**SSUM™**  
Terra Motion

SSUM is a collaboration between  
Stantec & Terra Motion Ltd.

**<1 mm**

precision of vertical  
movement

**12**

Get ground deformation  
updates of your entire  
project every 12 days

## PREDICT future problems by looking at the past

How do we measure a change that cannot be easily seen at scale? Surface Subsidence & Uplift Measurement (SSUM™) can provide the necessary information to plan for future events by looking at the past. Landslides, sediment build-up, mine closures, permafrost thaw and dewatering activities can all cause surface deformation impacting your infrastructure. SSUM™ can help predict, prevent and protect for a safer future.

### What is the benefit?

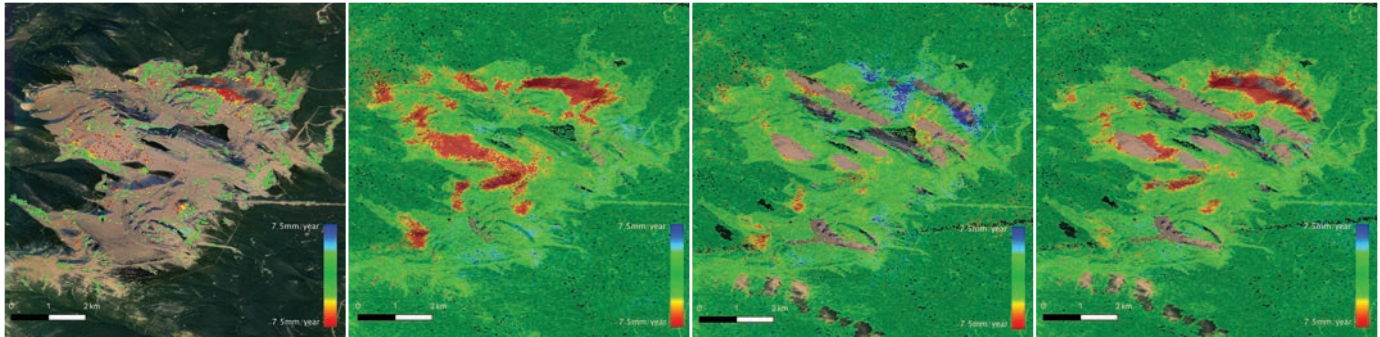
We leverage satellite imagery to detect surface elevation changes down to the sub-millimeter scale. Lateral movement can also be detected depending upon site location. With a global historical database of imagery collected from as far back as 2015, our ground subsidence measurements are not limited by cloud, smoke, vegetation or snow. We are capable of looking at landscape coverage at a 20m x 20m resolution down to 1m x 1m resolution to provide you with a better understanding of the ground beneath your project sites. This is SSUM™.

### How does it work?

SSUM™ uses Interferometric Synthetic Aperture Radar (InSAR) data to scan the ground at various phases. A change in transmitted electromagnetic wave travel time represents a phase shift. This translates to accurate and precise surface movement over time.

## SSUM Results

Using SSUM™ we can identify the full extent of deformation and how infrastructure is affected.



### Conventional InSAR

techniques only provide sporadic coverage of surface movement changes

### Total Movement

Surface movement in three-dimensions in contrast to Conventional InSAR

### Lateral Movement

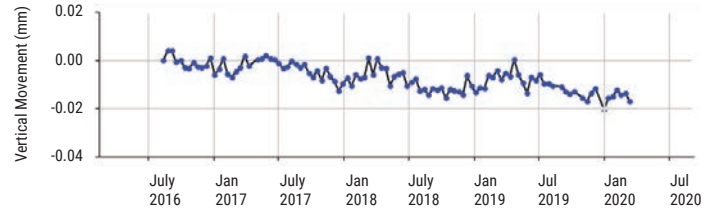
Surface lateral movement in East-West direction

### Vertical Movement

Vertical surface movement in the Up-Down direction

## The value of SSUM™

SSUM uses proprietary processing to extract nearly all signals from InSAR data. In 2020, we used SSUM to identify surface subsidence occurring at a mine site. Using SSUM's unique technology, we can identify subsidence throughout the entire mine site (above left). Conventional InSAR practices only provide a small portion of ground subsidence coverage. SSUM provides full coverage.



**Detailed accuracy** – Vertical movement of an individual 20m x 20m pixel every 12 days from 2016 to current.

## Ground movement applications

|  |  |
|--|--|
| Railways   | Identify and monitor ground movement and subsidence that could delay or halt operations            |
| Mining   | Monitor ground movement including subsidence and tailings stability                                |
| Permafrost                                       | Identify and monitor thermokarst hazards (including wash-out frequencies)                          |
| Pipelines  | Delineate ground deformation that could impact pipelines   |
| Glaciers   | Track glacial movement, velocity, and volume changes   |
| Oil & Gas, Geothermal or Groundwater abstraction | Estimate subsidence caused by consolidation due to fluid withdrawals and heave caused by injection |

We can help you identify possible ground movement on or around your project. To learn more, send us an email at [remotesensing@stantec.com](mailto:remotesensing@stantec.com)

Connect with us



**Grant Wiseman, MSc**  
Remote Sensing Scientist  
Global Environmental Services  
Phone: +1 204 928-8852  
[grant.wiseman@stantec.com](mailto:grant.wiseman@stantec.com)

**Rick Guthrie, MSc, PhD, PGeo**  
Director Geohazards  
Environmental Services  
Phone: +1 403 441-5133  
[rick.guthrie@stantec.com](mailto:rick.guthrie@stantec.com)