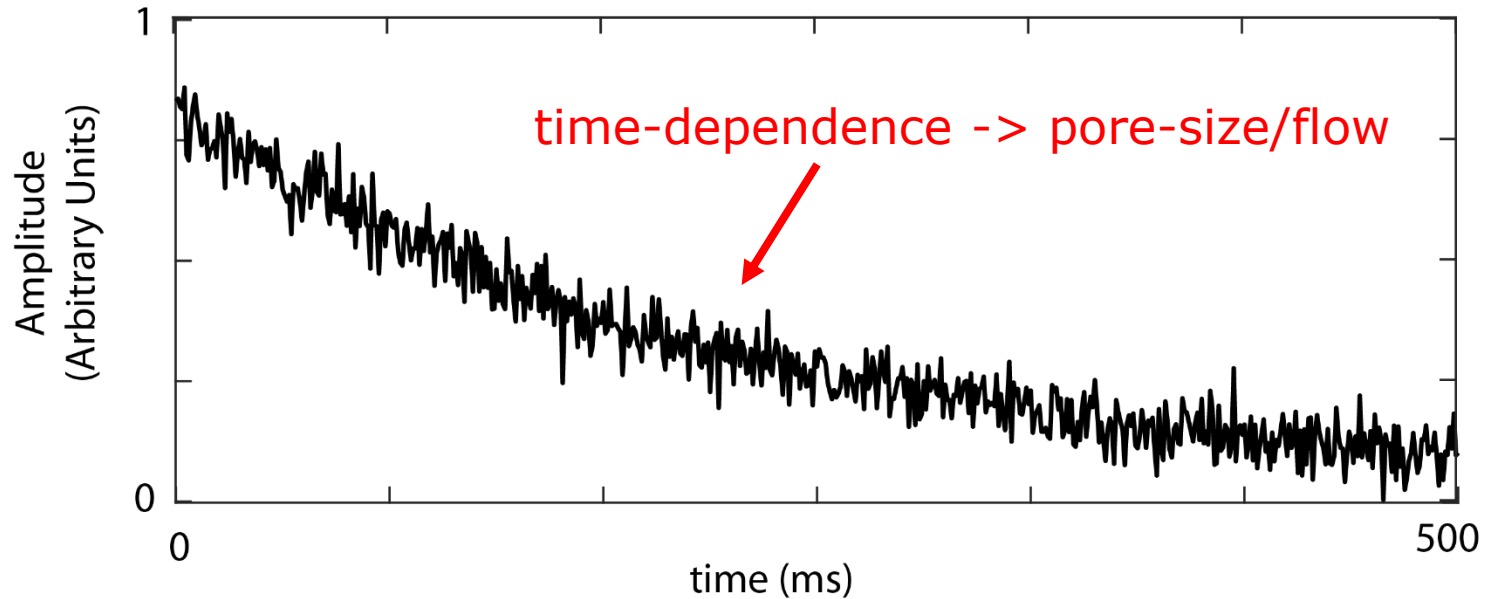
NMR signal



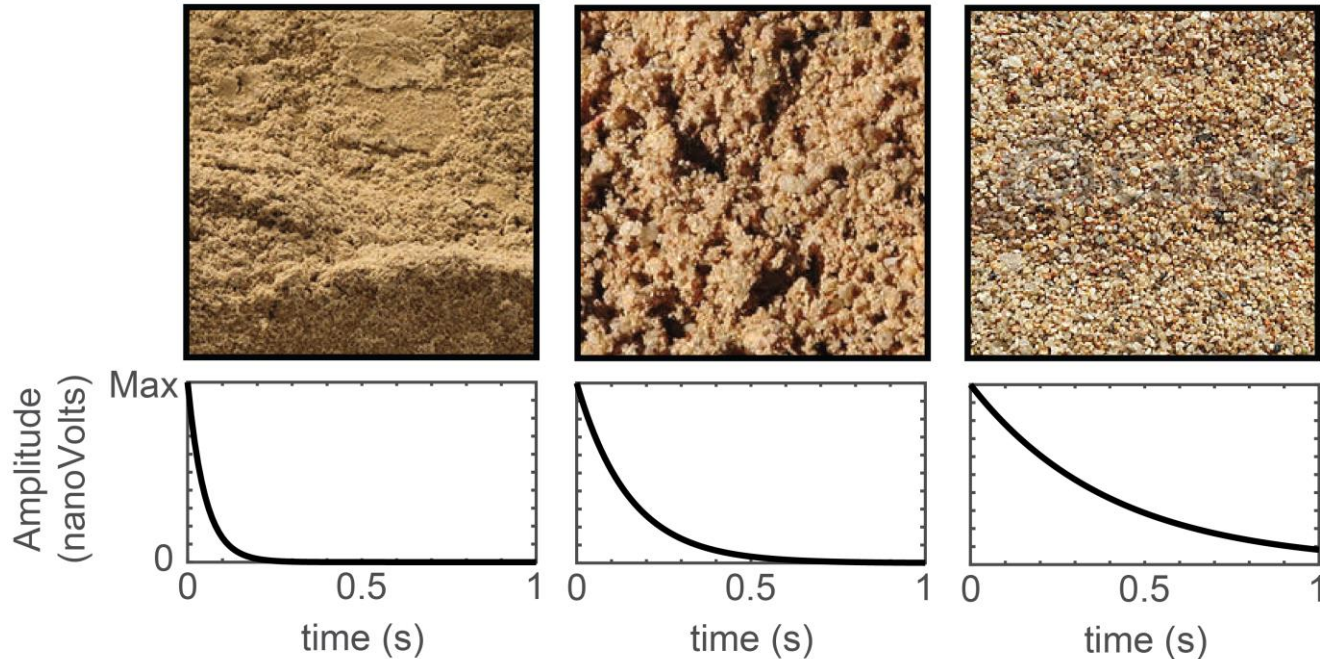
NMR signal



NMR signal



Interpreting NMR's time-dependence



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