



INNOVATIVE SATELLITE-BASED STRUCTURAL MONITORING

In order to ensure the reliable functioning of structures, especially bridges, and to create a basis for extending their service life, new approaches to monitoring are of crucial importance. With a suitable sensor fusion and the use of Sentinel satellite data from ESA, deformation measurements on structures can be carried out much more efficiently.

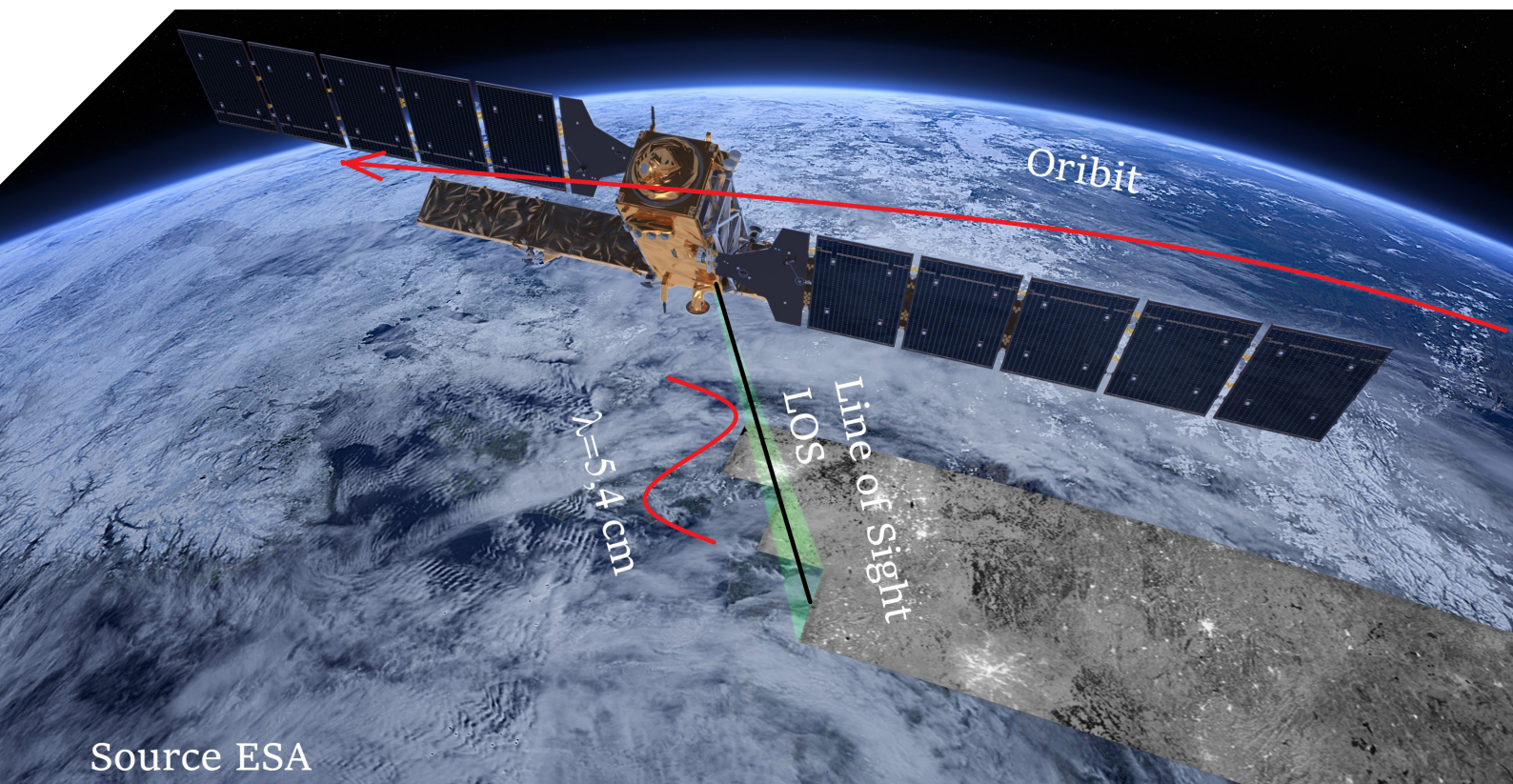
NETWORK-WIDE MONITORING VIA SATELLITE

In general, methods for contactless condition monitoring of structures offer new possibilities for monitoring entire sections of infrastructure. Instead of equipping structures individually with discrete sensors, it is possible to use non-contact methods to record and evaluate structures that are difficult to access, entire sections of structures and their surroundings. If this is carried out from space using satellites, there is the additional advantage of an extraterrestrial

reference. Instead of the previous collection of individual pieces of information at discrete points, in future it will be possible to monitor entire sections (e.g. a large number of bridges or settlement-sensitive structures) using remote sensing data and the Synthetic Aperture Radar (SAR) method. Compared to other data from radar satellites, the free Sentinel-1 radar data from the ESA offers the advantage of greater temporal coverage and therefore a better temporal resolution of the data.

NEW APPROACHES FOR DETERMINING THE DECISIVE DEFORMATION

The AIT Austrian Institute of Technology is pursuing solutions that have already been tested in large infrastructure construction projects, with a focus on the following innovations:



Source ESA

- Use of corner reflectors on the structures for better detection of the deformation of discrete points by satellites
- Consideration of the temperature deformation of the structure (both daily and seasonal) as an integral part of the monitoring concept
- Recording and modeling the structural temperature
- Sensor fusion - i.e. the combination of different methods and sensors to reduce errors and increase resolution
- Calculation of the decisive deformation of structures

PROTECTION OF THE STRUCTURE, SAVING OF CO₂

The overarching aim of these innovative approaches is to enable sufficiently accurate and cost-effective, permanent yet "minimally invasive" monitoring of structures. The implementation of satellite monitoring requires no or only isolated non-wired installations on the structures. However, the data obtained in this way makes a decisive contribution to increasing the service life of the infrastructure and thus saving considerable amounts of CO₂ compared to new construction.



AIT AUSTRIAN INSTITUTE
OF TECHNOLOGY GMBH
DI Dr. Alois Vorwagner
Tel +43(0) 50550 6624
Giefinggasse 2, 1210 Wien
alois.vorwagner@ait.ac.at
www.ait.ac.at