EAGE

8627

Ground Deformation Monitoring for all Project Phases of CO2 Storage Using Radar Satellites

A. Arnaud* (Altamira Information), M. de Faragó (Altamira Information), B. Payás (Altamira Information), J. Duro (Altamira Information), G. Cooksley (Altamira Information) & M. Banwell (Altamira Information)

SUMMARY

InSAR (Interferometry for Synthetic Aperture Radar) technology is a spaceborne measurement method that uses radar satellite images to detect and measure ground deformation with millimetric precision. Measurements are taken remotely from space, making this an appropriate tool for measuring ground motion in difficult to reach remote areas and in almost all weather conditions, during day or night.

The Stable Point Network (SPN) is an advanced differential interferometric chain which was developed in order to process several raw radar images to achieve millimetric ground motion measurements. Results are provided in GIS format and can be received and analysed by CO2 reservoir engineers remotely without the need for site visits.

InSAR may be applied at different stages during a CO2 storage project:

1)To select the most suitable site, prior to any ground work; the technique allows for the creation of historical ground motion studies of areas of interest to assess the stability of potential sites of CO2 storage by using images from the last 15 years. Moreover, SAR images are used to provide information for the detection of faults, lineaments and geological structures for surface characterization of potential reservoirs.

2)Once the site is selected and before the injection phase, a high resolution two year study enables the assessment of seasonal motion of the area of interest and the accurate identification of existing weak points (infrastructure, houses, etc.) to categorise them before the injection and pay special attention to them during the injection.

3)During the injection, surface deformation monitoring contributes to a better understanding of the CO2 distribution inside the reservoir. Given the wide area covered by radar satellite images, InSAR is a cost effective monitoring tool for the entire area surrounding the CO2 storage site.

4)For long term CO2 storage, InSAR provides a reliable and non-intrusive remote monitoring system.

InSAR is adaptable to any site conditions; measurements can be taken in remote desert areas as well as in rural vegetated areas. In the later case, aluminium reflectors are installed to guarantee satellite measurement points. The frequency of measurement updates depends on the concrete project needs and can be increased during critical stages of the project. The technique s capability to combine different satellites guarantees continuity of the measurements for at least the next 20 years.