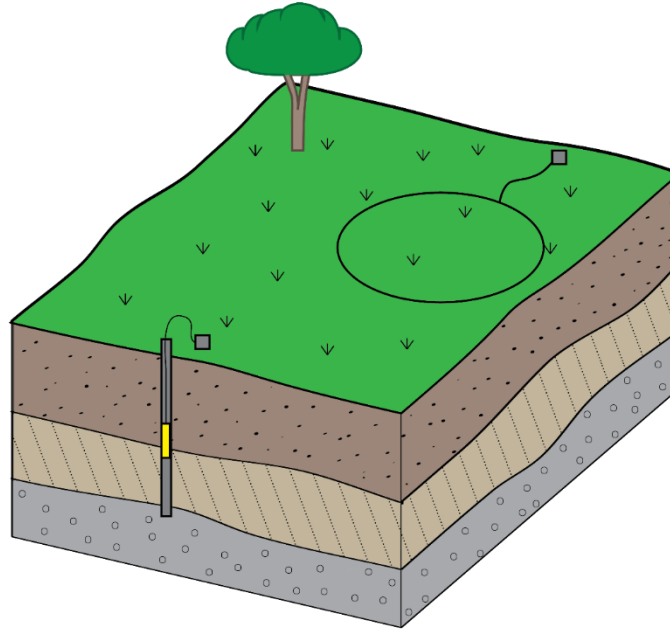
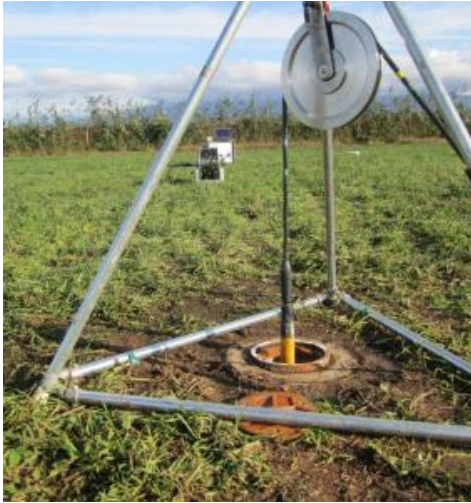
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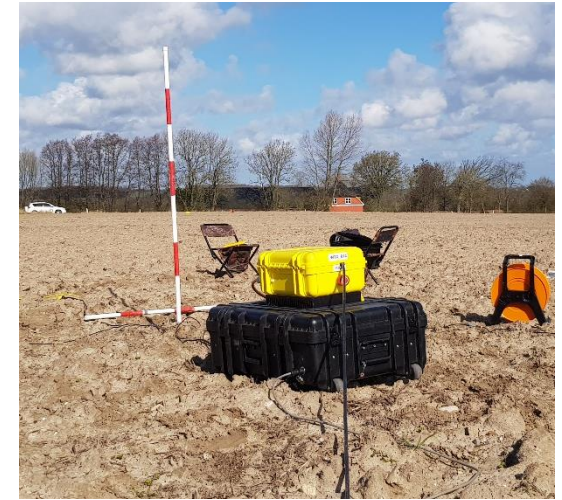


