HITCHHIKER -
Bistatic Synthetic Aperture Radar Imaging with a Stationary Passive Receiver System

To develop efficient algorithms for bistatic SAR focussing, there is a need for test data sets. Therefore it was decided to build up an own affordable sensor system to perform bistatic SAR experiments. Because of the high operating cost of a moving sensor platform, a stationary receiver was considered.

In summer 2009 the Center for Sensorsystems has developed a X-Band receiver for this purpose. The system was designed using the TerraSAR-X satellite as illuminating platform. The high bandwidth of the transmitter of 300 MHz and the sliding Spotlight SAR-mode enables the acquisition of SAR data with <1 m resolution. To preserve high flexibility, the system is not limited to this signal source.

After successfully proving the concept in experiments in 2009, we performed a series of interferometric and polarimetric measurements during 2010, which were processed using a time domain processor in addition to a frequency domain quick-look algorithm. The radar interferometry was based on a second pass of the satellite system, leading to a temporal baseline of 11 days. To overcome temporal decorrelation, the system was planned to be extended to four receiving channels enabling the performance of a receiver based single pass interferometry. This extended system is suitable in the field of seismic scene monitoring using differential interferometry, capable of measuring small movements of the earth's surface in the range of millimeters per year.

In a further step a noise based transmitter system was built up to complete the system to a stand-alone SAR sensor. This system, mounted on a mobile plattform will be independent of the former transmitter systems leaving a scene selection independent of the satellite's orbit. The use of noise waveforms enables multistatic experiments with a number of orthogonal transmitter systems even in continuous wave mode.

Closeup of the receiver system

Experimental radar setup in Koblenz with the team members
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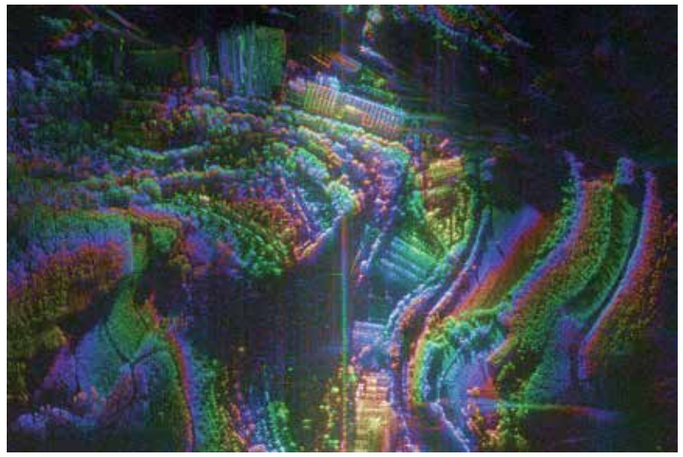

Focused Radar image of the village of Dreis Tiefenbach acquired at the University of Siegen

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