

Proceedings of the 10th Workshop “Seabed Acoustics”, Presentation P05:

Drone-based high resolution sediment survey in a silted gravel pit lake

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Institute of
Photogrammetry
and Remote Sensing

IMB MPA
KARLSRUHE KARLSRUHE

Drone-based high resolution sediment survey in a silted gravel pit lake

Projekt: Method development for a sustainable use of sand- and
gravelpit mines

KMU-Innovativ

„Seabed Acoustics“ 2022



S. Hilgert & K. Sotiri

Problem



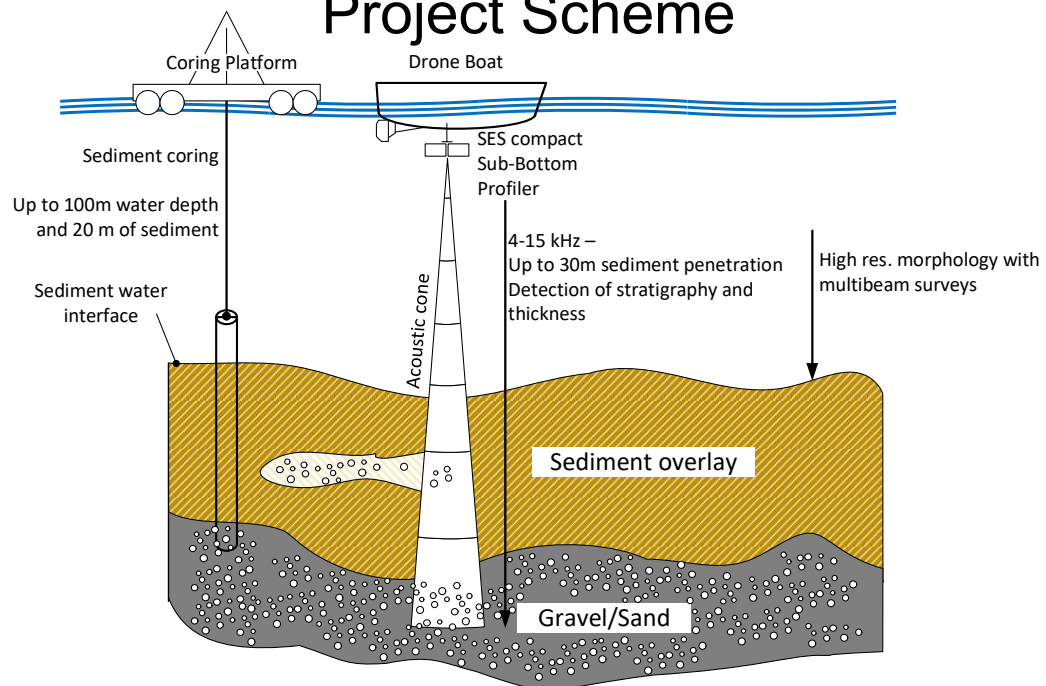
Ca. 60 Mil. t of fine sediment (tailing mud) in gavel pit lakes of the upper Rhine valley → largest and most valuable sand and gravel deposit in Europe

- Covering of resources which are economically feasible for exploitation
- Practical problems during dredging (dredgers get stuck...)
- Plant downtime
- "Unnecessary" enlargement of mining areas (growing resistance by the public)

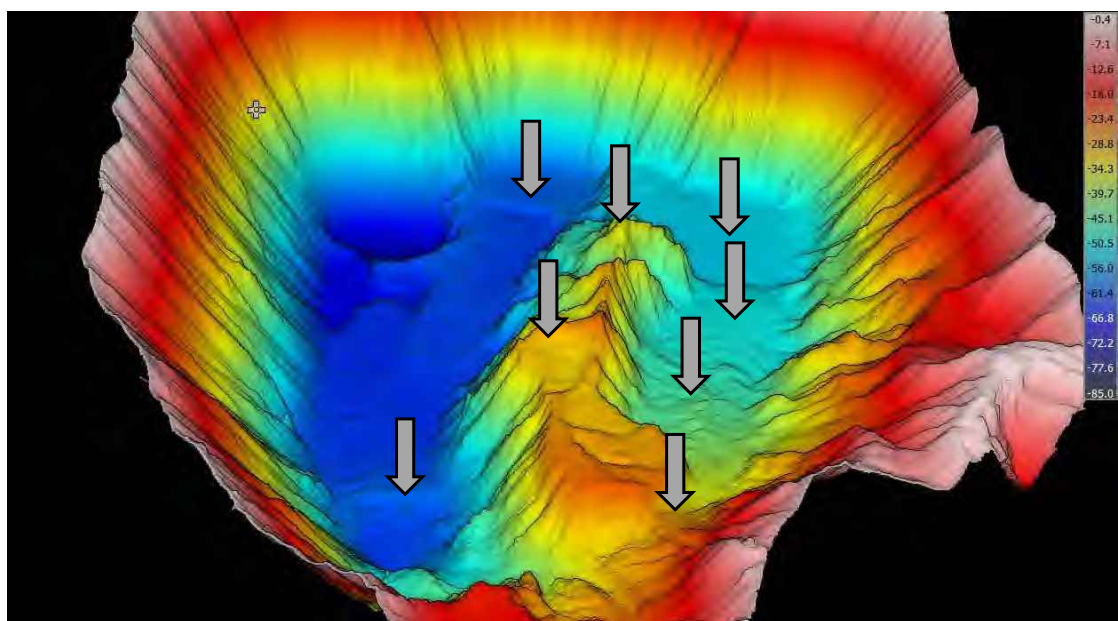
Research Questions

- What is the sediment composition?
- Which chemical and mineralogical Parameters are relevant?
- How is the distribution of the sediments?
- What is the best method for detection?
- Can the sand/gravel layers be reached by manual coring?
- Can a valid high-resolution resource model be developed?