NMR field methods

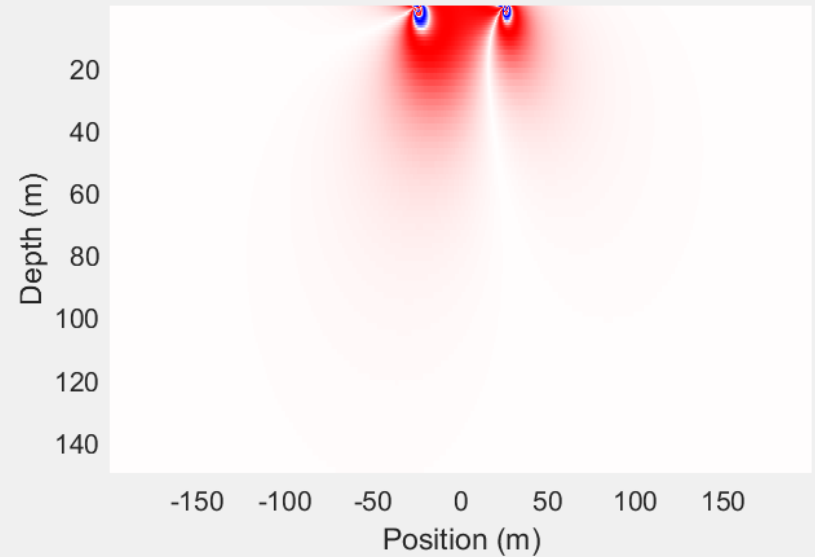
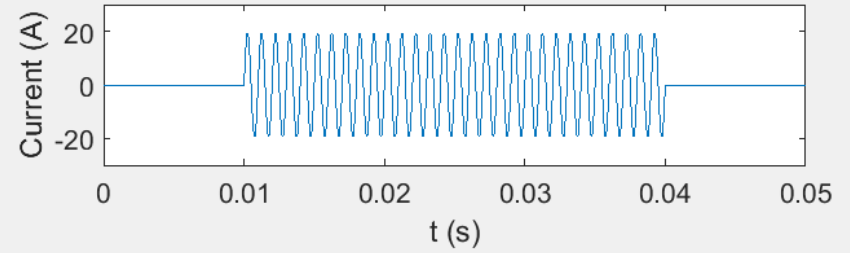
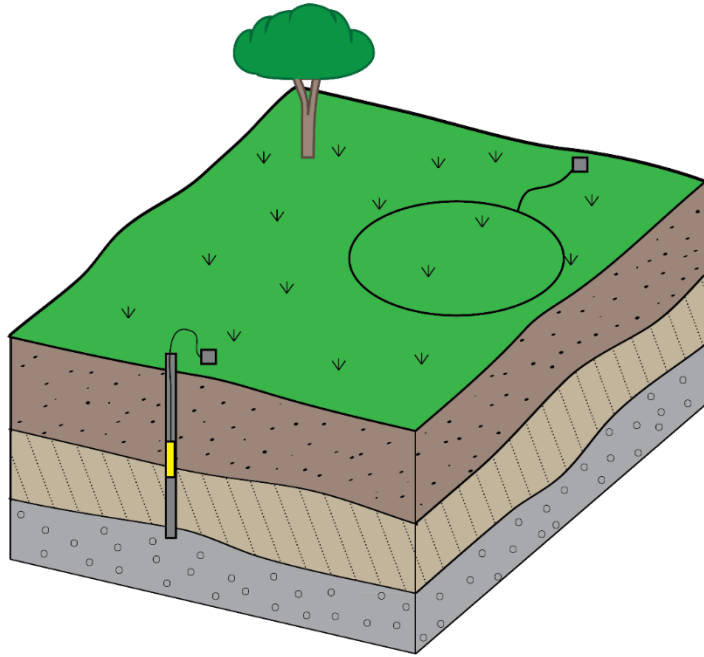
Logging NMR



