Chemical Architecture of a Submarine Slope Channel Complex Outcrop, Tabernas Basin, Spain

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The chemostratigraphic approach has been applied to well-known outcrops of a Miocene submarine slope channel system in the Tabernas Basin of southern Spain. These successions represent analogues for hydrocarbon-bearing reservoirs originally deposited as deepwater channels. The studied channel complex is composed of several individual channel units, which exhibit an overall thickness of >40m. They consist of sandy conglomerates, breccias and coarse and medium grained sandstone being products of debris flows and high-concentration turbidity currents, together with sandy mudstones. The channel complex can be traced over several kilometres, although it becomes less confined in a down flow direction.

The study investigates the relationships between the chemical and mineral stratigraphy based on the element and mineral distributions, and the known physically mapped correlation of logged profiles. Sandstone and mudstone samples from vertical sections in the different channel units have been analysed using element geochemistry, mineralogy and petrography. Chemical data have been obtained by ED-XRF analysis, with 10 major elements, 33 trace elements and 14 rare earth elements being determined. XRD analyses were employed to determine the whole rock mineralogy of samples. Petrographical data were obtained by thin section analyses.

The individual channel units can be distinguished from the chemical data. The stratigraphic variations in elemental concentrations have been compared to variations in the mineralogical and petrographic data. The results allow an interpretation of the chemical signatures with regard to provenance evolution and differences in the depositional conditions of the channel complex.
The findings demonstrate that the chemical-stratigraphic approach can provide a framework for the subdivision and comparison of sedimentary successions. The chemical based distinction of the individual channel units furthermore provides a chemical-stratigraphic profile, which is likely to be broadly consistent over a relatively large distance and to be maintained down the paleoflow direction of the channel complex.