ADVANCED 3D GEOLOGICAL MODELLING AT SGU: A VIRTUAL FLY-BY OF KEY MINERAL DEPOSITS IN SWEDEN

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The Geological Survey of Sweden (SGU) has implemented 3D geological modelling as an integral part of its workflow and geological mapping program. At the department of Mineral Resources, a growing number of geologists have access to advanced 3D geomodelling packages, such as Leapfrog Geo and SKUA-GOCAD. Together with geophysicists and geochemists utilizing interlinked software packages (Geosoft and ioGAS), the survey geologists can now construct highly advanced, multi-scale 3D geomodels to improve geological understanding and to efficiently provide 3D information and interpretations of the subsurface for decision making.

Examples of case studies are presented covering different geological settings and mineralization types throughout Sweden. Starting with the national 3D geological model of Sweden we zoom in on the classic ore district Bergslagen. Firstly, we fly around the currently mined Lovisa Zn-Pb deposit to briefly summarize its geology and to demonstrate the use of XCT-XRF drill core scans in 3D modelling (Luth et al. 2022). We then fly to Riddarhyttan (Fe-Cu-Co-REE) to highlight the strength of combining multiple datasets from 1) historic drilling and mine-maps 2) recent airborne geophysics and geological mapping and 3) very recent drill data provided by the exploration industry. We continue our flight northwards with a pitstop at the Blötberget Fe deposit where SGU conducted a short field campaign combining UAV derived magnetic measurements and geological mapping to investigate if the lateral extend of mineralization is controlled by a fault. A geological model based on 3D seismic data and drill data from the deposit will also be shown here. Our final destination is the western boundary of the Ljusdal lithotectonic unit (central Sweden) along which several structurally controlled gold, cobalt and lithium occurrences are presently targets for 3D geomodelling, with additional data input provided by two universities and other partners.

The common thread in the presented case studies is not only the combination - and partly integration - of multiple datasets acquired for various purposes at different times, but also to go all the way in terms of analysis and geological interpretations while constructing the model. This requires a multi-disciplinary approach, modernization of mapping projects, long term planning and continuity as well as flexibility, and an overall acceptance of the "3D modelling geologist" at the geological survey. Will this approach lead to the abandoning of traditional fieldwork and paper maps? On the contrary, geomodelling demands for a large number of reliable field observations (targeted and untargeted), field measurements and the optimal usage of historic data, including paper originals. Should we be doing this as a national geological survey? Yes, it is our mission!