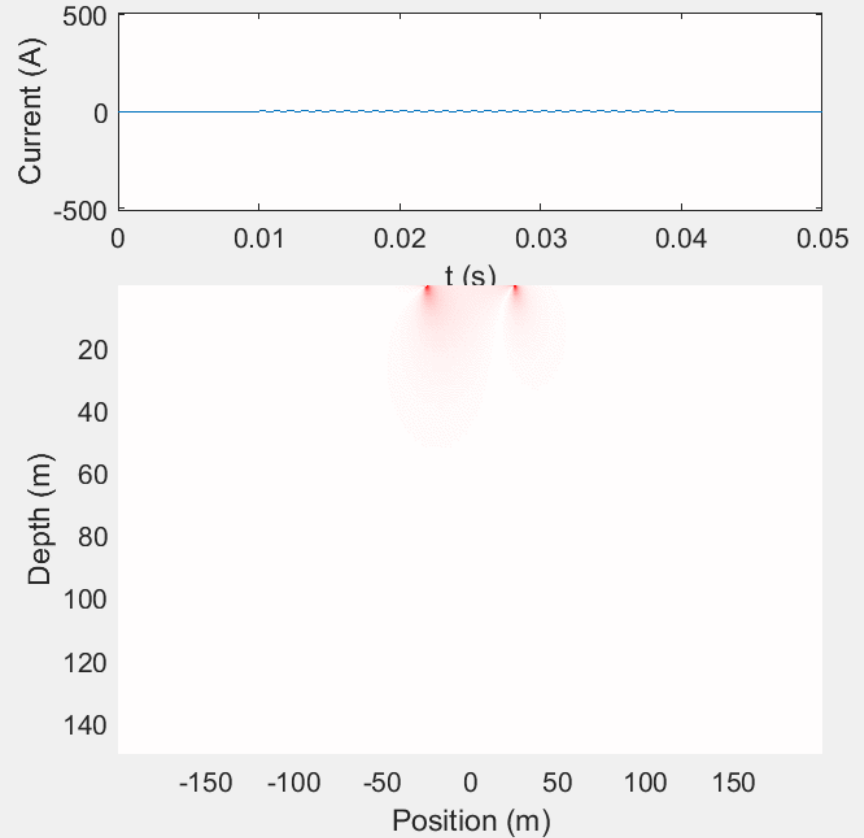
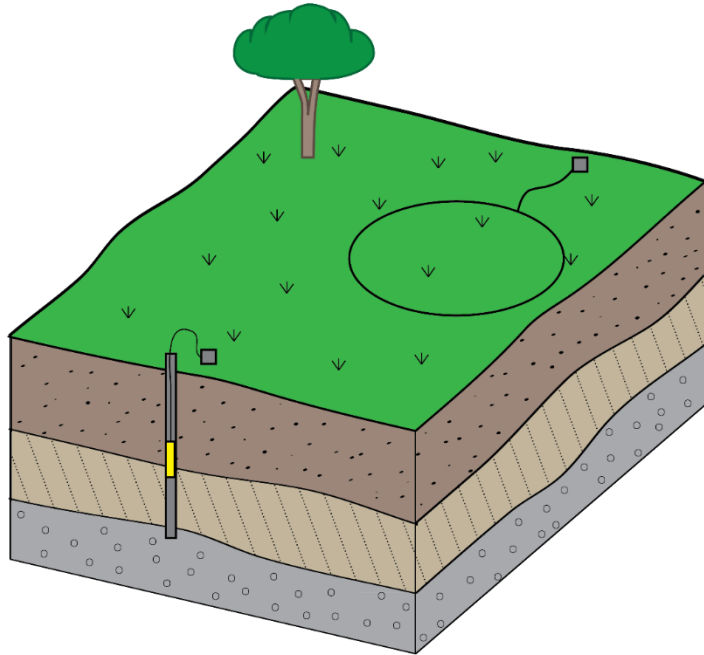
Surface NMR



