

## Geomechanical modelling of surface uplift around well KB-502 at the In Salah CO<sub>2</sub> storage site

Fokker, P.A., Orlic, B., Van der Meer, L.G.H. and Geel, C.R.

The injection of CO<sub>2</sub> in the InSalah field has caused uplift of the surface, as observed by satellite geodetic techniques (InSAR). Around one of the wells, KB-502, the uplift shows anomalous behaviour: a two-lobe pattern develops in the direction of the preferred fracture orientation. This indicates the tensile opening of a fracture or a fracture zone. To understand the full behaviour of the reservoir response and the surface movement we have first performed geological modeling, reservoir simulation and history matching. This has yielded an acceptable description of the reservoir in terms of pressure history and CO<sub>2</sub> breakthrough times. In the second place we have performed geomechanical modeling: we have developed an algorithm that models the surface deformation resulting from tensile fracture opening in a multi-layer subsurface. Both the reservoir model and a possible tensile opening of a fracture zone were input in a geomechanical analysis to understand the surface deformation pattern. Our algorithm successfully matched the global shape of a two-lobe pattern. However, the magnitude of the global surface uplift could not be made in line with the pressures around the injection well, and the surface depression above the assumed opening fracture was too narrow in comparison with the predicted response.