



DEFENCE AND SPACE
Intelligence

TerraSAR-X Based Dam Monitoring – Strong Alternative to Terrestrial Surveying

Case Study

Challenge

Collection of surface and object stability information in a risky environment.

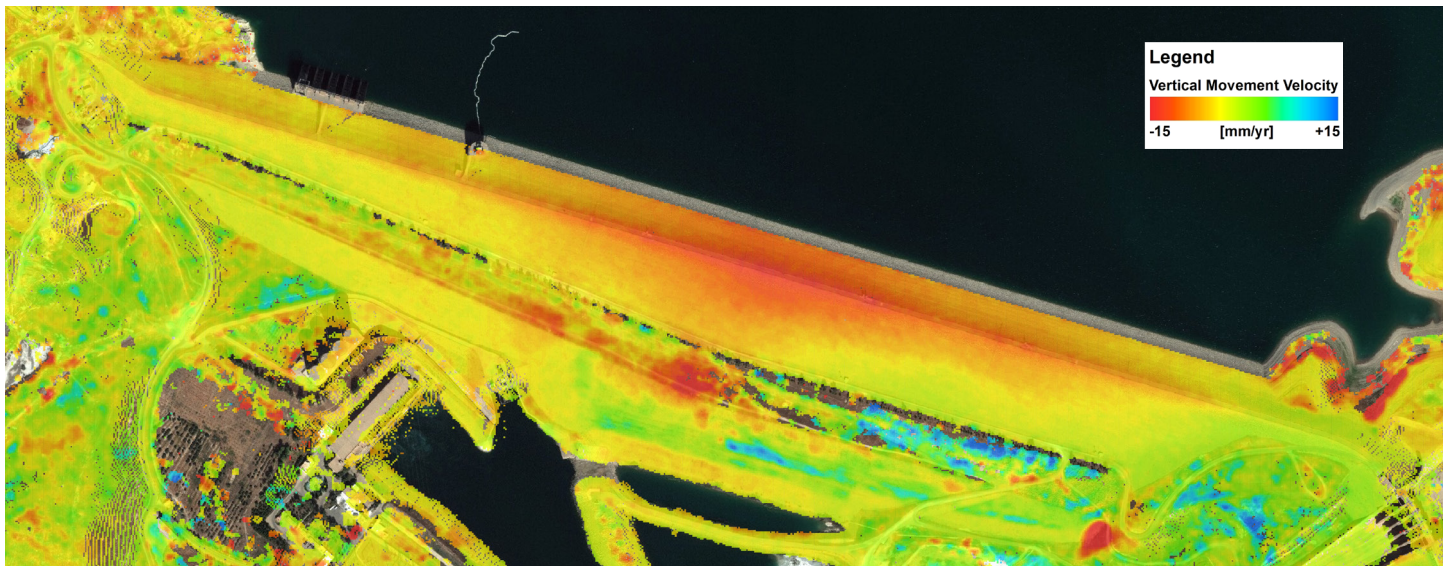
Solution and Results

Surface Movement Monitoring (SMM) service. Precise object and surface movement information with regular updates.

Benefits

Achieved results show a number of anomalies with a very high precision – remotely collected without any risk to staff.

AIRBUS



Challenge

The Mosul Dam was built in the early 1980s and is the largest dam in Iraq. It is located on the Tigris river, upstream of the city of Mosul. The purpose of the dam is to generate hydroelectricity and provide water for downstream irrigation. At full capacity, the structure holds around 12.5 million cubic metres of water and provides electricity to the 1.7 million residents of Mosul.

The dam is well known for its instability, as the riverbed is made of unstable soft soil and gypsum, a mineral that dissolves as water runs through it. The structure has to be grouted daily in order to keep water from seeping through.

Concerns over the dam's instability have led to major remediation efforts. Nevertheless, independent and objective risk evaluation needs to be continuously completed in order to support local operators, in case of any irregular surface movement to avoid any serious incidents occurring.

Solution and Results

Airbus provided its TerraSAR-X based SMM service to the customer. More than 30 TerraSAR-X high-resolution SpotLight scenes have been acquired, covering a one-year time period between April 2015 and April 2016. Data has been processed using a time series interferometric approach. The use of the WorldDEM™ Digital Elevation Model, which is exclusively available from Airbus, was used to introduce accurate dam heights and achieve results of maximum precision.

The results showed a number of surface movement anomalies, which were either visible through pure vertical displacements of the surface (e.g. through underground dissolution) or lateral movements of the dam crown induced by water pressure of the reservoir and/or underground instabilities. Airbus was able to demonstrate the suitability of the spaceborne approach for obtaining information about surface movements in the Mosul Dam area. The high precision and reliability of the SMM service provides a complementary solution for terrestrial surveying of larger objects, especially in environments that carry risk.

Applicability

The Airbus SMM service, is a sound complement to terrestrial surveying in general, whenever information on surface or object movements is required. Nevertheless, it is also an alternative in adverse conditions such as remoteness, climate, wilderness or when the social/political environment cause unwarranted risks for operating staff. Furthermore, the space-based solution offers a cost-saving potential due to significantly reduced effort and time for staff mobilisation and related safety measures.

Benefits

- Cost-efficient and precise information about surface instability with millimetric precision, available in near real-time – ideal for guiding countermeasures like concrete injection.
- Health, security and environmental (HSE) aspects are fulfilled due to remote character of measurements. No on-site staff involvement and risk exposure, and no impact on the environment.
- Wide area overview of surface movements also allows detection of non-predicted displacements potentially relevant for risk evaluation.

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