

Discussion

The new analytical data obtained for the basaltic glasses clearly show a chemical similarity to the composition of group 1 basalts, previously defined for the samples collected during TTR-10 (Fig.2). Major element variation range, previously defined, does not increase when including the samples collected along the segment, leading to the consideration of a major chemical variability in a few square km area, centred on the Lucky Strike Hydrothermal Field.

The range in MgO and in some compatible trace elements (Co, Ni, Cr) concentrations, the variation in Mg, the presence of plagioclase and olivine phenocrysts and the rare earth element (REE) patterns show that the crystal fractionation was involved in the magmatic differentiation processes for each group. However, they do not account for the entire chemical variability among the three Lucky Strike basalt groups.

The Azores mantle plume justifies the general enrichment in incompatible elements of the Lucky Strike segment basalts; however, to understand the reported small scale chemical variations it is necessary to invoke alternative processes such as: melting a small scale heterogeneous mantle or variations in the proportions of melt extracted from different depths in the melt zone (variable mantle temperature and accompanying pressure). The unusual high CaO/Al₂O₃ ratios for the glasses, which are supported by the high Ca content in olivine and with the crystallization of clinopyroxene (low-Al, Cr-diopside) could be explained by a reaction between the melts and a clinopyroxene-rich lithology (wehrlite or clinopyroxenite), or of mixing between melt fractions derived separately from distinct lithologies, including these both types and peridotite (Kamenetsky et al., 1998).

The identification of an evolution trend in the collected hydrothermal slabs, in terms of texture and mineralogy (increasing in the silicification degree, hardness and sulphide content) is matched by a clear chemical variation, leading to the formation of rocks most entirely made up of SiO₂ (65%) and Al₂O₃ (19%), with total absence of MgO, CaO, MnO and P₂O₅, and with Cu content higher than 6,000 ppm. This variation might reflect different degrees of cation exchange between the hydrothermal fluids and the existent basaltic basement. The same chemical effect is visible on the grained structured volcanoclastic / hyaloclastic material characterised by a significant increase in SiO₂, Na₂O, Ba (>3,000 ppm), Cu and Zn contents, and a progressive decrease in MgO, TiO₂, Al₂O₃ and CaO.

References:

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STRUCTURE AND PHYSICAL PROPERTIES OF THE SEDIMENTARY SEQUENCE IN THE SOROKIN TROUGH (NE BLACK SEA)

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New results from refraction and reflection seismic studies in the Sorokin Trough (NE Black Sea) which were carried out during the M52/1 MARGASCH cruise of R/V *Meteor* are presented to discuss the deep structure and velocity distribution within the sedimentary sequence.

Profiles 01 and 02 are crossing profiles and located over Kazakov and Odessa mud volcano. The profiles were shot using two 32 l Bolt airguns every 60 s. OBH 12-15 are located on

profile 01 and OBS 01-10 and OBH 11 on profile 02. OBS 08 is located on top of Kazakov mud volcano and the intersection point of the two profiles. Profile 01 is located within the topographical smooth area of the Sorokin Trough and therefore should provide background information about the regional sediments and upper crust. Profile 02 crosses the 200 m high Kazakov mud volcano and continues to the NW across the SE-NW trending chain of mud volcanoes. All 15 instruments were deployed with variable spacing from 1 nm up to 2 nm. The total length of profile 01 is 35 km and of profile 02 is about 60 km. All OBS and OBH data were processed using standard processing on board. With forward modelling a two-dimensional velocity depth distribution was developed independently for both lines. These results were based on both the wide-angle observations and near vertical events.

The SW – NE trending profile 01 was used as background information. The main attention was paid to the interpretation of the NW - SE trending profile 02. Nine seismo-geological units from Quaternary to Low Cretaceous were described within the model. The velocity characteristics of these units were compared with those which were previously suggested in this region using the MCS data.

Along this profile velocities from 1.5 to 2 km/s were interpreted down to about 1 km below seafloor. Although the refraction horizons were modelled parallel to the seafloor a distinct separation between northern and southern part of the section could be developed in terms of slightly increasing velocities to the south. These observations continue within the deeper layers which were formed by velocities from 2.4 km/s to 4.3 km/s covering the depth range from 2.2 km to 8 km depth. Further down the velocity distribution is homogeneous throughout the profile. Values increase from 4.1 km/s at 6.5 km depth to 5.8 km/s at 13 km depth. These deeper horizons show a slight uplift in the southern part of the profile correspondent to the Tetyaev rise. Local uplifts of the reflection horizons were observed under the mud volcanoes as well.

EVIDENCE OF STRUCTURAL CONTROL ON THE MUD VOLCANISM IN THE GULF OF CADIZ. RECENT RESULTS FROM THE TTR-12 CRUISE

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The Gulf of Cadiz is situated in a tectonically very active region, in a complex setting near a major plate boundary characterized by a combination of important strike-slip movement (along the Azores-Gibraltar fracture zone) and compressional tectonics related to the Africa-Eurasia NW-directed convergence. This area is characterized by extensive mud volcanism, pockmarks, mud diapirism and carbonate chimneys related to hydrocarbon rich fluid venting. A large mud volcano field, first interpreted on side-scan sonar imaging and later confirmed by coring, was discovered in this area in 1999, during the TTR-9 cruise. Since then, this area has been intensively investigated by single channel seismics, long range and deep-tow sidescan sonar, underwater TV, multibeam bathymetry, dredging and coring. The mud volcanoes are located at water depths between 700 and 3,500 m, with a diameter that can reach more than 4 km and whose height can reach a few hundreds of meters. Gas hydrates have already been recovered from 3 mud volcanoes.

During the TTR-12 cruise, several single channel seismic lines were collected in this area, complementing an already fairly extensive database of seismic lines, both single channel and multichannel. These lines have been preliminary processed on board and later re-processed onshore to enhance the deeper structure.