

rocks of Ca-alkaline and K-Ca-alkaline compositions. The modal, lithic grains and pebbles composition of the Val Gardena sandstone and conglomerate support such interpretation.

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Fans in the NE - Tauern Window (Austria)

SLACZKA, A.* & HÖCK, V.**

*Geological Institute, Jagiellonian Univ. Cracow, Poland, ** Institute for Geology, Univ. Salzburg, Austria

The northeastern end of the Penninic Tauern Window between the Fusch valley in the west and the Kleinarl valley in the east is built up by a variable sequence of rocks. In the north the dominating rocktype is the Klammkalk, an elongated body, thick in the east up to at least 1000 meters; it thins out dramatically between Rauris valley and Fusch valley. Within the Klammkalk, but increasing towards the south, intercalations of black and green phyllites are common. Between Kleinarl valley and Rauris valley there is a large, approximately up to 1000 m thick intercalation of black phyllites, quartzitic schists and finegrained breccias, separating a thinner southern layer of Klammkalk from the thicker northern layer. South from the main body of Klammkalk the rocks are dominated by lens-like dolomite breccias, black phyllites, chlorite-quartz-schists and last not least turbiditic sandstones with phyllites. The dolomite breccias and complexes of turbiditic sandstones form also elongated lenses several kilometers long. The southern continuation is built up by black phyllites.

The age of the whole sequence is still debatable. Finding of scarce crinoids (not determinable) in Klammkalk suggest Jurassic to Lower Cretaceous age. From black phyllites associated with the southern Klammkalk and black phyllites associated with the southernmost quartzites and breccias spores of Early to maximum Middle Cretaceous age were described.

Our investigations concentrated on the lens-shaped dolomitic breccias and the turbiditic sandstones. The breccias form several individual lens-shaped elongated layers, which merge in the vicinity of the Großarl valley into one relatively thick breccia complex. The individual layers consist of several thinner beds usually up to 50 cm in thickness. The boundaries are generally flat but are occasionally uneven, probably representing channelfills. In some cases beds are contorted, that could be best explained as effect of syndimentary slumping or sliding. Most of them are matrix supported breccias and display a gradation. As a conclusion we assume on the base of the observed structures that rocks represent massflow deposits and created a local channelized submarine fan. The dolomitic breccias are concentrated in the east, between the Kleinarl valley and the Gastein valley, farther to the west they occur also. However, they create only local lenses becoming smaller towards the west, but locally increasing again. Complimentary with the decrease of the breccias towards the west we observe an increase in turbiditic sandstones. They vary from generally medium bedded to thick bedded. Quite often the clastic layers display a sharp, uneven lower boundary with small, broad channels and the gradate upwards into mudstones. Some of the beds display a gradation of grains. In many cases it is possible to detect an original upright position. In some cases we observed bottom current structures such as flood marks and dragmarks (PREY 1975, 1977). The current structures suggest a source area to the SW.

A similar lens-like distribution of dolomite breccias with also similar internal structures can be observed in the Matrei Zone

between the Matreier Tauern valley in the west and the Leiter valley in the east. They are in analogy to the breccias in the northern part again intercalated by black phyllites. Turbiditic sandstones were not found until now, but in comparable position chlorite bearing quartzites occur highly folded and recrystallized. HÄUSLER (1988) described from the Hippold nappe and the Radstadt nappe very similar lithologies and structures, which he interpreted as fans.

Our findings suggest that the clastic sediments in the northeastern Tauern Window formed along a large passive continental margin to the south of the Penninic Zone, which was the deposition area of the Northern Calcareous Alps and of the Lower Austroalpine deposits of the Radstädter Tauern: This margin was dissected by large listric faults forming local extensional basins separating various swells and eventually flooded by oceanic crust (e.g. Reckner, Matrei Zone). On both sides of the Tauern Window one can find big, often elongated blocks of dolomite and limestone. At least a part of them represent olistolites derived from the southern carbonate platform of the Northern Calcareous Alps. The clastic fans were probably supplied from uplifted and tilted blocks from the same area. In that time the basinal, pelagic or hemipelagic sediments were represented by the black shales and sandy marls.

Reservoirqualitäts-Vorhersage im nordwestdeutschen Rotliegenden

SOLMS, M.*, STRAUSS C.***, GLOVER, B.W.*** & KELLY, S.***

*Solms Geological Consultant (SGC), Lehrte, **BEB Erdgas & Erdöl GmbH, Hannover, ***Shell Exploration and Production, Aberdeen, U.K.

