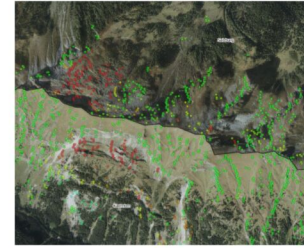
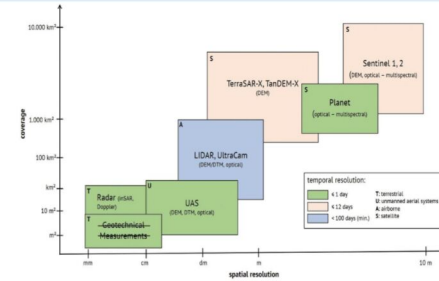


"Non-contact data acquisition, data analysis (visualisation) and interpretation" Kappas, 1994

"...by measuring and interpreting reflected and emitted electromagnetic radiation" DIN 18716

→ sensor systems from locations on the Earth, from aircraft (especially aeroplanes) or satellites

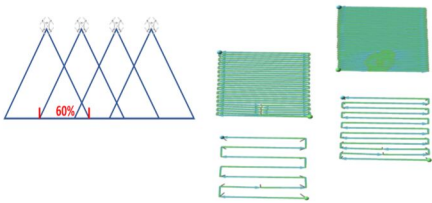


## TECHNIQUE

## ADVANTAGES

## DISADVANTAGES

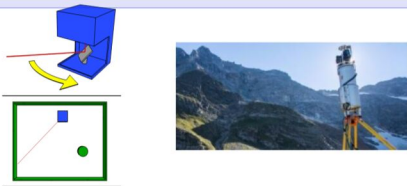
### Photogrammetry



- ✓ inexpensive
- ✓ lightweight, portable platforms
- ✓ with DGPS accuracy in the "cm" range
- ✓ not only RGB (NIR, thermal etc.)

- long computation times
- vegetation = surface
- areas from 10 km<sup>2</sup> very complex

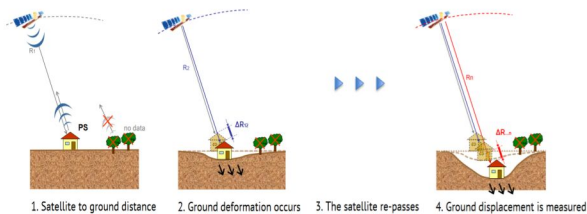
### Laserscanning



- ✓ vegetation is only a limited problem (multi-pulse)
- ✓ short raking time to the finished point cloud
- ✓ active accurate method
- ✓ cm accuracy/resolution

- price (from 30k euros)
- high copter weight > 2kg
- limited use on snow/water

### InSAR



<b>Historical study of ground motion</b>	<ul style="list-style-type: none"> <li>- Large image data archives enable the retrieval of ground movement data dating from 1992</li> <li>- Provide the history of ground displacement before construction takes place</li> </ul>
<b>Motion data beyond in-situ instrumentation</b>	<ul style="list-style-type: none"> <li>- Motion data to detect and measure the surface extension of deformation gradients during construction and monitor its evolution</li> </ul>
<b>High density of measurement points</b>	<ul style="list-style-type: none"> <li>- Urban structures and civil engineering infrastructures are the best surfaces for radar reflection providing hundreds of thousands measurement points</li> </ul>
<b>Very precise measurements</b>	<ul style="list-style-type: none"> <li>- Annual average measurement precision ± 2-3 mm/year</li> <li>- Precision for each measurement ± 3-7 mm</li> </ul>
<b>Continuous measurement updates</b>	<ul style="list-style-type: none"> <li>- CosmoSkyMed: image available every 4-8 days; TerraSAR-X: image available every 11 days; Radarsat: image available every 24 days</li> </ul>
<b>Coverage of very large areas</b>	<ul style="list-style-type: none"> <li>- Worldwide image availability: ground motion studies of anywhere on Earth</li> <li>- Coverage of thousands of km<sup>2</sup>: 100x100 km Envisat 30x50km TerraSAR-X, etc</li> </ul>

- movement rates of mm-cm per year (limited by wavelength)
- potential reflectors present? (vegetation intensity)
- orientation of movement (pure north/south movements not visible)
- a minimum of 15 radargrams must be available