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ABSTRACT OF THE PLENARY SPEAKER

A Vision for Spaceborne Synthetic Aperture Radar (SAR)

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In a changing and dynamic world, high-resolution and timely geospatial information with global access and coverage becomes increasingly important. Constellations of radar satellites will play a major role in this task, since spaceborne radar is the only sensor that has all-weather, day-and-night, high-resolution imaging capability. Examples of applications for such a satellite constellation are environmental remote sensing, global 2-D and 3-D mapping, change detection, hazard and disaster monitoring, geoscience and climate research, as well as reconnaissance and security related tasks. Long-term vision is a space based sensor web that provides a view of our planet like we are used to observe with Google Earth, but with high-resolution images and relevant geospatial information being updated every few minutes.

This talk provides first an overview of the state of the art and applications of spaceborne synthetic aperture radar (SAR). One prominent example is the TanDEM-X mission, the first bistatic radar in space. It consists of a synthetic aperture radar interferometer with two almost identical satellites flying in a closely controlled formation. With a typical separation between the satellites of 150 to 500 m a global Digital Elevation Model (DEM) with 2 m relative height accuracy at 12 m posting is being generated. While data acquisition has been finished mid-2014, the processing of the global TanDEM-X DEM will be concluded by mid-2016. As of November 2015, 75% of the landmass is already processed and available for scientific and commercial applications. The results achieved so far show that the relative height of the final DEM is well within the specifications of 2 m (3.É– interval), while a superior performance is achieved for the absolute height accuracy (1.2 m instead of 10 m).

Second, the talk will describe the paradigm shift that is taking place in spaceborne SAR systems. The fast growing user community poses demanding requirements for higher resolution and shorter revisit time which push the development of new technologies for achieving a wide-swath high-resolution imaging. New antenna concepts with digital beamforming will boost the performance of future SAR systems by at least one order of magnitude. One example is Tandem-L, a highly innovative SAR satellite mission which is based on two L-band radar satellites using a two-dimensional feed array with digital beamforming in combination with a large deployable reflector. These technological developments will open the door for a global remote sensing system for the continuous observation of dynamic processes over the Earth surface with unprecedented accuracy. Ultimate goal of such a system is to provide geospatial information as an essential contribution to solve global societal challenges related to climate change, sustainable development, land use, mobility, environmental protection and security.