3D tomography and geochemistry of drill cores reveals geological structures, minerals, textures – combined data for maximised results

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ABSTRACT

Structural and mineralogical data, as well as textures and geochemistry are hidden within drill core. Extracting the data has so far been done in several separate steps - many of them also destructive, and requiring long sequences of sample preparation, or being labour intensive. For instance, traces of structures being interpreted by examining their two-dimension projection on the surface of the drill core.

By scanning drill cores using combined data from X-Ray Transmission and X-Ray Fluorescence, automatically measuring the weight, and performing three-dimension (3-D) tomography of the core at the same time, a high-resolution 3-D visualisation of the structures, textures and mineral distribution can be made, as well as a display of elemental and density distribution along the drill hole.

Already having digitised data, and being able to select and annotate planar and linear features in the 3-D volume, is a significant leap forward, together with the ability to export all the data into geology modelling software.

Making optimal use of the combined data is key to efficient, sustainable and economically viable exploration and mining, and helps further our understanding of the geology that underpins it.

Examples from Gold Road's, Gilmour Gold Deposit, Western Australia, and Saturn Metals Apollo Hill Gold Deposit, Western Australia, illustrate how these companies use the data and what impact it has had so far on their understanding and knowledge of their controls on mineralisation.

To maximise data extraction, further steps are envisioned. With increasing accessibility to computing power the use of deep machine learning algorithms is now practical also in real time applications, I, and the application on drill core scanning is discussed, with possible future directions on automation of feature extraction and combinations, as well as elemental and mineral signature recognition.