

Determining the seismic sound velocity from first arrival tomography of MCS data within the Olga Basin (Northern Barents Sea)

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The Olga Basin is located in the northern Barents Sea, approximately 300 km southeast of Svalbard. Its Cenozoic history is characterized by significant uplift and subsequent erosion. As a result folded and faulted sediments of mainly Mesozoic and Paleozoic age are forming the recent seafloor. The Olga Basin is defined by a depression of the Mesozoic and Paleozoic sediments. Because of the Cenozoic erosion the folded sediments crop out at the seafloor in a circular pattern. This formation history led to a lateral sequence of out-cropping horizons of different age and likely of different seismic v_p velocity. In 2015 BGR carried out a 2D multichannel seismic survey aboard the research vessel OGS Explora in the course of the Panorama project. During the multichannel seismic data acquisition in the area of the Olga Basin with a 3600 m long seismic streamer cable we were able to record streamer refractions from several layers within each shot. By means of first arrival tomography of the recorded refractions we were able to resolve the velocity distribution in high resolution and accuracy. Because of the shallow seafloor in addition with the high velocities of the surficial sediments the conventional stacking velocity analysis is affected by the significant NMO stretch. Thus, the results of the tomography are an asset to the conventional stacking velocity analysis by combining the reflected and the refracted information in each shot. The observed v_p velocities are generally high, in the range between 3000 and 4000 ms^{-1} . The younger sediments of the Jurassic formations show in general higher v_p velocities in comparison to the older Paleozoic sediments that crop out at the seafloor. This could be explained by higher amount of faults within the Paleozoic sediments.