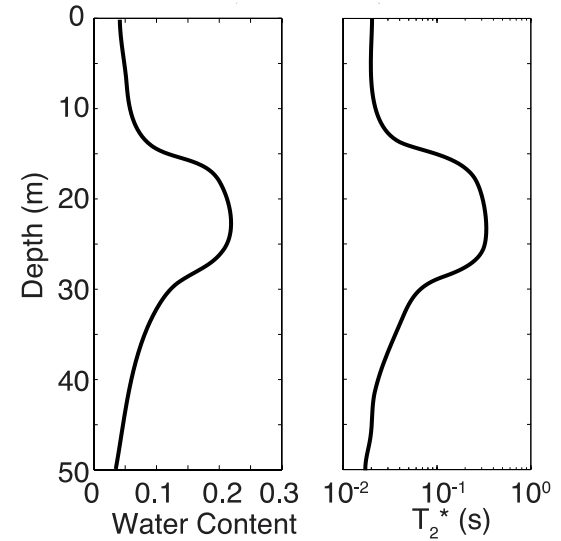
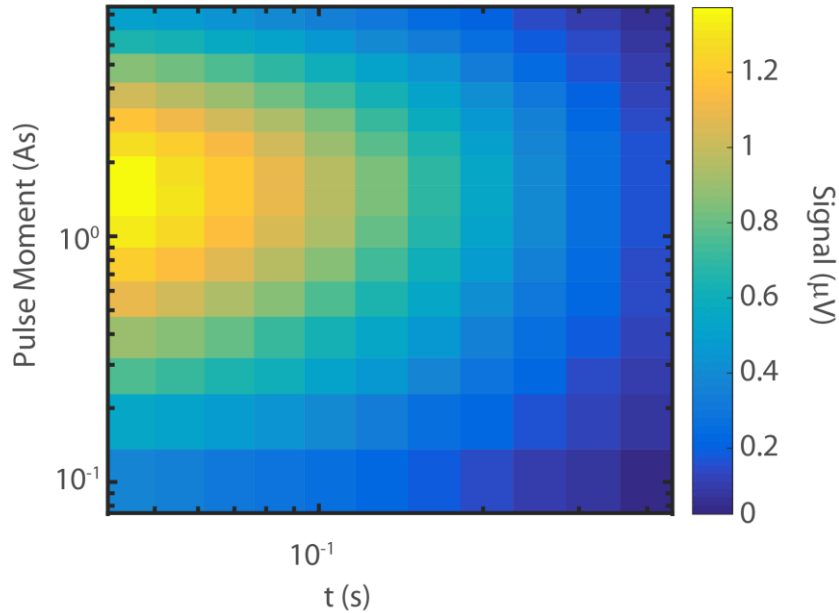
Surface NMR



