Climate

# Radar reflectors

Geopartner Inspections has developed radar reflectors that can be used to calculate ground motion based on time series of images acquired by radar satellites.

## The benefits of setting up radar reflectors

- opportunity to closely monitor surface ground motion in almost real time
- supplements and minimises the need for costly levelling, such as when using water level gauges etc.
- ability to precisely document the movements of an object over time

Radar satellites work by transmitting a radar pulse that is reflected by the surface of the Earth. The satellite measures the radar pulse that is reflected back. The method whereby the radar pulse is reflected is used to characterise the surface. Variations in the measured reflection shown in two radar images contain information about how the surface has moved in the interval between the recording of the two radar images. This technique is called InSAR and can also be used in the form of longer temporal sequences of images, from which more robust movement pattern can be calculated and mapped.

### The benefits of setting up radar reflectors

The advantage of setting up a radar reflector is that it ensures a strong signal that is easy to identify in the radar image. It also shows the precise origin of the signal. If the radar reflector's movements are known, such as from repeated measurements over time using levelling, this information can be used to calibrate calculations for all other reflection-producing natural objects in the radar image. Natural reflectors include kerb stones, road signs, lampposts, large stone slabs, stairs or other stone, concrete or metal objects with flat surfaces and right angles.

Satellite data from radar reflectors can also supplement levelling-based elevation measurements and have great potential when following movements over time while the reflector is in place. The interpretation of calculated movements is generally difficult, but setting up radar reflectors can produce a more robust basis for the calibration of satellite-calculated movements of surface objects.

### Applications:

- Can be used as a fixed point for best possible local GNSS measurement
- Can be used as a dynamic fixed elevation point
- Can be used to monitor critical movements on buildings and infrastructure

Picture 1: Radar reflector RR1 set up near Lemvig.

Picture 2: Single-geometry radar reflector for installation with minimal environmental impact.

### Reflector types

Currently, Geopartner sell several different types of reflector, each for different applications:

**RR1** is a "muse" type reflector. This is a double trihedral reflector that signals in both ascending and descending satellite tracks. This type of reflector is suitable for positioning in stable areas, where there is a need to collect ground motion information at a well-defined point.

The **RR2 reflector** is a traditional trihedral reflector. Smaller than the RR1, it can be configured to send a signal in either ascending or descending satellite paths. The RR2 reflector was developed for positioning in areas where digging needs to be kept to a minimum, such as dykes. The RR2 was therefore developed with a special anchoring system that screws into the ground and has minimal impact on its surroundings.

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