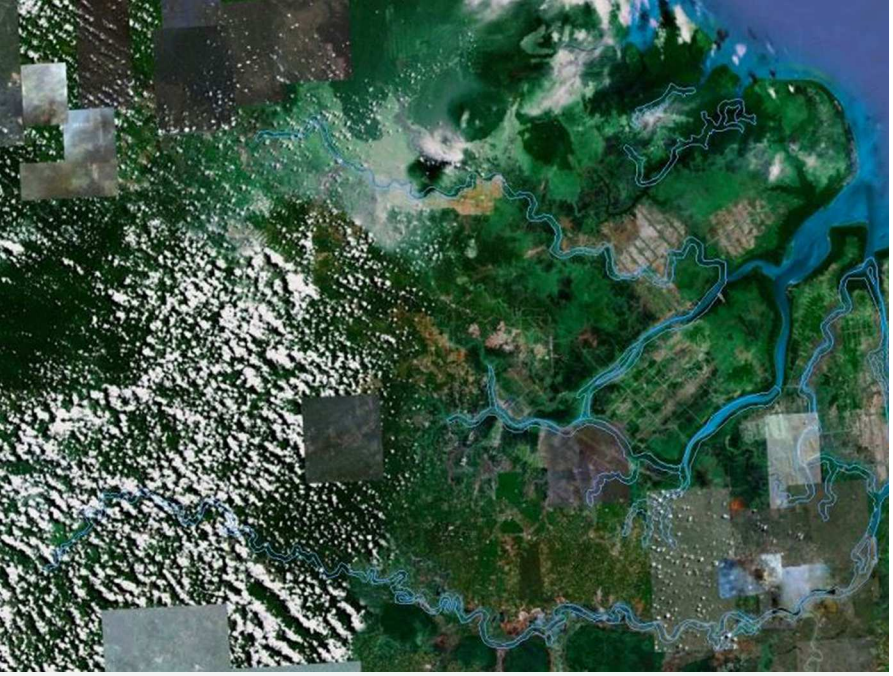


National Aeronautics and
Space Administration

technology solution

Optics

Digital Beamforming Interferometry

Dividing a single antenna into two antennas

Synthetic Aperture Radar (SAR) is a sophisticated form of radar that implements a single antenna to successfully scan a target area, store the received signals, and coherently process the signals to resolve elements in an image of the target area. Interferometric SAR (InSAR) uses two or more SAR images to generate three dimensional maps of surface deformation or digital elevation using phase difference information. InSAR is commonly implemented with SAR systems in a repeat pass platform configuration where two SAR images are generated during each of the passes, and an interferogram between the two images provides the desired "height" measurement, or in a single pass configuration where the SAR system uses two separate antennas are used to generate the interferogram.

NASA Goddard Space Flight Center has developed a new approach that uses a single phased array antenna and a single pass configuration to generate interferograms.

BENEFITS

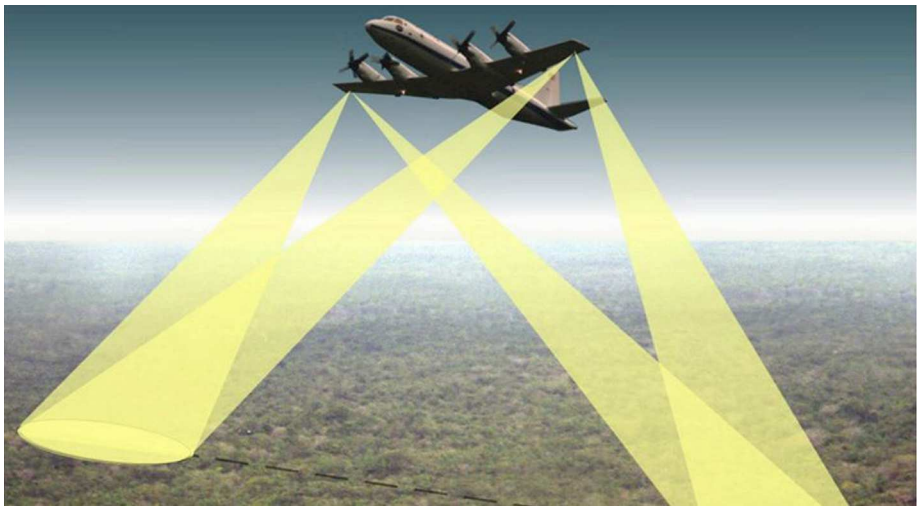
- Simple design: reduces complexity inherent in typical systems
- Powerful and Extensive: capable of fine resolution measurements
- Doubles coverage area: able to synthesize beams on both sides of the track
- Effectively turns one nadir looking antenna into two

THE TECHNOLOGY

NASA Goddard Space Flight Center (GSFC) has developed a new approach that uses a single phased array antenna and a single pass configuration to generate interferograms, known as Digital Beamforming Interferometry. A digital beamforming radar system allows the implementation of non-conventional radar techniques, known as Digital Beamforming Synthetic Aperture Radar Multi-mode Operation (DBSAR).

DBSAR is an L-Band airborne radar that combines advanced radar technology with the ability to implement multimode remote sensing techniques, including several variations of SAR, scatterometry over multiple beams, and an altimeter mode. The Multiple channel data acquired with a digital beamformer systems allows the synthesis of beams over separate areas of the antenna, effectively dividing the single antenna into two antennas. The InSAR technique is then achieved by generating interferograms from images collected with each of the antennas. Since the technique is performed on the data, it allows for synthesizing beams in different directions (or look angles) and performs interferometry over large areas.

Digital Beamforming Interferometry has potential in many areas of radar applications. For example, NASA GSFC innovators developed the first P-Band Digital Beamforming Polarimetric Interferometric SAR Instrument to measure ecosystem structure, biomass, and surface water.



EcoSAR: P-band Digital Beamforming Polarimetric Interferometric SAR

APPLICATIONS

The technology has several potential applications:

- Many areas of radar applications
- Enables InSAR measurements using single antenna radars

PUBLICATIONS

Patent No: 9523768; 9523768

More Information

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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GSC-TOPS-22