Institut für Photogrammetrie
und GeoInformation

Leibniz
Universität
Hannover

Monitoring Displacements at the Hong Kong International Airport with Temporarily Coherent Scatterer InSAR (DE/EN)

Monitoring displacements at the new runway of Hong Kong International Airport is essential for ensuring the safety, stability, and operational efficiency of this critical infrastructure. As one of the busiest airports in the world, any structural instability could have significant implications for air traffic safety. With the challenging geotechnical conditions present in the region, including land reclamation and the airport's proximity to the sea, precise displacement monitoring is crucial for adapting to environmental and anthropogenic factors. The archive of Sentinel-1 offers 10+ years of images allowing to monitor the airport with Interferometric Synthetic Aperture Radar (InSAR) time series methods and derive displacement maps and displacement time series for hazard assessment.

While conventional InSAR time series methods require the radar backscatterers at the surface to be coherent for the whole study period (continuously coherent scatterers), recent developments allow to also derive the displacement of temporarily coherent scatterers (TCS) with dedicated methods. TCS exhibit a coherent signal over parts of the study period and require adapted unwrapping strategies to derive their displacement time series.

In this thesis, displacement map and time series shall be derived from the whole Sentinel-1 archive covering 2014-2024 to monitor the Hong Kong International Airport. In particular, the new runway shall be analysed which was constructed during the study period such that TCS pixels are likely to be prevalent. The state-of-the-art change detection method shall be used to identify the change point and to estimate the coherent lifetime of the TCS. Subsequently, the InSAR time series software SARvey (https://github.com/luhipi/sarvey) shall be used to derive the displacement information jointly from TCS and continuously coherent pixels.

Good Python programming skills, working with Linux command line and applying research software is required for this thesis. The thesis will be supervised by Andreas Piter.

Reference
Ma, P., & Jiang, X. (2024). Mapping vertical and horizonal deformation of the newly reclaimed third runway at Hong Kong International Airport with PAZ, COSMO-SkyMed, and Sentinel-1 SAR images. International Journal of Applied Earth Observation and Geoinformation, 132, 104030.

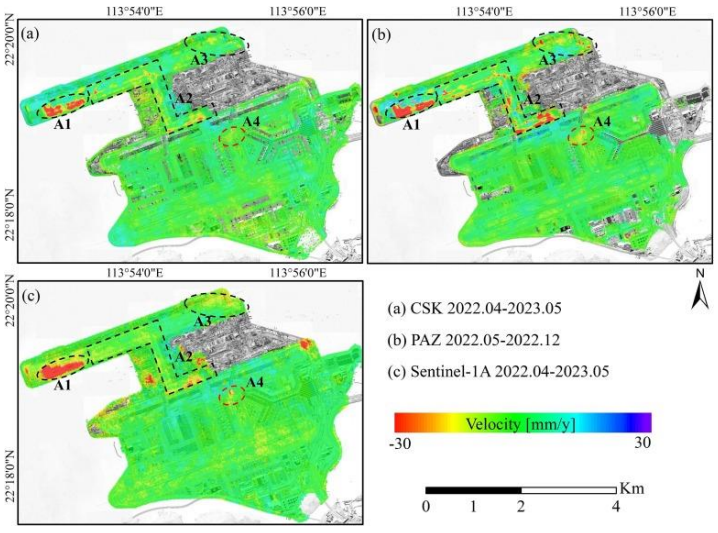

Figure: Displacement maps derived for the Hong Kong International Airport from COSMO-Skymed, PAZ and Sentinel-1 (Ma, P., & Jiang, X., 2024).

Fakultät für Bauingenieurwesen
und Geodäsie

Institut für Photogrammetrie
und GeoInformation
Prof. Dr.-Ing. habil. Christian Heipke

Andreas Piter, M.Sc.
Tel. +49 511 762 - 9040
E-Mail: piter@ipi.uni-hannover.de

Besucheradresse:
Nienburger Straße 1
30167 Hannover
www.ipi.uni-hannover.de

Zentrale:
Tel. +49 511 762 0
www.uni-hannover.de