Project Scheme



Projektumsetzung



Drone Survey

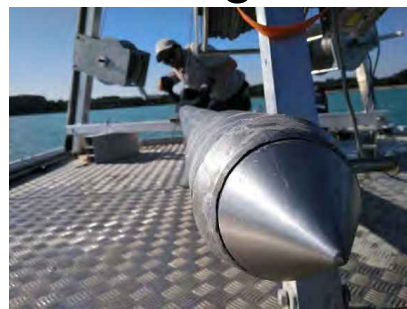
- Measurements with the Calypso drone and a SES Compact system
- Multi-Ping mode (6 & 12 kHz)
- Division of the lake into raster blocs of ~10km profile length
- Line spacing of 5m, two surveys 90° displacement and overlap at the turns



Sediment Coring

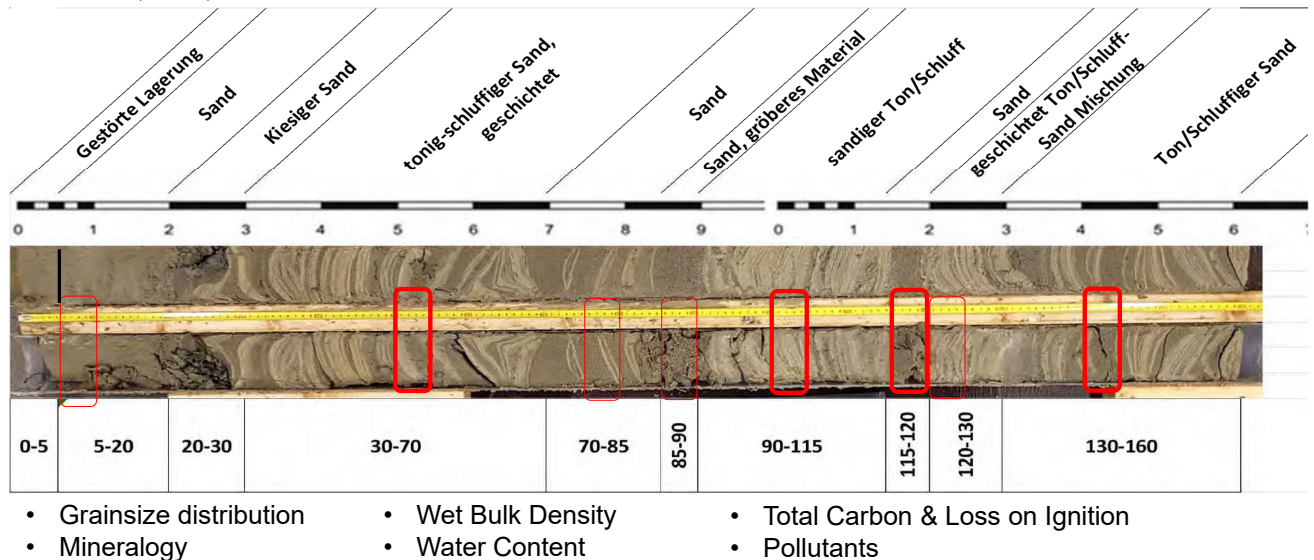
Four campaigns

- May, June, July 2021
- June 2022

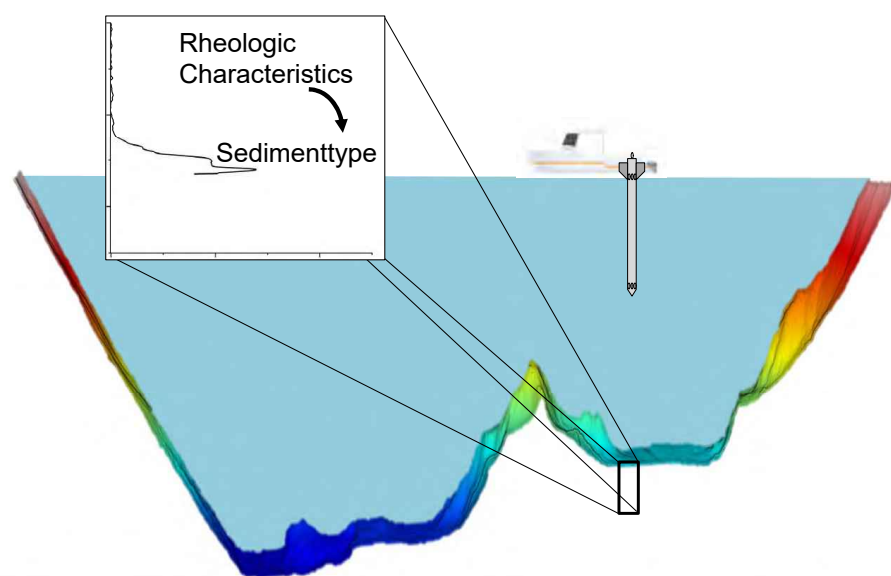


