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The propagation of acoustic waves to determine the soil strength of arable soils in situ.

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To investigate soil mechanical parameters by acoustic transmission in situ an easily applicable device consisting of a sparker source with good repetition properties and accelerometers with good frequency response was developed. The transducers are installed in boreholes and give the possibility to investigate wave propagation at various depths within a distance of 1[m].

Measurements were performed at several locations with different land use in the Central Plateau of Switzerland. At one location it was possible to detect compacted areas that resulted from trafficking with heavy construction engines. From the field measurements it was possible to obtain values of elasticity M that agreed well with values determined with triaxial testing on undisturbed samples. Measurements with infiltration showed the influence of high water contents on acoustic properties, especially on travel times and amplitudes. The influence of changes of water contents near field capacity was found to play a minor role on acoustic transmission. From the velocities determined in situ it was possible to compute bulk densities of the investigated soils. In order to determine structural parameters of arable soils and to assess the state of compaction this method may open new possibilities.