Monitoring Land Subsidence in Ho Chi Minh City Using Radar Interferometry Techniques
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ABSTRACT
The level of the ground water has been constantly lowering and the urbanization has been rapidly developing during the last decades due to the strong groundwater extraction which has led to the subsidence of some areas in the Ho Chi Minh City (HCMC). Land deformation at the rate of few centimetres per year can be measured at the heavy ground water pumping stations. This poster demonstrates the effectiveness of radar interferometry to detect the deformations in HCMC. The goal is to employ this powerful new technique to measure the land subsidence phenomenon in HCMC using ERS SAR SLC scenes acquired over HCMC.

INTRODUCTION

• Subsidence in Ho Chi Minh City is a long term problem
• Conventional methods: precise levelling and GPS – they are costly and time consuming
• Radar Interferometry – Permanent Scatterer InSAR - economical, fast, provides information on a large area

METHODS

The Interferometric Concept

The unit of length used in InSAR is the wavelength:

\[ \lambda = \frac{c}{f} \]

\[ AR = c \cdot \Delta \phi \]

The PS Technique

Observed interferometric phase is the sum of many terms

\[ \phi_{\text{inter}} = \phi_{\text{def}} + \phi_{\text{topo}} + \phi_{\text{data}} + \phi_{\text{orbit}} + \phi_{\text{noise}} \]

RESULTS

Data ERS-1 & 2
Total correlation, trend
\[ \rho_{\text{corr}} = \rho_{\text{phase}} \cdot \rho_{\text{basis}} \cdot \rho_{\text{noise}} \]
\( p \) denotes correlation

Subsidence trend

We see that the some Southwest subsidence areas coincide. The most reliable information is in the zone were the PS are concentrated. Moreover, looking at the position of the “subsidence zones”, most of tide flood sites lie at these areas of the city (as expected).

CONCLUSIONS

- The capability of using PS techniques to map land subsidence phenomenon in Ho Chi Minh City.
- Progressing urbanization and a rising population cause more exploitation of underground-water and more large structures to be built. This is effecting HCMC surface causing significant ground deformation.

BIBLIOGRAPHY