Spain, LCE-18-2017

Efficient 3D subsurface reconstruction/restoration methods and workflows with less uncertainty

3D reconstruction of the subsurface has many and important socio-economic applications (mineral and water resources, gas storages, tunneling, geothermal energy, etc.) However, accurate reconstruction is extremely expensive and time-consuming. This problem has to be faced by the H2020 in some strategic lines (CCS, Geothermal energy) to look for quick and efficient evaluations of potential structures to aid in the decision-making process. IGME has capabilities and experience for:

1) Quick, efficient and cost-effective 3D reconstructions
IGME has well-proven and long experience in 3D reconstruction based on integration of geologic and geophysical data, particularly with potential field geophysics (PFG; gravimetric and magnetic surveying), both ground and airborne. PFG may help acquiring homogeneous and dense datasets, together with classic structural geology analysis (i.e. cross section balancing) can effectively unravel the subsurface geometry. The main advantage of using PFG is the overcoming of heterogeneity and scarcity of other geophysical techniques (e.g. seismic) in a quick and cost-effective way. Besides, modern 3D reconstruction methods (and software packages) can rapidly integrate any kind of data to obtain reliable 3D reconstructions.

2) Development of innovative 3D restoration (validation) tools of the subsurface
Restoration (validation) methods were developed during the 70's to allow a less risky decision-making in areas with scarce and heterogeneous geophysical information.
We have developed a novel restoration method based on an unconventional approach (using paleomagnetic vectors together with standard datasets) that substantially reduces the uncertainty of the reconstruction of the underground in deformed areas (Ramón et al., 2012-JSG, and 2016a&b Math Geol & Geol Soc Sp Pub). This development was partially done with the gOcad consortium. Additionally, we have developed a novel methodology (CT scan of analog models) that allows for the first time (Ramón et al., 2013-Tectono and 2015) to quantify the reliability of other commercial methods of restoration, and thus achieving a numerical evaluation of quality of the restoration results.

* Skills in 3D reconstruction workflows and software packages:
gOcad (consortium member), Move (MVE), 3DGeomodeller (Intrepid Geophysics), Oasis Montaj (Geosoft), Kingdom Suite (IHS), etc.

* Relevant projects
IGME has successfully applied and refined its own workflows for the last 30 years in international projects, Dominican Republic, Angola (PLANAGEO), PROMINE (VII-EU-FP), and in national projects searching and evaluating numerous CCS structures at the nation scale (ALGECO2) as well as in the Spanish pilot plant for CCS (Hontomin).

We propose:

A) To evaluate a case study in the Southwestern Pyrenees that was identified as a large potential CCS reservoir (ALGECO project). In addition, this area has also geothermal interest (interaction of cover and basement faults with hot springs).

B) To apply and refine our 3D workflow; improving 3D reconstruction tools (more efficient and quick) based on integration of geologic and gravimetric/magnetic data

C) To apply and improve our 3D restoration concept and evaluating uncertainties in other 3D restoration approaches (methodological goal w. or w/o case studies; CT scan of analog models)

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Topics

LCE-18-2017.:
EGS in different geological conditions

LCE-30-2017:
Geological storage pilots

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