

The areas of the *primary textures* (growth and sector zoning) and *secondary texture* (convolute zoning) in zircon crystals were identified by comparative observation of the SEM-CL and SEM-BSE contrasts. The primary textures represent the effect of the main magmatic event and the secondary texture reflects the imprint of any post-magmatic event.

Based on these preliminary textural features and structural state determinations we defined the spot positions and spot sizes for the LA-ICP-MS measurement.

LA-ICP-MS (point) analysis of 263 spots was performed on these fully mapped zircons, out of which 173 were concordant. These concordant data, interpreted here, represent 99 spots from the host granitoid rock, 35 from the hybrid rock and 39 from the mafic enclave.

The results indicate the same crystallization age of the mafic enclave and that of the host rock. We can conclude that the genetics of these granitoid rocks is in situ unmixing.

Additionally, zircon crystals show bimodal age distribution (335.6 ± 0.74 Ma and 345.9 ± 0.95 Ma), independently from the rock types, zircon morphology and texture. These age data are conform with our previous zircon texture and zircon inclusion observations, suggesting continuous crystallization of the granitoid pluton in a long time interval, that gave chance for the formation of hybrid magma during the intrusions of the mafic "enclave" into the host granitoid.

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Underwater cave exploration using ^{222}Rn as natural tracer

Katalin Csondor¹, Anita Erőss¹, Ákos Horváth², Dénes Szieberth³

¹Department of Physical and Applied Geology, Eötvös Loránd University,

²Department of Atomic Physics, Eötvös Loránd University, ³Department of

Inorganics and Analytical Chemistry, Budapest University of Technology and

Economics

Applied

The Molnár János cave is one of the largest hypogenic caves of the Buda Thermal Karst (Budapest, Hungary) and mainly characterized by water-filled passages. The major outflow point of the waters of the cave system is the Boltív spring, which feeds the artificial Malom Lake. Previous radon measurements in the cave system and in the spring established the highest radon concentration (71 BqL^{-1}) in the springwater. According to previous studies, the origin of radon was identified as iron-hydroxide containing biofilms, which form where there is mixing of cold and thermal waters, and these biofilms efficiently adsorb radium from the thermal water component. Since mixing of waters is responsible for the formation of the cave as well, these iron-hydroxide containing biofilms and the consequent high radon concentrations mark the active cave forming zones. Based on previous radon measurements, it is supposed that the active mixing and cave forming zone has to be close to the spring, since the highest radon concentration was measured there. Therefore radon mapping was carried out with the help of divers in order to get a spatial distribution of radon in the cave passages closest to the spring. Field parameters of the samples (pH, temperature, specific electric conductivity) and the radon activity concentration in addition to some water chemistry parameters (chloride and sulfate concentration) were determined. Based on our measurements, the highest radon activity concentration (84 BqL^{-1}) was found in the springwater. Based on the distribution of radon activity concentrations, direct connection was established between the spring and the deepest point of the cave (István-room), which was verified by an artificial tracer. However, the distribution of radon in the cave passages shows lower concentrations ($18-46 \text{ BqL}^{-1}$) compared to the spring, therefore an additional deep inflow from hitherto unknown cave passages is assumed, from which waters with high radon content arrive to the spring. These passages are

assumed to be in the active cave formation zone. This study proved that radon activity concentration distribution is a useful tool in underwater cave exploration.

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From Russia with love – On production since 1947

István Nemes

MOL Group

Applied

According to the global oil market changes one of the company's reactions was to take more ownerships of its assets by reviewing them one-by-one in-house to cross-check historical values and possible third-party numbers, and map associated risks. In line with the strategy one of the greatest challenges was to set up a comprehensive in-house database on one of MOL's largest assets in Russia. Historically the modelling, dynamic simulation and forecasting, field development optimization was planned by local, authenticated institutes and service companies – according to the Russian Federation's law – and MOL provided supervision and took part in the decision-making process. The changes provided the opportunity as well as challenge to start an in-house subsurface project aiming to gain a well-established, up-to-date knowledge on the asset and become a more integrated party, as MOL HQ, in the daily life of the field.

The field was already discovered and put on production in 1947, but based on its initial in-place volumes and comparison to average Russian hydrocarbon field sizes it was peripheral, so its development progressed at a very confined pace. This explains how and why it is reaching the plateau production only this year and still has low recovery and room for investment in re-development, and is still a significant member in MOL's portfolio.

The interdisciplinary team faced/is facing several unexpected challenges, problems and pitfalls while building the database, quality-checking and interpreting the data with a starting vintage of 1947. To overcome these problems new approaches, "unorthodox" methods

were needed while maintain the overall goal to arrive to a reliable output set of volumes, production forecasts, well placement and development concept. The presentation would like to highlight some of the focal points during the workflow from the start until the finalization of a reference case static model from a practical point of view, rather introducing the big frame than getting lost in the details, but highlighting the most interesting (sometimes surprising) aspects.

The structure of presentation aims to follow the workflow used in the last 1.5 years, by this giving an overview of the subsurface tasks necessary to build a robust base of optimized work and future investments.

Also giving an outlook on the afterlife and use of the data and model to increase profitability of the field and to highlight remaining risks and uncertainties, and how those shall be mitigated.