

Abstract Template

Geomatics Conference 2004

Guidelines:

Key challenges include the need to continue delivering robust support to the business, while at the same time aligning with the new operating model.

The main objective of the conference is to provide delegates and their organizations with a high quality learning event focused towards facing this challenge.

Papers and posters should focus on practices worth replicating and examples of excellence, and should fit into one of the four generic themes.

The conference will run over three days with 4 sessions each day. Each speaker will be allocated a 30-minute time slot (20 minutes for the presentation and 10 minutes for questions). Each session will be separated by a refreshment or meal break, during which time poster presentations will occur.

Abstracts should be submitted to program coordinator, Rebecca Day (Rebecca.Day@shell.com) by Friday 16th July.

Title: **Subsidence monitoring using radar interferometry**

Author: **Gini Ketelaar, Petar Marinkovic, Freek van Leijen, Ramon Hanssen**

Presentation: **x**

Poster:

Operational Excellence: **Technical Excellence:**

Business Processes: **Geo Information Management:**

Space required for posters (m²): _____

Abstract: (< 500 words)

In a cooperation project between NAM and Delft University of Technology, monitoring subsidence due to gas and oil extraction in the Netherlands using the radar interferometry (InSAR) technique is investigated. Complicating factors are the temporal decorrelation (changing earth surface) and the low subsidence rate (< 1cm/year), which requires a strict quality description in terms of geodetic precision and reliability parameters.

The presentation contains a brief explanation of both conventional InSAR and the Persistent Scatterer (PS) technique. Because of atmospheric signal and temporal decorrelation, conventional InSAR may not be suitable in many subsidence areas in the Netherlands. Therefore, the research focuses on a PS type of approach, selecting reliable measurement points having a consistently high amplitude through time.

Furthermore, the results of two research projects will be presented: one dealing with the interpretation of PS-InSAR observations and one about the validation of corner reflector InSAR observations using independent leveling observations.

1. Rotterdam – separation of deformation regimes

Although PS-InSAR results may be very precise, this does not automatically imply a reliable estimation of the deformation parameters of the signal of interest. Compared to conventional geodetic techniques using well defined benchmarks, the physical definition of a PS is less clear: does the reflection originate from the roof of a building or is it a multipath effect with the surroundings involved? Depending on the type of reflection, a PS deformation measurement may be due to different deformation regimes (structural instabilities, shallow and deep mass displacements).

A PS-InSAR analysis has been carried out by TRE/NPA for NAM for Rotterdam. In this area, the expected subsidence due to gas extraction is very low: 0 to 2 mm/year. The resulting PS movements show high local variations which mask the signal of interest. A model-driven method has been used to select PS's for estimating the gas extraction deformation regime. The subsidence prognosis variogram, based on geological information and reservoir behavior, is used as additional information.

The selected PS's reveal a pattern more similar to that of gas extraction, but local variations remain high.

2. Corner reflector experiment

To validate the estimated deformation parameters from InSAR point scatterer measurements, knowledge about the observation statistics is necessary. One way to improve this understanding is to perform a controlled experiment using an additional independent technique. In the period from March 2003 to April 2004 the movements of five corner reflectors in the area near Delft University of Technology have been monitored using leveling and repeat-pass InSAR (ERS-2 and ENVISAT).

Condition equations have been set up for the leveling-InSAR double differences between each pair of corner reflectors within an interferogram. Results of the misclosure analysis will be presented.