

Acoustical Imaging; from acoustic field equations to imaging and inversion

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To understand the propagation of acoustic wave fields in heterogeneous media, it is important to have knowledge about the underlying physical mechanisms of these fields. During this course, the acoustic field equations (equation of motion and equation of deformation) will be derived, and it will be shown how the acoustic field is described via a pressure and a velocity wave field. Next, linearized versions of the field equations are used to derive a wave equation for linear acoustics. A similar approach is used to show how the Westerveld equation used for non-linear acoustics may be obtained. Next, different solution methods for modelling acoustic wave fields in heterogeneous media will be explained, as well as the concepts behind Kirchhoff Integrals, Rayleigh I and II, and evanescent waves. Finally, the ideas behind imaging and (non-linear) inversion for quantitative imaging are explained.