



## **Combination of geophysical and geotechnical Methods for the hydrogeological Characterisation of the near Surface**

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A detailed knowledge of subsurface structures (including geometry and relevant parameters) and processes is an important prerequisite for the understanding and the solution of different environmental and hydrogeological problems. Problem examples include - but are not limited to - the management of water resources, the management of contaminated megasites, and the geotechnical evaluation of building ground.

For example for new constructions or reconstructions, a complete description of the ground is needed including the site history and long-term loads the soil was exposed to (e.g. consolidation, creeping, maturing). In this context, the prediction of ground deformation is one of the most important topics in geotechnical engineering, where the prediction requires the knowledge of soil stiffness. In most cases local site tests such as Cone Penetration Tests (CPT) and load bearing tests as well as laboratory tests are used to estimate stiffness. An alternative for a spatial continuous characterization of the subsurface is the use of geophysical methods. The best exploration results can be expected from the combination of seismic methods with local geotechnical tests, borehole measurements and laboratory investigation of soil samples.

Within the presented project high resolution geophysics in combination with "Direct Push" technologies will be developed and refined to estimate the soil stiffness along surface profiles and to characterise the hydrogeological situation. The project also includes technical inventions for a rapid surveying technique and the necessary software

development. Field tests are carried out at known test sites where detailed information about subsurface conditions already exists.

We will present results of measurements for near surface and hydrogeological characterisation with different geophysical methods, e.g. seismics, GPR (ground penetrating radar), DC-geoelectrics in comparison with geotechnical results, e.g. CPT and soil sampling at a field site near Leipzig, Germany. Concerning seismic methods several sources to generate seismic signals are tested to accomplish VSP, refraction seismics and surface waves methods. For the VSP measurements “Direct-Push” technologies are used. A better understanding of the relationship between seismic or other geophysical and geotechnical parameters is an essential prerequisite for the successful application of geophysical methods for construction site characterisations. For this purpose, extensive CPT measurements were done. The results of such an investigation should help to optimise the construction work and to reduce the economical risks, which arise from an incomplete knowledge of the subsurface condition. By repeated application, the investigation technique could be used for the monitoring of time dependent changes of the subsurface during the construction.