Characterization of the Sediments

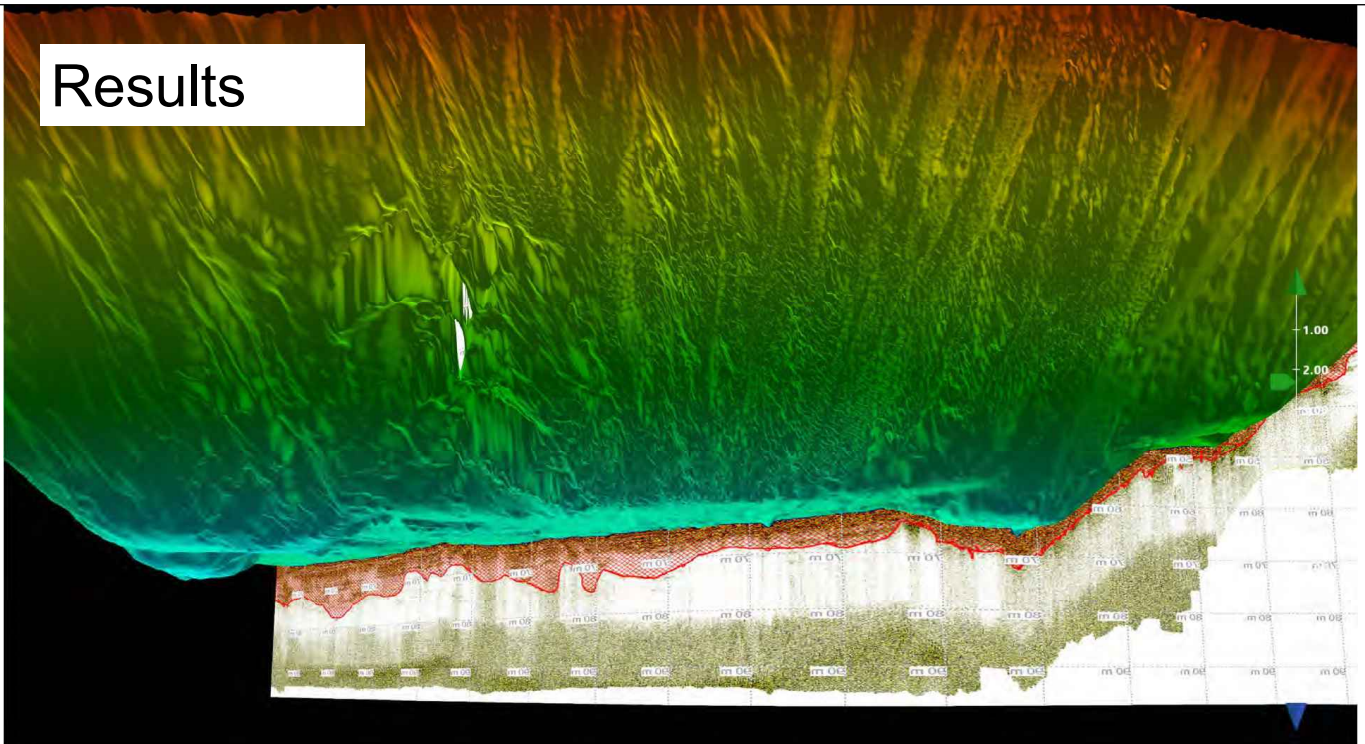
Core 2, L2, 80 – 280



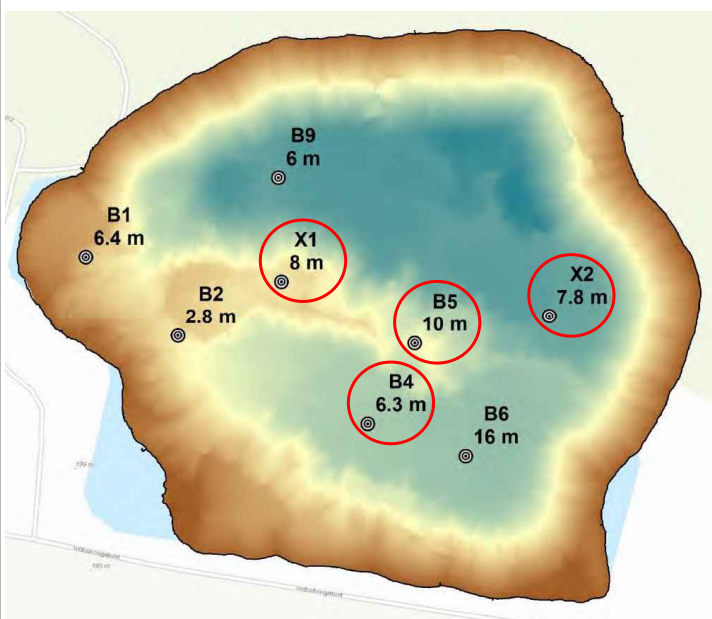
Freefall-Penetrometer „Graviprobe“



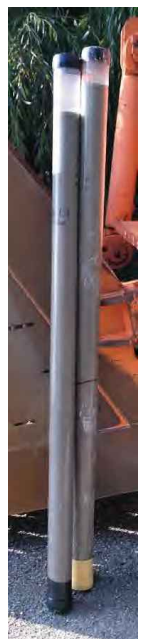
Results



