Geophysical Research Abstracts, Vol. 7, 01869, 2005
SRef-ID: 1607-7962/gra/EGU05-A-01869

A 2.5D Kirchhoff depth migration applied to OBH/S time sections from the Sorokin Trough in the Black Sea prior to a 3D tomography

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Geoscientific investigations were performed as a part of the MARGASCH project during a cruise with the german research vessel METEOR in the Black Sea in 2001. The goal was to quantify the distribution and the structure of gas hydrates and to relate them to fluid migration zones in sediments. The target area of this study lies in the Sorokin Trough, which is located south-east of the Crimea peninsula. This region is affected by compressional tectonics, which leads to diapiric compressional structures in the sediments where fluids and gas migrate to the seafloor.
This study focuses on a 3D grid of high resolution seismic measurements. The study area extends to 7km x 2.5km, where 10 Ocean Bottom Seismometers (OBS) and 4 Ocean Bottom Hydrophones (OBH) recorded the seismic signals generated by two 1.7l GI-guns with a shooting rate of 10s.
A 2.5D Kirchhoff depth-migration applied to the OBH/S time sections (common receiver gathers) gives a spatial image of the subseafloor. The image comprises reflectors, which are at a maximum depth of 1000m and a maximum distance of 400m to the receiver at the seafloor. To obtain the depth image of the entire profile, all OBH/S sections along one transect are superimposed. The resulting image shows strong lateral variations in the reflection patterns: parallel sedimentary layers to a maximum depth of 1000m below the seafloor occur in the peripheral regions of this 3D research area. The central region of the 3D grid is characterized by blanking and several fault zones dipping in the south-eastward direction. The 2.5D depth-migration across the profiles is the basis for a 3D tomographic inversion.