Surface NMR

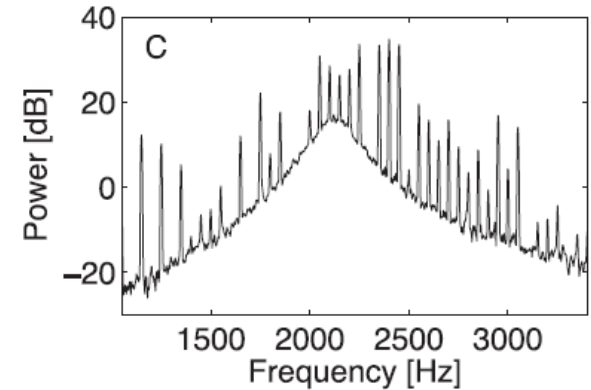
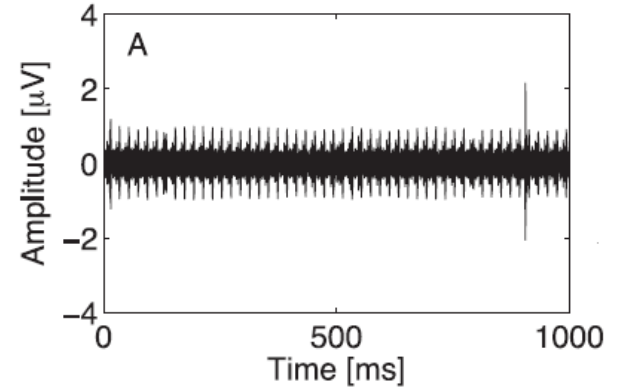


Surface NMR data and results



Challenges with surface NMR

1. Noise issues
2. Slow measurement speeds
3. Poor spatial coverage



Challenges with surface NMR

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Apsu – a new compact surface NMR system

1. **Lightweight instrumentation**
2. **Generator powered**
3. **Shallow-focused system (top 25-30 m)**
4. **Ultra-flexible acquisition design**
5. **GPS-synchronized and wireless**
6. **Efficient noise-suppression measurements possible ~100 m from buildings**



Field example from Aars



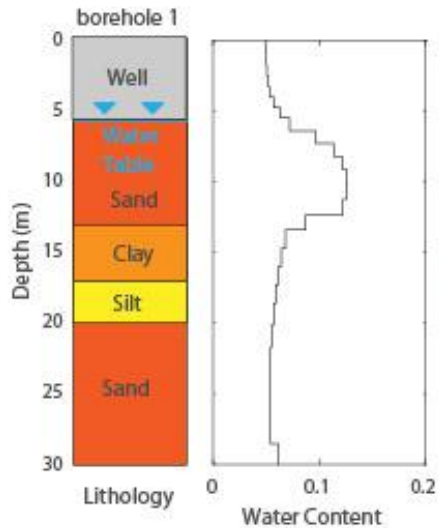
1. 15 sites
2. 4 days of collection (2 persons)
3. Typically 1-2 hours per site