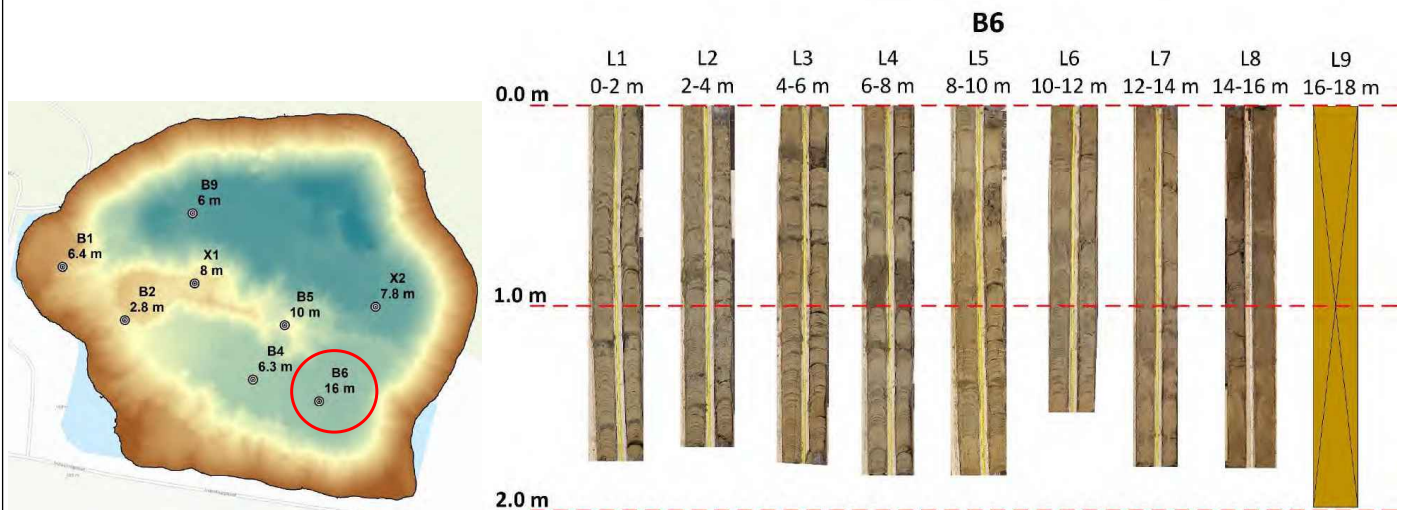
Sediment Cores



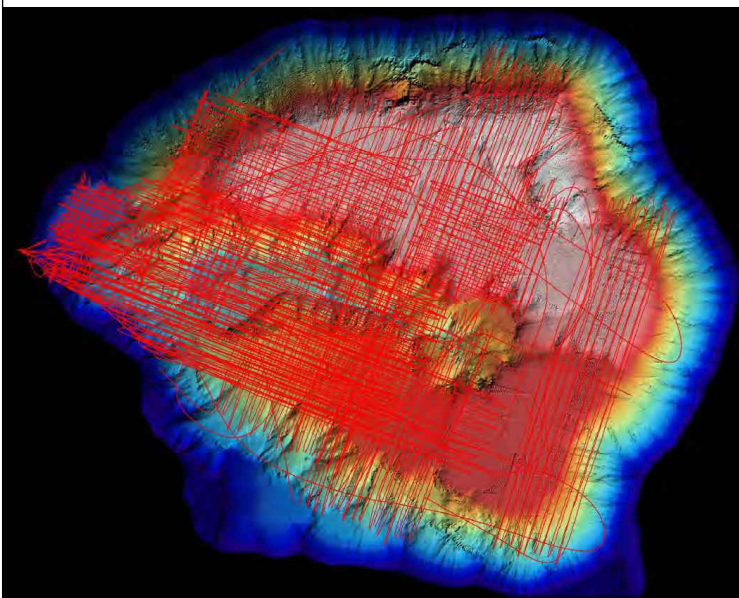
8 cores
with 70,5 m total length



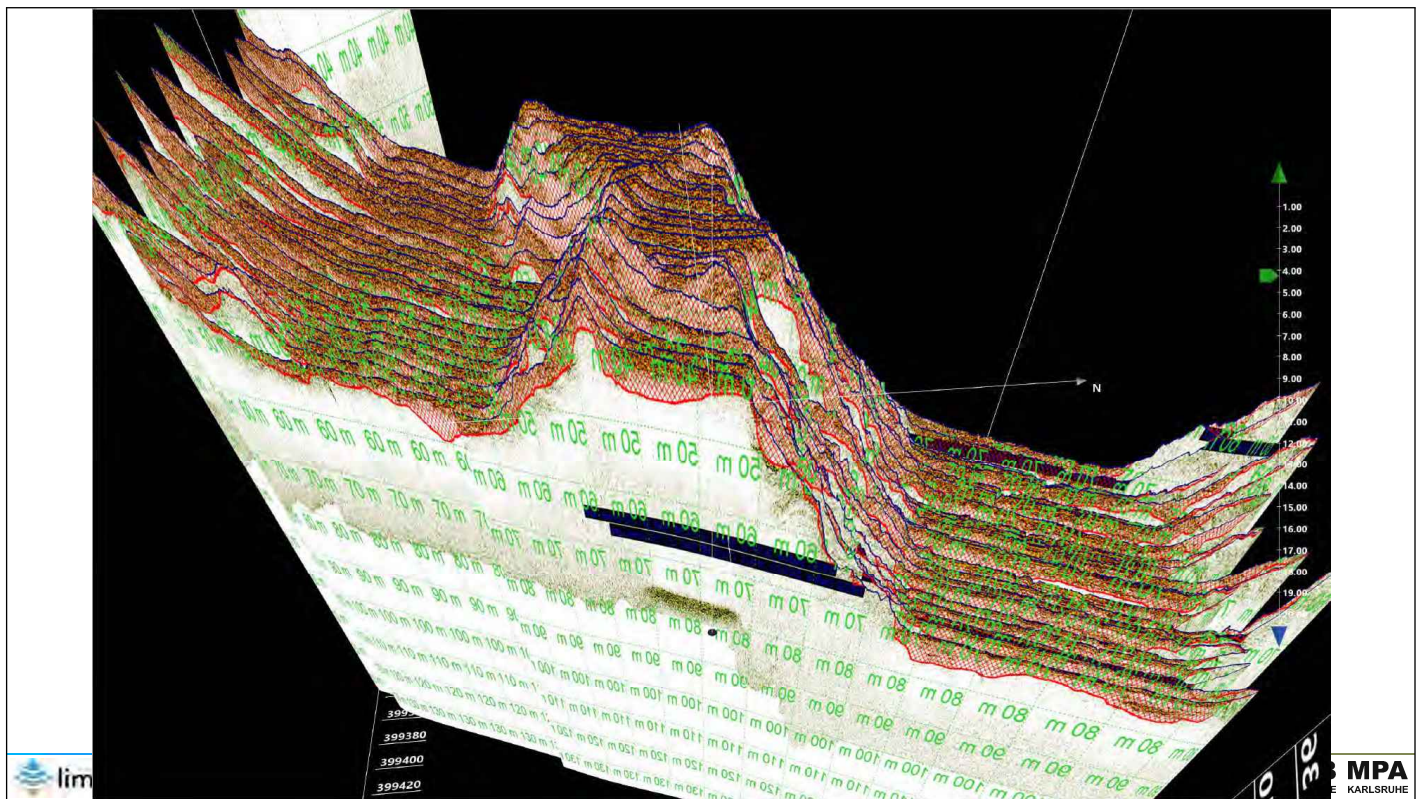
Sediment Cores



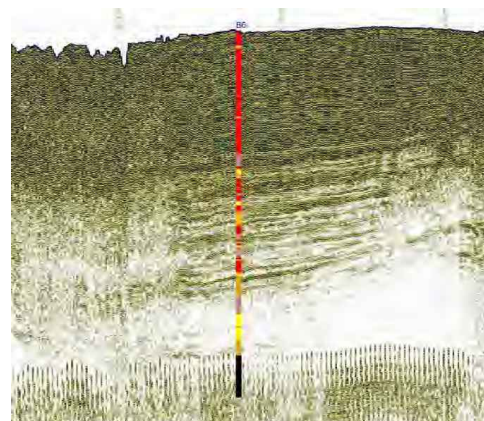
