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GEOCHEMICAL STUDY ON ORGANIC COMPOUNDS OF THERMAL WATERS IN DEEP AQUIFERS OF THE PANNONIAN BASIN

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In previous studies e.g. (Kárpáti et al., 1999, Varsányi et al., 2002) it was concluded, that the chemical composition of thermal water (TW), organic matter included, reflects processes leading to their development. In this study we report data and the concentrations of some major and minor organic solutes in formation waters from different depths and locations in subbasins of the Pannonian Basin (Hungary). The TWs are of the $NaHCO_3$ and $NaHCO_3$–NaCl types. The Pannonian Lake was brackish in the first phase of its evolution but subsequently became a freshwater system. The bulk of the dissolved inorganic carbon has been produced by bacterial and early thermal degradation of the OM The aquifers of 38 TWs studied spread from half to two kilometres of depth in the Pannonian Basin and the majority of the aquifer sediments (33) were deposited in the late Neogene Pannonian Lake, and on the adjacent delta plains and flood plains. Neogene strata are covered by Quaternary deposits (thickness of up to 800 m), which represented by one sample, besides 2 Paleogene and Mesozoic TWs in the series studied. The goal of this research to identify and describe the geochemical characteristics of environment where the aromatic compounds found were generated. In a considerable part of samples the H and O isotope ratios of water and H and C isotope ratios of methane were demonstrated and discussed by Vető et al. (2004).

During this survey the following homologue series identified in the TWs: alkyl-benzenes, alkylthiophenes, tetrahydrothiophene, tetrahydrothiopyrane alkyl derivatives, alkyldihydroindenes, ethylindane, alkylphenols, tetraline and its methyl derivatives, naphthalene and its alkyl derivatives, 1,1'biphenyl and its methyl, ethyl and, hydroxy derivatives, alkylbenzothiophenes, 1,2-dihydroacenaphthylene, dibenzofurane and its methyl derivatives, 9H-fluorene and its methyl derivatives, xanthene, dibenzothiophene and its methyl derivatives, phenanthrene and its methyl derivatives, 9H-carbazole, mono-, ,di- and trimethylcarbazoles, fluoranthene, pyrene, 11H-benzofluorene and fatty acids (over 500 compounds). 14 alkyl-benzenes, 18 PAHs and 16 alkyl- phenols were quantified in TWs.

Generally, in the colder TWs (under 50°C outflow temperature, but, of course, in the case of deeper waters the actual aquifer temperatures may be significantly higher than

measured ones) the aforementioned various compound classes were not detected confirming that these compounds were generated from their precursors during late diagenesis and early catagenesis during continuing burial. The possible source for the compounds observed are humic and fulvic acids solved in the waters or/and the organic matter of the lignite seams occasionally intercalated aquifers. The suggested reaction for generation of the above products is hydrolitic disproportionation of the supposed organic reactants.

The results demonstrate that the appearance and abundance of aromatic hydrocarbons, alkyphenols and fatty acids in thermal waters are governed by temperature and influenced by organic facies. The different homologues enter the thermal waters at different temperatures, and their concentrations grow as a function of temperature rise and organic richness of sediments in the studied range of temperature. Within the homologue groups the relative proportion of lower members increases with temperature rise.

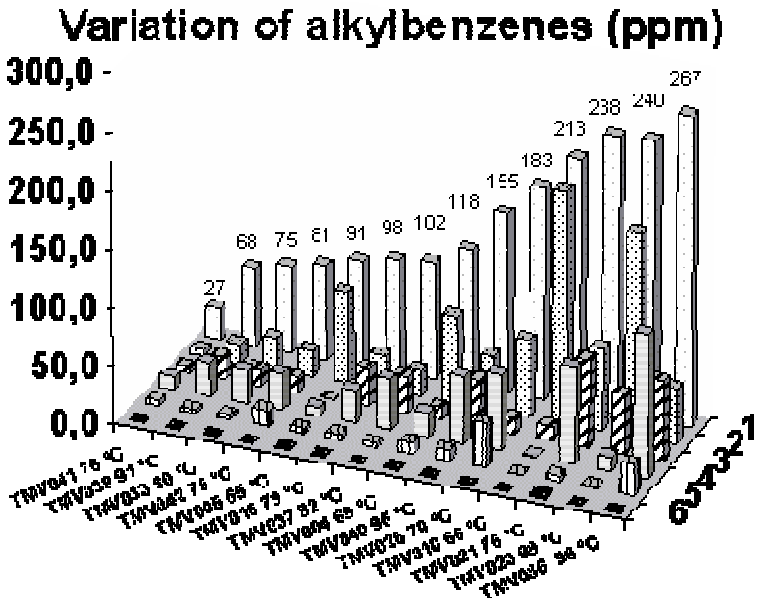

Figure 1. The variation of the quantities of different alkyl-benzene series in thermal waters originating from deep aquifers (500-2300m) in Pannonian Basin, Hungary

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