

BACKGROUND

- Interferometry is a well established technique that uses phase unwrapping of SAR signals to retrieve millimetric movement along the line of sight of the satellite.
- All satellites equipped with SAR sensors orbit the Earth on a Near Polar orbit above the Earth's surface allowing surface deformations to be detected anywhere on Earth.
- There are nearly a dozen satellite SAR missions with InSAR revisit ranging up to every 5 days.
- Millimetric precision deformation measurements are generated for both surface structures and terrain.
- Telespazio offers motion detection services over both urban and rural areas.

WHAT YOU GET

- Output data as displacement contours or point cloud in SHP or KMZ format compatible with Google Earth and mainstream GIS.

SURFACE DEFORMATION MONITORING

GROUND MOTION MEASUREMENT FROM SPACE

With preferential access to the world's highest revisit Synthetic Aperture Radar (SAR) satellite constellation COSMO-SkyMed supplemented by other commercial and open source SAR missions, Telespazio UK can provide clients with high precision ground motion analysis over large areas and high value assets to monitor structural and geotechnical deformations. The service delivers movement rates of millimetres/year at densities in excess of 10,000 points per sq km over periods of times from weeks to decades.

Telespazio specialises in advanced SAR image processing and interferometric (InSAR) processing chains to support geotechnical analysis and structural integrity monitoring of a wide variety of assets and engineering structures .

For consulting and construction engineering projects requiring in-depth structural risk management assessment, Telespazio is experienced in supporting design, construction and O&M phases to help clients deliver infrastructure projects more effectively on time and within budget.

The satellite InSAR system works in parallel with traditional in-situ techniques, but brings new business benefits and operational savings when deployed together. Because SAR is weather independent with overpasses every 12 hours, Telespazio can provide reliable and repeatable ground motion analysis with updates on a weekly basis over areas in excess of 1,600 sq km in size. Open sky access means that physical site inaccessibility is no longer an impediment— or cost. InSAR is 100% non-invasive, removing the need for in-situ equipment, access approvals, service suspension and greatly simplifying Health & Safety and Lone Worker issues.

SERVICE EXCELLENCE

A key advantage of partnering with Telespazio for delivering professional geotechnical support is the breadth of services.

- Time series motion history of each measurement point for duration of survey period.
- Professional geotechnical analysis including geological and geomorphological interpretation.
- Update report from weekly to annually.

QUICK FACTS

- SAR Interferometry is the measurement of signal phase change between two images acquired over the same area at different times.
- Technique allows archive data to be used from 1992 onwards.
- InSAR uses a stack of multipass images usually a minimum of 30.
- SAR automatically identifies stable reflectors (Persistent Scatterers) on the ground that return stable signals to the satellite sensor.

PORTFOLIO EXPERIENCE

Telespazio Group has a long heritage of delivering InSAR services for many sectors and applications:

Civil Engineering

- Tunnel and underground sites
- Railway & road
- Dams & Reservoirs
- Bridges and viaducts
- Water leakage & extraction
- Flood defenses
- Landfill subsidence

Energy

- O&G Infrastructures and reservoir monitoring
- Industrial plants
- Power stations
- EOR, Shale Gas Production
- Oil rig stability

Environmental

- Archeological investigations
- Tectonic activity
- Landslides

Others

- Insurance: loss adjustment

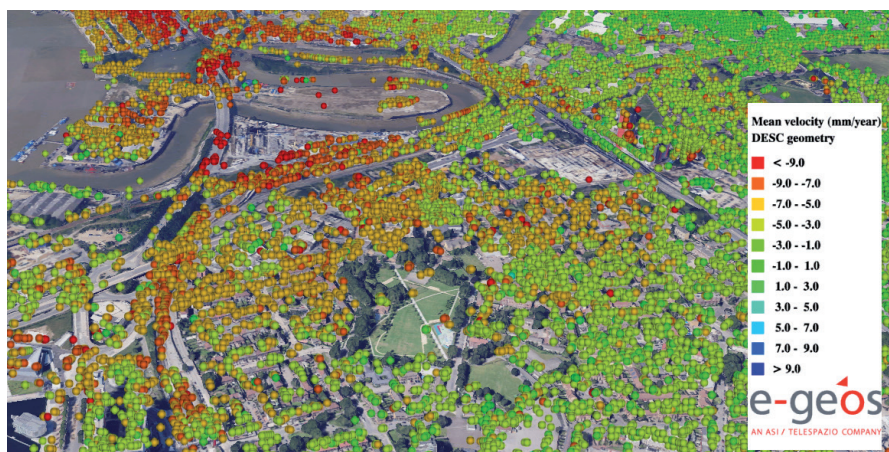
PSP-IFSAR—this technique can generate up to 20,000 measurement points per sq km over highly reflective surfaces such as urban built environments and infrastructures including bridges, viaducts, culverts, road junctions, dams, embankments and high value Critical National Infrastructures assets such as water treatment works, chemical plants, pipelines, power stations, turbines and reservoirs.

ISBAS— an innovative algorithm developed by technology partners GVL for low coherence areas such as those dominated by vegetation. The service can retrieve continuous deformation information ensuring seamless measurement surveys for wide area phenomena such as water extraction, water injection and tectonics.

DELIVERING RESULTS

Telespazio's ground motion service is based on a legacy of vast experience and portfolio spanning decades.

- **Historical insight** — in addition to commercial SAR data Telespazio can integrate Open Source SAR data from previous missions including ERS, Envisat and now Sentinel-1 dating back to 1992. Providing historical ground motion insight is valuable information for scheme design and also asset liability assessment for due diligence.
- **End-to-End service** — with direct satellite tasking access, Telespazio can plan the optimum data collection strategy for clients to best meet accuracy and frequency requirements. The service also includes consultancy and professional geotechnical & geological interpretation of InSAR results to ensure InSAR addresses the relevant engineering requirement.



SMART INFRASTRUCTURE

Telespazio is committed to expanding the utility of InSAR beyond its conventional monitoring application by creating new innovative capability centered on early warning and prediction. Aligned with the introduction of Smart Infrastructure initiatives, Telespazio UK is integrating InSAR products with Artificial Intelligence (AI) platforms and Big Data Analytics engines. These advances uniquely incorporate InSAR into structural stability algorithms that allow asset failure to be predicted in advance, which is an extremely powerful transformational capability for asset owners. Predictive maintenance strategies have the potential to dramatically reduce through life costs by removing the need for reactive and expensive remediation repairs after the fact. Preventative Maintenance also allows owners and operators to better plan for service disruptions and ward off potentially huge revenue losses due to emergency repairs and avoiding reputational damage at the same time. Telespazio has been awarded several innovation contracts to develop InSAR as a component of an intelligent early warning structural deformation service. Integration with 3D visualization technologies and BIM, working with CNI owners in the UK and overseas.