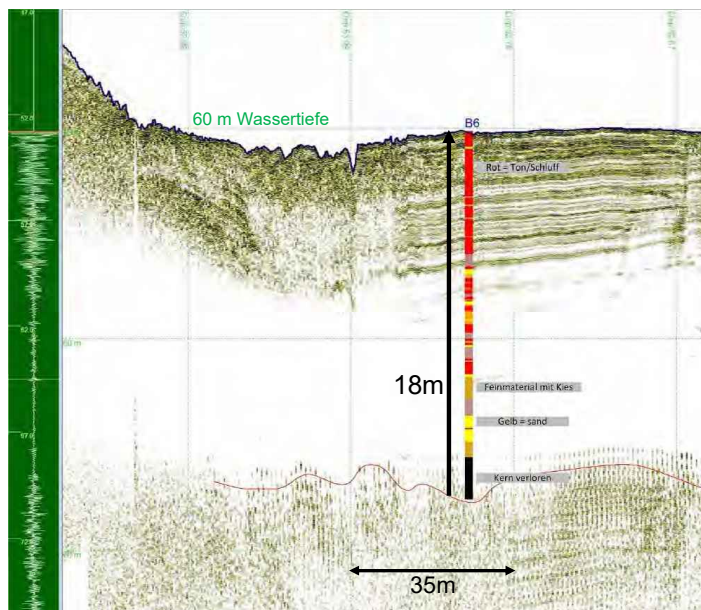
Drone Results



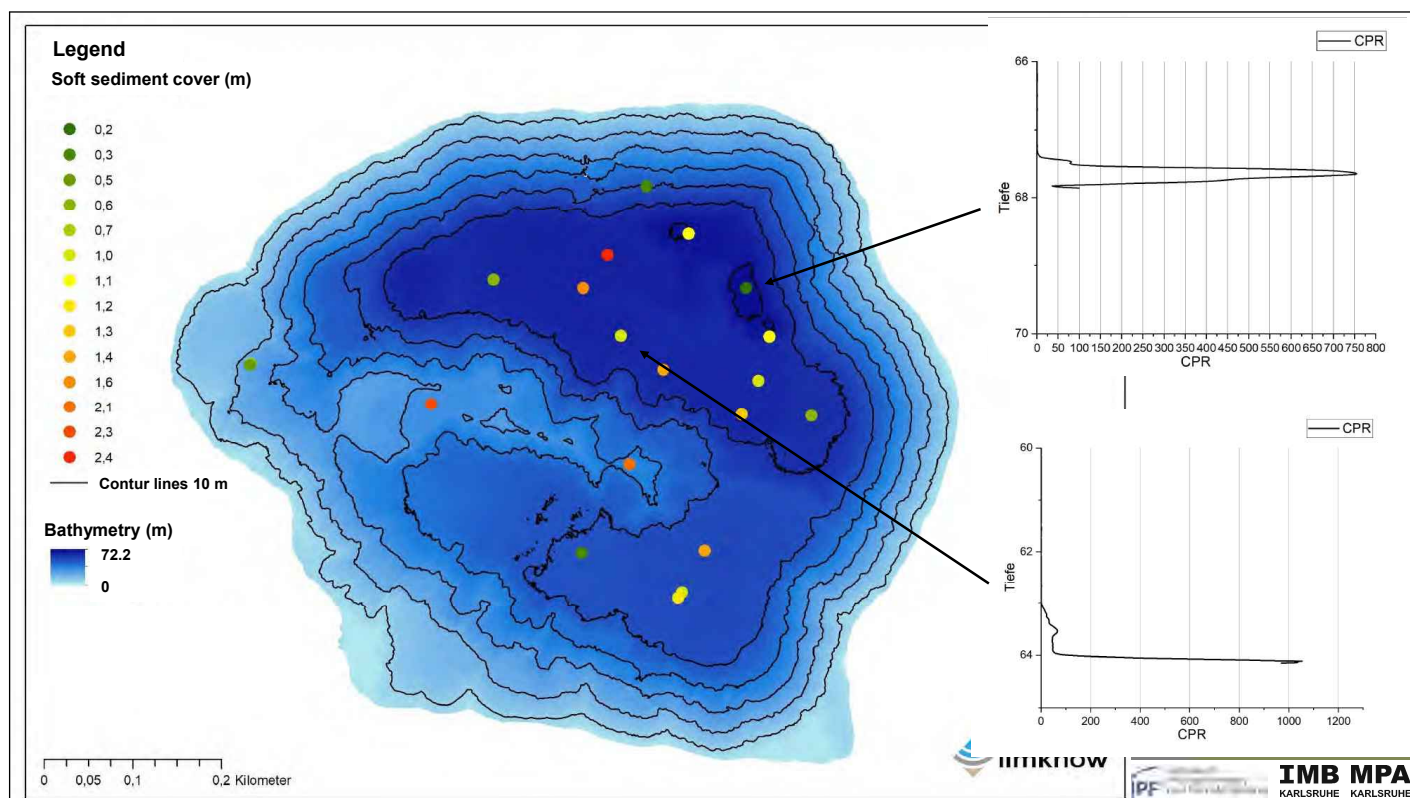
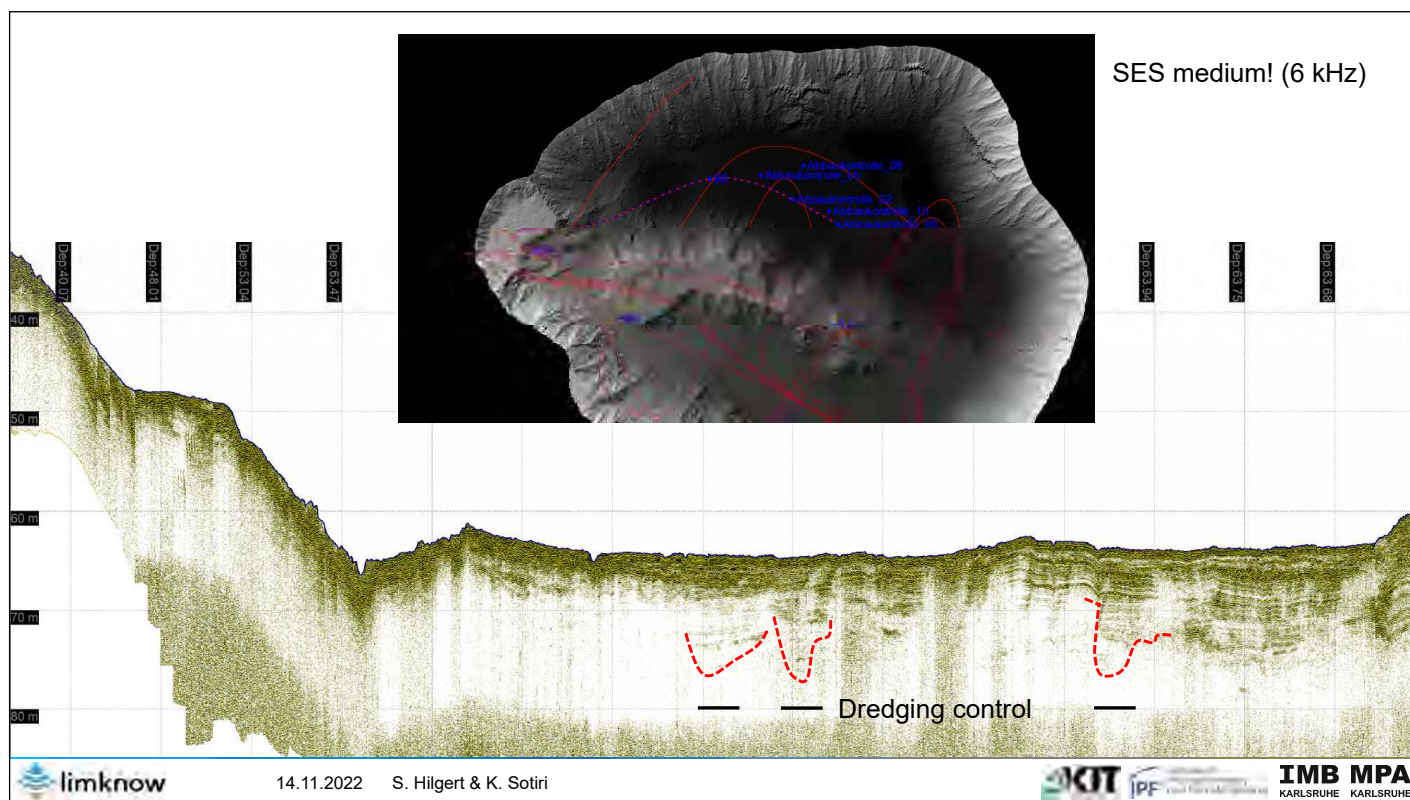
- More than 180 km seismic profiles
- 5 m line spacing
- Penetration up to 30m
- Sediment overlay >25m detected

