(vertical and horizontal) analyses as well as comparisons in aspect of the fluid inclusions.

The main idea is to add temperature information to the petrological reconstruction of diagenetic conditions and to trace hydrocarbon migration in the cements discussed.

The present day bottom hole temperature equals in Paproc´ to about 100 °C. Samples come in general from five boreholes from the depths of 2500 - 2800 m being taken, apart from the Rotliegendes, also from the over- and underlying rocks (Zechstein and Carboniferous, respectively). The following types of the Rotliegendes cements have been studied - calcite, -anhydrite, - quartz overgrowths on detrital grains.

Water inclusions occur in general in all the types of cements listed. They are very small (in maximum up to 5 μm), being those mostly of medium salinity and average homogenization temperatures. They are mostly two phase ones, with fairly consistent liquid to vapor ratios. Temperatures obtained in carbonates and anhydrite are comparative in their range to the present borhole values. Quartz rim data are higher. One phase inclusions observed in the upper part of the profile are very small (below 1 μm - 2 μm) or some - in the interval 4 - 8 μm. Only those bigger ones could have been analysed thermometrically. They homogenize at (-104) °C. Raman studies have been done to the selected samples.

The microthermometrical results obtained have been compared with vitrinite reflectance.

Data from the fluid inclusion studies in the Paproc region, being still in progress, represent the first contribution to the reconstruction of the diagenetic history in the area studied.

METAMORPHIC FLUIDS IN THE MEATIQ BASEMENT COMPLEX (EASTERN DESERT, EGYPT): EVIDENCE FOR A "CLOCKWISE" P-T PATH

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The structural and metamorphic evolution of the Meatiq basement complex has been a contentious issue for some time. Two main models involve either the formation of the basement and the covering ophiolite nappes during one orogenic cycle and consequently only one metamorphic event (e.g. RIES et al., 1983), or during at least two orogenic cycles with a polyphase structural and metamorphic history (e.g. EL GABY et al., 1990; WALLBRECHER et al., 1993; NEUMAYR et al.,

1995). In this study, fluid inclusions within the basement rocks of the Meatiq dome are investigated to supplement petrological studies, and the implications on the metamorphic evolution of the terrane are discussed.

Fluid inclusions have been investigated from various basement lithologies including gneisses and garnet-bearing quartz-rich schists at the structurally lowest parts, and metapelites at the structurally upper parts of the basement. Four types of fluid inclusions are present in all lithologies investigated. These are: Type 1) H_2O-$CO_2 \pm CH_4$ (single inclusions, cluster), Type 2) CO_2-$H_2O \pm CH_4$ (trails, cluster), Type 3) $CO_2 \pm CH_4$ (trails, cluster), and Type 4) H_2O (trails). Texturally, type 1 inclusions, which occur in quartz inclusions in peak metamorphic garnet, represent the earliest fluids, whereas Type 2 and 3 inclusions form subsequent metamorphic fluids with increasing CO_2 content with time. Trails of type 4 inclusions crosscut trails of CO_2-bearing inclusions as well as quartz grain boundaries and are interpreted to represent the last fluid generation.

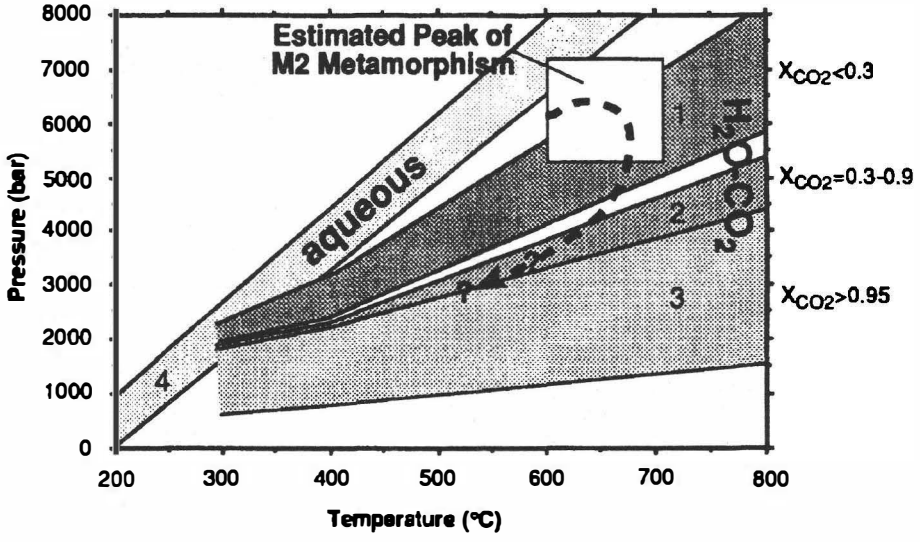

Fig. 1: Isochores for the various fluid types in the Meatiq basement.

Although type 1-3 inclusions have distinctly different CO_2 content, microthermometric data of these inclusions are very similar. Melting temperatures of CO_2 ice for type 1-3 inclusions range typically from -56.6 °C to -57.1 °C and in only one sample up to -57.6 °C which indicates that these inclusions contain mainly CO_2 and only minor other gases, probably CH_4. Clathrate melting temperatures between 7 °C and 10 °C indicate a salt content between 0 and 6 equiv. wt% NaCl for type 1 and 2 inclusions. Homogenization temperatures for the CO_2 phase for most type

1-3 inclusions range from 23 °C to 31 °C. Type 3 inclusions show the lowest bulk densities between 0.5 and 0.75 g/cm^3. The highest bulk densities are recorded for type 1 inclusions in the range of 0.75 to 0.95g/cm^3. Type 2 inclusions are intermediate with 0.65 to 0.85 g/cm^3. Melting temperatures of H_2O for type 4 aqueous inclusions between -5 °C and 0 °C indicate only minor salt components of 0 to 10 equiv.wt% NaCl. Homogenization temperatures range from 150 °C to 205 °C.

NEUMAYR et al. (1995) distinguished a M1 migmatization event, a M2 amphibolite-facies metamorphic event and a greenschist M3 metamorphic event in the basement of the Meatiq dome. Textural evidence suggests that type 1 inclusions represent peak M2 metamorphic fluids. This is supported by isochores which pass through P-T conditions of 600 - 660 °C and 4 - 7 kb which have been estimated for the M2 metamorphic peak (Fig. 1). Type 2 and 3 inclusions represent retrograde M2 metamorphic fluids. The slope of the type 2 and 3 isochores relative to type 1 isochores indicates a clockwise P-T path for the M2 metamorphic event. Type 4 aqueous inclusions may either represent late M2 or, more likely, M3 metamorphic fluids which is supported by steeper type 4 isochores compared to type 1-3 isochores.

In summary, the fluid types in the basement of the Meatiq complex represent dominantly M2 metamorphic fluids and indicate a clockwise P-T path for this event. Textural and microthermometric data for type 4 inclusions are consistent with a polymetamorphic history in the metasedimentary rocks. Evidence for M1 metamorphic fluids has not been detected in the metasedimentary rocks.

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