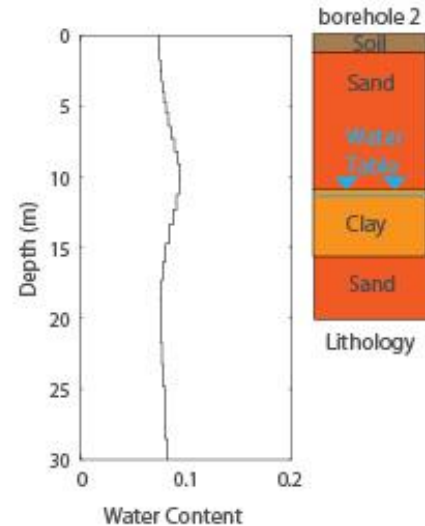
Field example from Aars



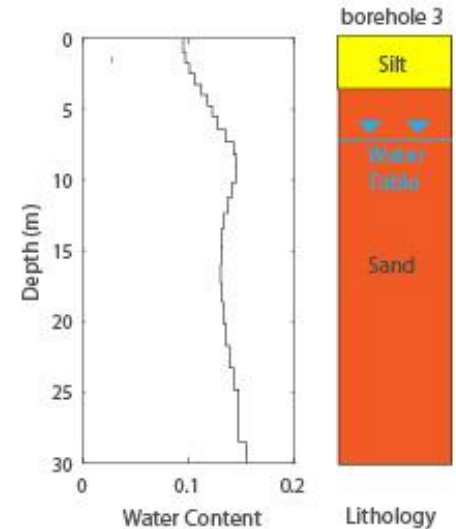
Site 1
(~250 m north of borehole 1,
~200 m south of borehole 2)



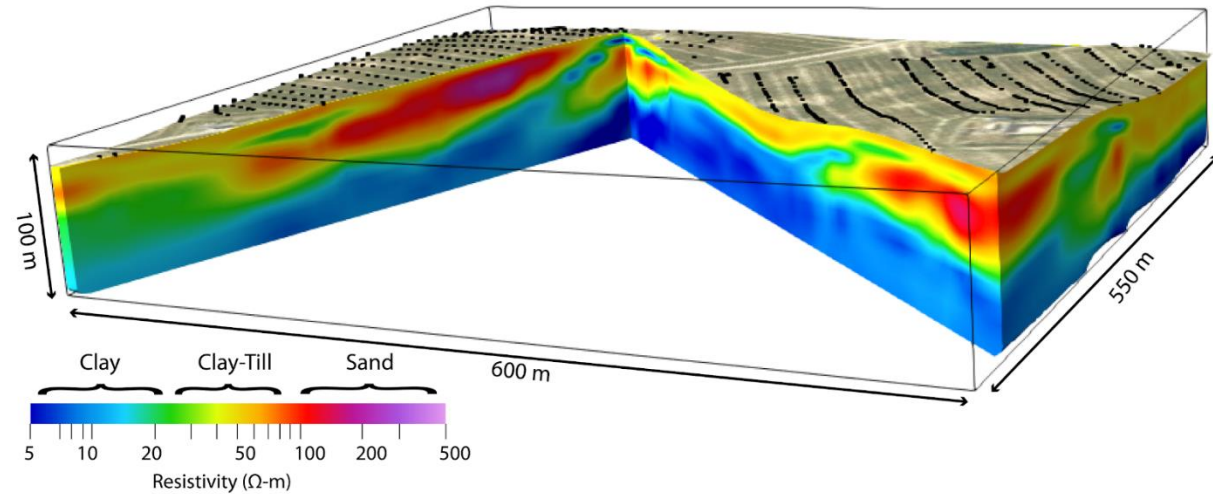
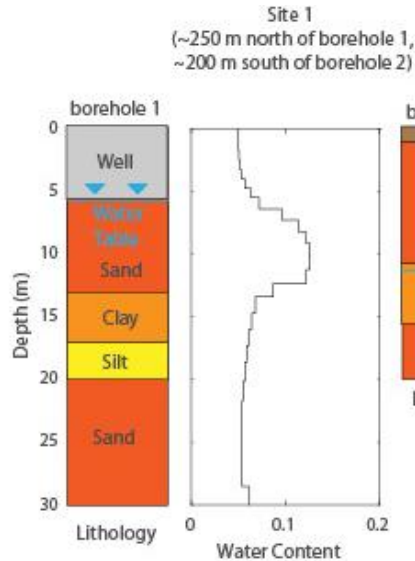
Site 2
(~75 m east of borehole 2)



Site 3 (~150 m north of borehole 3)



Where does NMR fit?



Future developments

1. Increased depth penetration
2. Accelerated acquisition rates
3. Expanding mapping coverage
4. Enhanced sensitivity to parameters linked to flow
5. Workflows for porting NMR data into hydrological models
6. Workflows for integrating NMR/EM data sets

