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3D Structural Model in Beiuș Basin and its adjacent areas, Romania; a study to propose a potential location for the installaltion of a CHPM system

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3D modelling technique has become an important tool to observe and analyse the subsurface. Geological models, as structural representation of the subsurface, lead to a better understanding of the spatial shape and distribution of the geological structures. Three-dimensional modelling is a significant step toward a better understanding of the geology setting of Beiuş Basin and its adjacent region. The study of the geometry of the middle and upper Triasic sedimentary deposits within Beiuş Basin and their contact with an Upper Cretaceous – Paleogene intrusive body where contact aureoles have been formed, leads to a further understanding of the tectonics of Beiuş Basin and Bihor Mountains and helps to propose a proper location for a CHPM system.

CHPM (Combined Heat, Power and Metal Extraction from ultra-deep ore bodies) is a disruptive technology where an enhanced geothermal system (EGS) has to be established on a deep metal-bearing geological formation, which would be conducted in a way that the co-production of energy and metals could be possible. This new technology is proposed by the project CHPM2030 (https://www.chpm2030.eu/). The rationale for choosing the Beiuş Basin area as a study site for applying the CHPM technology is the existence of geothermal potential and of an intrusive body with regional extension.

The aim of our work is to build a 3D geological model of both the batholith and Triassic deposits, in order to observe their spatial distribution and to know if the requierements of a CHPM system are met (existence of heat and mineralization in the same place). Beside generating skarns at the contact with the hyperabissal batholith, the Triassic deposits host the geothermal aquifer that provides district heating for the town of Beiuş.

Building the three-dimensional model requires the integration, digitalisation, organisation and visualisation of all types of input data available such as geological maps and cross-sections, lithological colums, geophysical maps, wells, etc. in a 3D geological database. A 3D geological model at a regional scale of Beiuş Basin and its adjacent area has been built in SKUA-GOCAD software using the geological map and sections as a starting point. In the workflow, the geological structures were modeled with different interpolation algoritms. The result was an interactive 3D geological model which can be anytime updated as new data are available and may represent a basis for new scientific research.