

## **Digital twin: buzz word or paradigm change for geological modelling?**

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By tradition, 3D geological models are built from observations (outcrops, boreholes, geophysics...), through geological interpretations (conceptual geological, lithostratigraphic pile), in order to represent as accurately as possible the geological understanding (including history) of the subsurface. Those numerical models (geometric and parametric) are then used through simulation tools to describe the impact on the subsurface of a natural (earthquake...) or anthropic event (oil and gas extraction, mining, CO2 storage, transfer of pollutants...).

In the industry, digital twins are now considered as a “digital replica of a living or non-living physical entity”, that are built according to usage specifications, to reproduce accurately the behaviour of the physical entity. In other words, they are specified for the users’ needs. When data can be collected from the physical entity during its life through sensors / IOT, those data will be used to improve the efficiency of the digital twin through AI technics.

If we can consider that this user driven approach has been used for some domains of geoscience modelling, it is not yet possible to combine the geological models with the built infrastructure that is in interaction with it (ie tunnel, geothermal installation...) in order to create a seamless “digital twin” of the “natural + man made” entities. Such digital twins are now required to help decision making for “critical” underground usage, in order to assess their performance, their security, and long-term behaviour. They are also (if not primarily) important for facilitating the dialog between stakeholders.