

## **Abstract DGG-Tagung, Vortrag**

### **Seismic properties of black shales studied by body wave tomography, surface wave inversion and laboratory analysis**

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Black shales are sedimentary rocks with a high content of organic material, which leads to a dark grayish to black color. Because of their potential to contain oil or gas, black shales are of great interest for the support of the worldwide energy supply. The aim of our work was to localize the Alum black shale layer at the Danish island Bornholm and to characterize this layer seismically. We were especially interested in the compressional to shear velocity ratio of the shallow-lying black shale. The velocity ratio is an indicator for the possible content of oil or gas. Two active seismic experiments were carried out in October 2010 and June 2012 at three crossing profiles using two types of sources (weight drop, mini-vibrois). All profiles were located as near as possible to an existing scientific borehole leading to correlation possibilities. Additionally, borehole samples were available for the velocity analysis at a laboratory scale. The high quality data of the weight drop experiments were used for a travelttime tomography to obtain P-wave velocity models. The final tomography models are in good correlation to each other, although they have been obtained independently. The Alum black shale layer appears as a low velocity layer between limestone on top and a sandstone layer beneath the black shale. The comparison with the borehole information at the study area gave a good agreement of sonic log velocities and tomographic models. The mini-vibrois data are influenced by strong occurrence of surface waves. We analyzed the Love waves of the SH recordings of one seismic profile to estimate the S-wave velocity model and to calculate the velocity ratio. In the laboratory studies, the black shale samples appeared to be highly anisotropic, especially the P-wave velocity and the  $v_P/v_S$  velocity ratio.