Coal seams, coarse-grained channels and a lacustrine delta: A lesson in alluvial depositional dynamics (Junggar-Basin, NW-China, Upper Triassic).

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In the Haojiagou valley (40km W of Urumqi, Junggar-Basin, Xinjiang, NW-China) a fluvial to deltaic succession of the Middle Triassic Huangshanjie and the Upper Triassic Haojiagou formation is exposed. The sedimentary inventory comprises gravely channel bodies, sheet like sandy and clayey units, as well as ferrocrete horizons and coal seams. Literature suggests that the whole section is related to a huge lake in a broken foreland basin of the ancestral Tian Shan.

A broad spectrum of different lithofacies types and architectural elements is recognized and related to four principal depositional environments: the lacustrine delta slope with turbiditic features, delta front and lakeshore, the coastal backswamps and the distal alluvial plain fed from a near hinterland. Depositional dynamics show an overall progradational trend of the alluvial plain resulting in a landward stepping of the section. Preservation potential is preferentially good in such a palaeogeographical position and suitable exposures make the section a natural laboratory.

Statistical evaluation of channel body size, geometry, interconnectedness and stacking patterns was done at a 600 m thick and 1 km wide two-dimensional section, which was composed from hundreds of small scale outcrop photos with a spectacular mounting and photo-surveying technique. In addition, 1.4 km of detailed lithological section was logged, accompanied by 4500 gamma ray measurements. This dataset show best the stacking patterns of the sedimentary architecture as a proxy for regional sequence stratigraphic cycles. Depositional trends show a clear four-fold hierarchy, while only the macro- and overall scale reveals sequence stratigraphic relevance. Micro- and meso scale cycles are likely to be governed or masked by autocyclic processes.

It could be demonstrated that gamma log interpretation cannot be done in a standard way, as there were recognized many unusual and misleading log shapes. An outcrop control is essential to detect the exact position, thickness and make up of the lithofacies. Additionally we attached porosity and permeability measurements to the rock types.

This data set may be used as an outcrop analogue. All kind of data gained from this easily accessible large scale outcrops can be transferred to inaccessible but comparable subsurface areas where less information is available or interpolation schemes for existing data sets are needed. Our research results are highly valuable to establish time lines at a regional scale and for prediction of facies transitions, geobody architecture and their petrophysical properties.

In particular, this is important as in some areas of the Junggar-Basin these units act as prominent hydrocarbon reservoirs and seals. Also, the up to 10m thick coal seams play an important economic role, so the study is planed to act as a basic reference for further investigations and facies predictions in the area.