Schlechte Reservoirqualität (R●) ist häufige Ursache für Fehlbohrungen im nordwestdeutschen Rotliegenden. Innerhalb maturaer Kohlenwasserstoff-Provinzen wie dem nordwestdeutschen Rotliegend-Becken ist es deshalb zwingend notwendig, existierende Modelle und Strategien so weiterzuentwickeln, um Risiko und damit auch die Kosten bei der Erschließung des Restpotentials zu minimieren. Das Poster präsentiert 2 Play-Modelle und zur RQ-Vorhersage im nordwestdeutschen Rotliegenden:

1. Das „Paläocharge-Retention-Modell“: Während primäre Lithofazies lediglich die Ablagerung eines potentiellen Netto-Reservoirs bestimmen, wird die Erhaltung des Porenraums durch quasi-Inhibierung schädigender diagenetischer Prozesse innerhalb der KW-Säule eines Paläofeldes kontrolliert. Das vorgestellte Modell erklärt die Entfärbung primär rot gefärbter, gut sortierter Sandsteine im NW-deutschen Rotliegenden durch KW-induzierte Fe³⁺-reduktion, oft verbunden mit Erhaltung des fröhdiagenetischen Tonminerals Chlorit. Der Übergang zwischen grauen Sandsteinen und roten, hämatitischen Sandsteinen ist oft stratigraphisch diskonform und mit einer RQ-Verschlechterung verbunden. Reservoirbereiche mit Chloritdiagenese sind i.d.R. durch eine horizontale Grenze von unterlagernden illitisierten Abfolgen abgetrennt. Die Übergangszone beider Bereiche ist durch Chlorit/Illit-Vergesellschaftungen repräsentiert. Die meisten Sonden des nördlichen Fairways produzieren aus chloritischen Graufolgen. KW-Remigration/ Leakage führt dagegen zur diagenetischen Schädigung ehemals gasgefüllter Träger, oft verbunden mit intensivem authigenen Illitwachstum.

Wichtige Faktoren der RQ-Vorhersagestrategie im durch das „Paläocharge-Retention-Modell“ beschriebenen Play sind ein möglichst exaktes 3D-Abbild von Temperatur- und Charge-Geschichte, verbunden mit fundierten Vorstellungen zur Strukturbildung des Prä-Salinars. Eine geostatistische Permeabilitätsvorhersage (aus seismischen Attribut- oder Impedanzkarten) ist daher nur unter Einbezug der Paläocharge-relevanten Daten aus Referenzbohrungen sinnvoll.

Die Gültigkeit der im Modell beschriebenden Kontrollfaktoren beschränkt sich auf alle Träger, die im grundwasserkontrollierten Milieu eines flexurell absinkenden Beckens abgelagert wurden. Dies gilt für alle Sandsteine der Hannover-Wechselfolge und für einen Großteil der Dethlingen-Formation im nördlichen Beckenbereich.

2. Das **„Framework Cementation Modell“**: Bei diesem Modell wird die Reservoirqualität im wesentlichen durch bestimmte textuelle Merkmale (z. B. Korngröße, Sortierung etc.) innerhalb trocken äolischer Lithofaziestypen kontrolliert. Es existieren direkte Beziehungen zwischen Fazies, Diagenese, Petrophysik und seismischem Abbild. Diese Beziehung wird über frühdiagenetische Zementation des Porenraums durch gerüststabilisierende Zemente (z. B. Karbonat) realisiert. Die Gerüstzemente schützen den intergranularen Porenraum gegen Kompaktion und Tonmineralneubildung und können durch CO₂-saure Wässer im Vorfeld junger Chargephasen gelöst werden.

Hauptbestandteil der RQ-Vorhersagestrategie im beschriebenen Play ist eine möglichst hochauflösende Kartierung der Reservoirfolgen im Impedanzvolumen einer seismischen Inversion. Dabei ist eine exakte Kalibrierung mit den Abschnitten optimaler Reservoirausbildung in Referenzbohrungen unumgänglich.

Die Anwendung des Modells bezieht sich auf alle oberhalb des Paläo-Grundwasserspiegels abgelagerten Reservoirfolgen mit lateral wechselnder Geometrie. Dies gilt für alle Hauptreservoirs der südlichen Grabenränder sowie die Sandsteine der Mirow-Formation und die tiefsten Teile der Dethlingen-Formation in den Grabenzentren. Die markante Faziesbindung petrophysikalischer Eigenschaften sowie eine häufig sehr einfache Lithofaziesvergesellschaftung erlauben in diesem Play eine Faziesvorhersage über seismische Klassifikation.

Synorogenic deposition of turbidite fans in the Central-Carpathian Paleogene Basin: evidence for and against sea-level and climatic changes

SOTAK, J.* & STAREK, D.**

*Geological Institute, Slovak Academy of Sciences, Severná 5, 974 01 Banská Bystrica, Slovak Republic, **Geological Institute, Slovak Academy of Sciences, Dubravska cesta 9, 842 28 Bratislava, Slovak Republic

The Central-Carpathian Paleogene Basin (CCPB) was formed as a marginal sea of Peri-Tethyan basins. It shows a fore-arc basin position developed on the destructive plate-margin and in the rear of the Outer Carpathian accretionary prism.

