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On the importance of the geological architecture in 3D modelling

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3D Geological modelling aims at representing the geology of the subsurface in 3 dimensions. Building a 3D geological model is not only pushing data through a code to obtain a representation of the geology. Two kinds of knowledge are mainly used to complete a geological model. The first one is explicit and consists in the data that constrain the model. The other one is generally implicit and consists in the geological knowledge that is used – sometimes unconsciously– by the person(s) in charge of completing the model. This knowledge is essential to drive the interpretation supporting the model.

The geological knowledge can be seen as an architecture underlying the 3D model. This geological architecture is derived from data, observations, interpretations, and experience. It needs to be compatible with the data but the same geological architecture may apply to various sets of data. Then, a 3D model is a geometrical realization of the topology represented by the geological architecture.

Formalizing such relations between geological structures and bodies is a way to conceptualize, to store, and to retrieve the geological knowledge. It is also a tool for the automation of the 3D model computation [1] [2]. In that case, the geometry of the modelled structures can be generated using the data and the rules of the geological architecture. The presentation will demonstrate how the geological architecture can be set up to represent various geological contexts and how it can be stored through standards such as GeoSciML [3]. Finally, the pertinence of storing 3D model, data, and geological architecture will be debated.

References:

[1] Calcagno P et al. (2008) Physics of the Earth and Planetary Interiors, 171, 147–157.

[2] Perrin M et al. (2013) Ed. Technip, ISBN: 9782710810025.

[3] IUGS-CGI (2016) OGC GeoSciML v.4.0