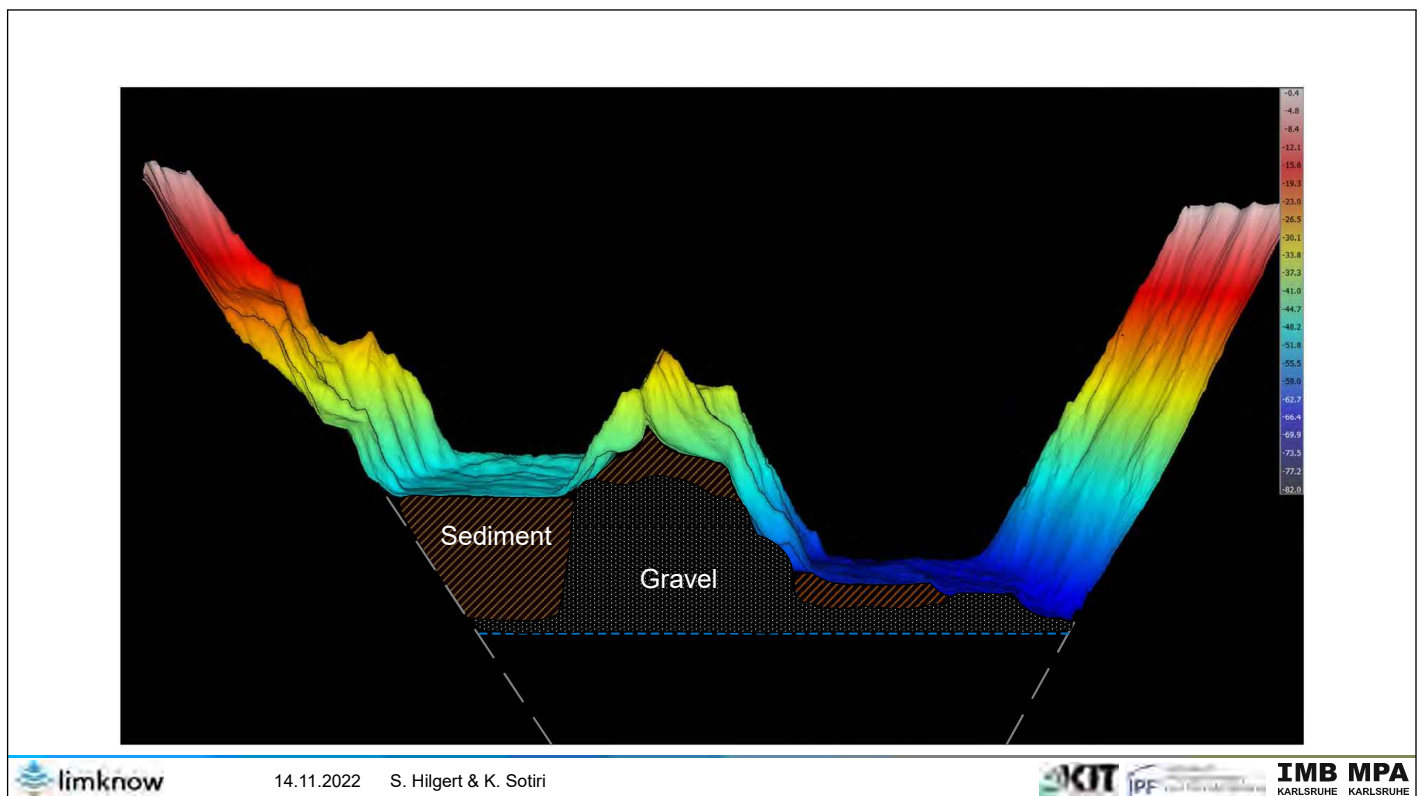
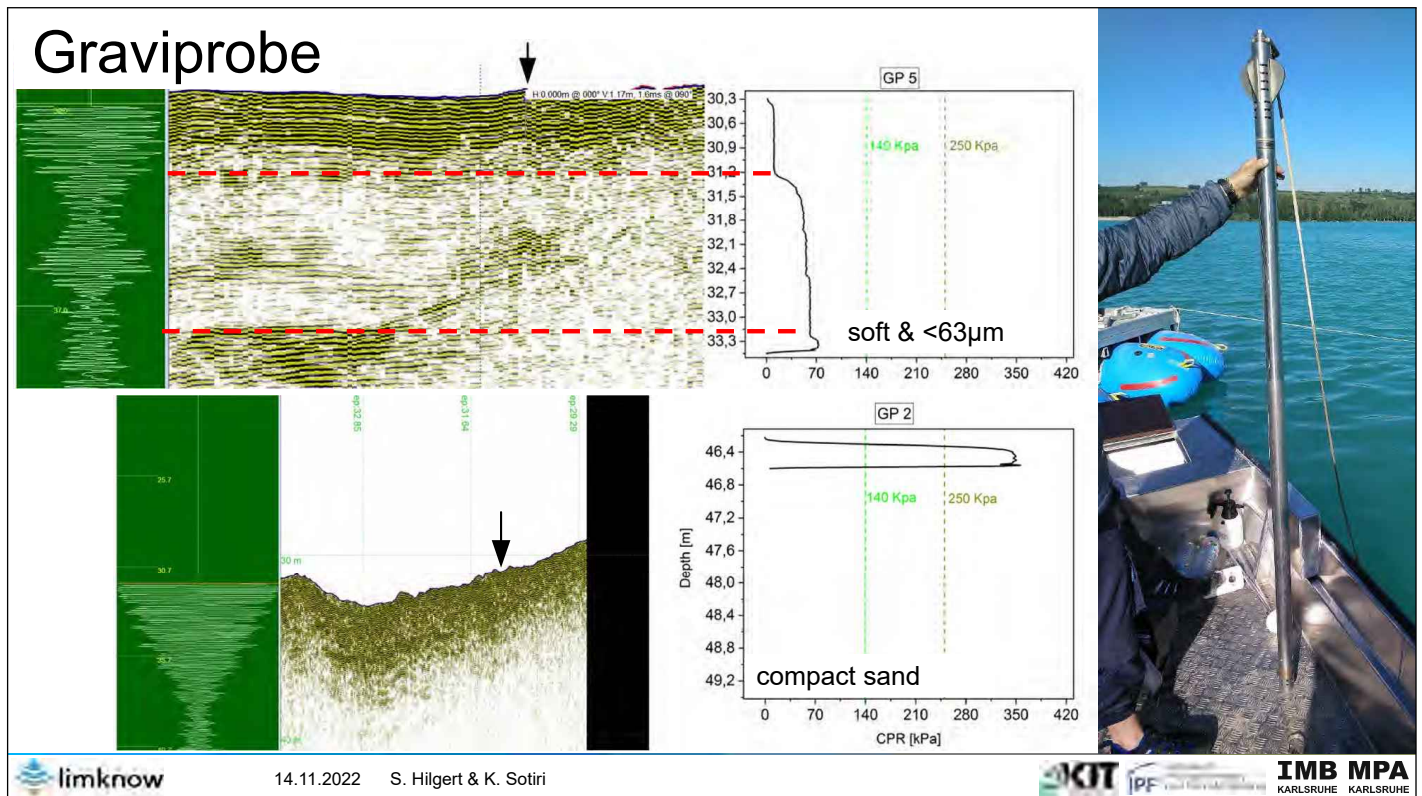