The CCPB has undergone two third-order cycles of initial transgression (TA 3.5 - 3.6 sensu Exxon's cycles), that was followed by two second-order cycles of deposition (TA4 and TB1 sensu Exxon's cycles). The initial transgression was preceded by deposition of alluvial-fan and delta-fan sediments. Upper Lutetian transgression in the CCPB led to shallow-marine deposition of nummulitic banks developed in two 3rd order cycles. The nummulitic cycles of the CCPB disappeared due to the inversion of the Middle Eocene warm climate in the beginning of the TA4 supercycle. Climatic changes culminated in the "Terminal Eocene Event", which corresponds to the global cooling and glacio-eustatic regression. Consequently, the extensive carbonate deposition on broad, warm shallow shelves was replaced by terrigenous sedimentation on bypassed shelf areas. The sediments from above the nummulitic limestones are depleted in CaCO₃ and enriched in organic matter. They contain an abundance of cool-water coccoliths (e.g. *Isthmolithus recurvus*, *Zigrablithus bijugatus*), diatom oozes (Menilites) and Globigerina-rich fauna (Globigerina Marls). The small-scale intercalation of non-calcareous black shales and Menilites with Globigerina Marls indicates a short pulse of the high carbonate productivity during the terminal Eocene fertility

crisis (precessional cycles).

Climatic control of depositional changes in the CCPB became less significant in time of forced regression, even when the Globigerina Marls still recorded the sea-level and CCD fluctuations in the Sambron Beds (e.g. the CCD drop in the Eocene/Oligocene boundary). The falling stage of forced regression is recorded by a Type-1 sequence boundary on shelves (between carbonate platform deposits and overlying formation), which were eroded by fluvial channels entering the basin through marginal delta-fed fans. During this time, the basinal slopes were actively tilted and incised by submarine valleys, which fed the basin-floor and slope fans. The Sambron Fan (like as Tokaren, Szaflary and Pucov Fans) represents a lowstand system tracts consisting of canyon-fill, spillover and mass-failure deposits.

The TA4 supercycle tended toward the gradual rise of relative sea level during the Early Oligocene. Successive formation of the CCPB (Huty Fm.) corresponds to transgressive and highstand system tracts. The transgression is marked by ravinement surfaces detecting between Eocene Nummulitic banks and Middle Rupelian sediments of NP 23 Biozone. Basal sediments of the transgressive formation still show the cool-water influence, salinity decrease and semi-isolation, as indicated by wetzeliellacean dinoflagellates, imprints of diatoms, brackish nektonic fish and ostracods. Higher in the section, the carbonate-free sequence reveals the first pulses of nannofossil blooms, characterized by reticulofenestrids of NP 23 Biozone, which became flourished due to sea-level rising and renewed circulation. The Lower Oligocene transgression rose up to highest sea-level in time of 32 Ma, which restored the Paratethyan circulation. Consequently, the CCPB became reoxygenated increasing in carbonate precipitation, productivity, fertility, etc. (calcareous claystones, abundance of cyclicargoliths, oxygen-related ichnocoenosis). Maximum flooding of this sequence falls into the condensed horizons of manganese layers. Late highstand of this formation is evidenced by small-scale progradational events and megaturbidite beds.

The TB1 supercycle was introduced by the Intra-Oligocene regression in time of about 30 Ma (distinctive drop in sea level related to the Antarctic glaciation and cooling of the Northern Hemisphere). The falling stage of the Late Oligocene regression in the CCPB is expressed by an offlap break of prior highstand sediments in the upper fan zones (e.g. eroded Mn blocks in conglomerate-slope accumulations) and related correlative conformity between mud-rich fans (Huty Fm.) and sandy-rich fans (Zubrec and Biely Potok Fm.). The sandy-rich deposition of the CCPB lasted till to the Early Miocene, as has been already indicated by some nannoplankton and foraminiferal species (e.g. *Helicosphaera scissura*, *H. kamptneri*, *H. cf. ampliaperita*, *Triquetrorhabdulus cf. carinatus*?). The regression in the CCPB reached the maximum lowstand on the base of the NN2 zone, when the brackish fauna became to appear in the Paratethyan basins (shallow-water brackish dinoflagellates, small gastropods). According to this evidence, the deposition of the Biely Potok Fm. should terminated till to the Early Eggenburgian, i.e. to the lowstand phase at the beginning of the NN2 zone, which preceded the next transgressive cycle TB 1.5 in the Presov Fm.

Fission track dating on clastic sediments of the foreland basin: Implications for the thermotectonic evolution of the Swiss Alps

SPIEGEL, C., KUHLEMANN, J., DUNKL, I. & FRISCH, W.

Geologisches Institut Universität Tübingen, Sigwartstr. 10, D-72076 Tübingen, cornelia.spiegel@uni-tuebingen.de

The clastic sediments of a foreland basin record the exhumation