Doris 5 and Event-Triggered InSAR Processing

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amount of CO2 injected at the end of 2008 was 2.5 million tonnes. Its effects is clearly visible and it is produce a deformation signature at the Earth's surface.

This analyses use ENVISAT data to estimate land uplift and subsidence. and by using DInSAR method to investigates how CO2 injection propagate into the reservoir gives us a clear description about the direction and zones of deformation at depth.

The swelling is observed in regions surrounding the three horizontal injection wells from the wellhead to the tail, and images confirmed that the propagation is perpendicular to the well's drilling directions.

The analysis of the deformation series has revealed that The surface heave rate up to 8 to 14 mm/year was detected around all of the three injection wells . And a slightly subsidence was detected around the producers wells and it appears to be constant. This is a preliminary results and study area will be monitor with PS.

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The Delft Object-Oriented Radar Interferometric Software (Doris) was developed

in the late 1990s as one of the first open-source platforms for creating

interferograms from single-look complex radar images. As such it

has served the geodetic and geophysical community for almost two decades, and

formed the backbone of several time series processing chains, such as StaMPS and DePSI.

Both the advent of the Sentinel-1 mission, with its high-level coregistration

requirements, as well as increasingly demanding requirements for the efficient

processing of large data volumes, triggered the development of a 'next

generation' implementation of Doris, now available as Doris 5.

We improved, extended and integrated various software components

to support faster and more efficient setup and execution of scientific research.

Performance improvements on stack processing of Sentinel-1 images were achieved

by implementing parallelization. Basically, throughput improvements scaling linearly with the number of cores were achieved, albeit bounded in efficiency by file-I/O bottlenecks.

Coregistration procedures for Sentinel-1 are now by default based on DEM-based

coregistration (which became available in Doris 4). Millipixel coregistration

accuracy in azimuth direction is achieved by implementation of Enhanced Spectral

Diversity, and the de-ramping and re-ramping of the azimuth spectrum.

Other new elements include the burst concatenation and swath mosaicking for

adjacent sub-swaths.

Doris 5 is compatible with all the other SAR sensors used for interferometry,

such as RadarSAT-2, TerraSAR-X, Cosmo-Skymed, ALOS-2, ENVISAT and ERS-1/2.

To facilitate the automatic and autonomous interferogram generation in case of

specific events, we developed ETIP (event-triggered interferometric processing).

ETIP is currently triggered by major on-shore earthquake events, satisfying

user-defined boundary conditions. For example, the USGS earthquake webservice is used as trigger, starting an automatic processing chain that downloads the relevant Sentinel-1 satellite data, producing the interferograms, and posting these on-line for further analysis.

In our contribution, we will present the implementation and functionality of Doris 5, and show results of the ETIP chain based on Sentinel-1 data.

Doris 5 is posted on-line on http://doris.tudelft.nl and freely available for the

scientific community.

Extracting Small and Long-Wavelength Vertical Land Surface Movements from an InSAR Image Time Series: The Case of Glacial Isostatic Adjustment in Scotland

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When assessing past and future sea level trends at Scotland's coast, understanding the effects of glacial isostatic adjustment (GIA) plays a crucial role. Especially against the backdrop of climate change and the global rise of sea levels, it is important to adequately determine the modern rate and spatial distribution of GIA-related crustal uplift in Scotland.

Differential SAR Interferometry (D-InSAR) is an established technique for analysing crustal motion and land surface deformation caused by co- and interseismic processes, volcanic activity, landslides and subsidence. However, when it comes to the detection of small, long-wavelength displacements, such as GIA-induced vertical land movement, the application of D-InSAR becomes challenging. A very high quality standard in terms of precision and accuracy is then necessary to make it a competitive tool to established geodetic techniques, such as GNSS.

This study investigates the applicability of a D-InSAR time series technique, the Small Baseline approach (SBAS), in its ability to determine recent rates of vertical land motion in Scotland with a high accuracy and precision (in the mm/yr level), as well as on a broader spatial scale than conventional geodetic techniques that rely on spatial interpolation. A range of error signals (atmospheric water vapour, orbital ramps, topographic artefacts etc.) needs to be sufficiently eliminated before the extraction of any uplift signal is possible. This requires the advancement of correction techniques