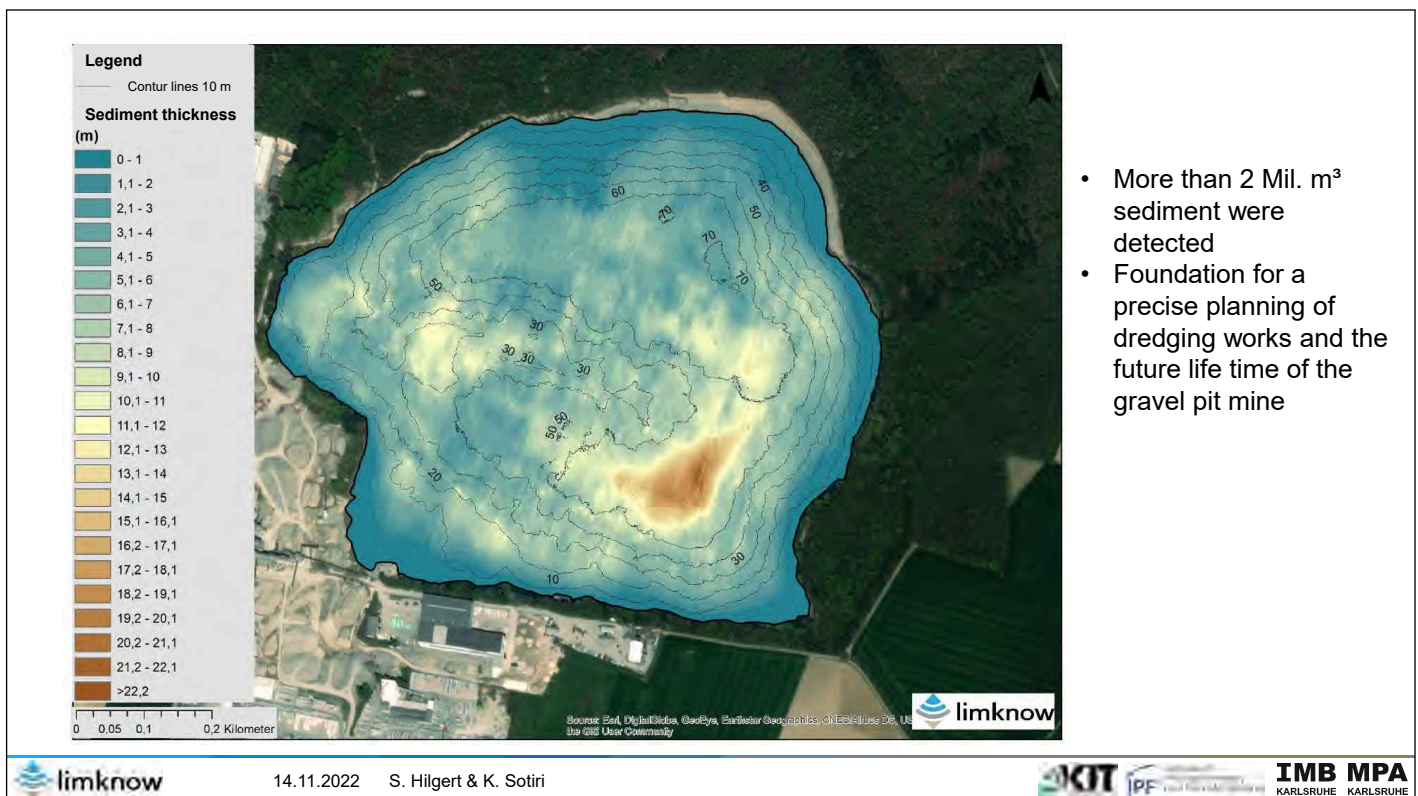
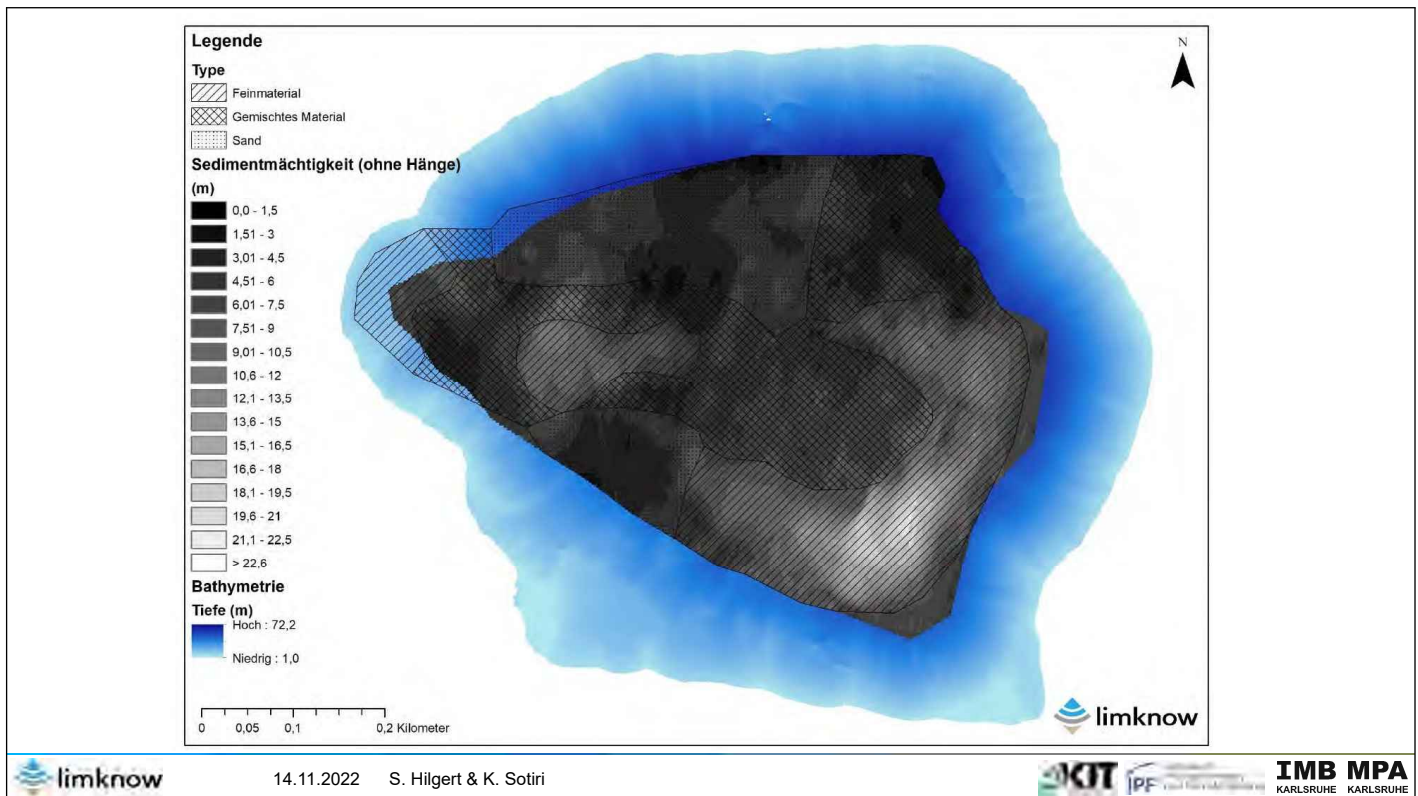
Cores vs. Seismic



SES medium! (6 kHz)







Outlook

- Further fine tuning in the seismic data processing
- Improvement of the spatial data through AI
- 3D-Interpolation
- Better separation between gravel-sand-fines
- Follow up research project (submitted)

Thank you for
your attention!



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