Evaluation of commercial drilling and geological software for deep drilling applications

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The avoidance of operational delays, financial losses and drilling hazards are key indicators for successful deep drilling operations. Real-time monitoring of drilling operation data as well as geological and petrophysical information obtained during drilling provide valuable knowledge that can be integrated into existing geological and mechanical models in order to improve the drilling performance.

We have evaluated ten different geological and drilling software packages capable to integrate real-time drilling and planning data (e.g. torque, drag, well path, cementing, hydraulic data, casing design, well control, geo-steering, cost and time) as well as other scientific and technical data (i.e. from drilling core, geophysical downhole logging, production test) to build geological and geophysical models for planning of further deep drillings in a given geological environment.

To reach this goal, the software has to be versatile to handle different data formats from disciplines such as geology, geophysics, petrophysics, seismology and drilling engineering as well as data from different drilling targets, such as geothermal fluids, oil/gas, water reservoirs, mining purpose, CO_2 sequestration, or scientific goals. The software must be capable to analyze, evaluate and plan in real-time the next drilling steps in the best possible way and under safe conditions.

A preliminary geological and geophysical model with the available data from site surveys and literature is built to address a first drilling plan, in which technical and scientific aspects are taken into consideration to perform the first drilling (wildcat well). During the drilling, the acquired scientific and technical data will be used to refine the previous geological-drilling model. The geological model hence becomes an interactive object strongly linked to the drilling procedure, and the software should allow to make rapid and informed decisions while drilling, to maximize productivity and minimize drilling risks and costs.

This procedure enables a timely, efficient and accurate data access and exchange among the rig site data acquisition system, office-based software applications and data storage. The loading of real-time data has to be quick and efficient in order to refine the model and learn the lessons for the next drilling operations.