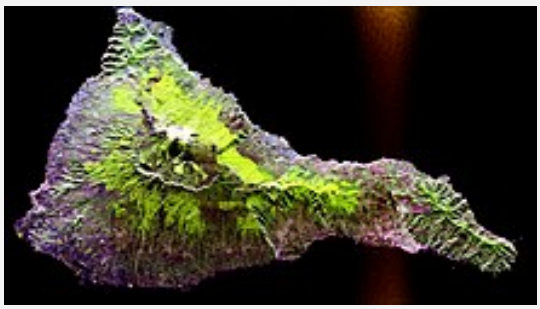
SYNTHETIC APERTURE RADAR

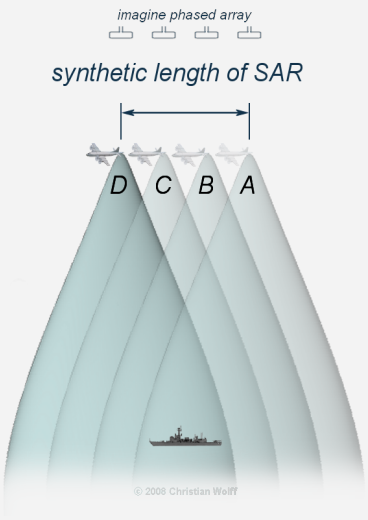
Team Wiley

INTRODUCTION



Synthetic Aperture Radar (SAR) is a form of radar used to create images of an object, such as a landscape. SAR provides finer spatial resolution than is possible with conventional sweep beam radars. *(Beside, an image taken with a SAR.)*

OPERATING PRINCIPLES



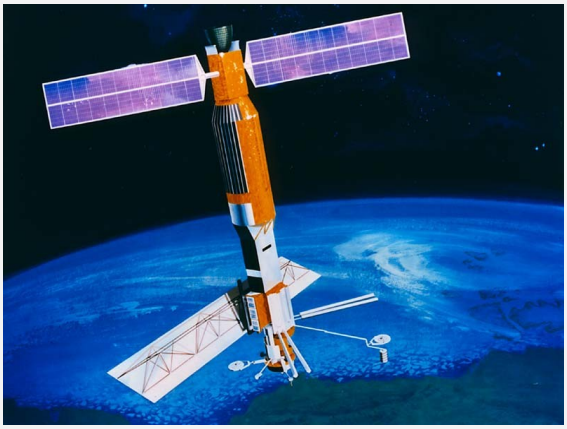
Synthetic aperture radar systems use beamforming to direct the signal in a direction perpendicular to the path the system is traveling. So what does this mean? The radar moves around the surface, using the antenna's movement over the target area to simulate the effect of several antennas, creating a kind of panoramic image; this is what is meant by the term "synthetic" opening. This technology can create highly detailed two-dimensional and three-dimensional images of landscapes.

An SAR satellite forms images from the echoes of electromagnetic signals sent by its antennas. These SAR images are used to study the changing shape and properties of the Earth's surface and therefore can be valuable for a wide variety of applications, like forest fire monitoring, flood mapping and understanding earthquakes. However, SAR technology and its family of powerful techniques such as interferometric SAR (InSAR), polarimetric SAR (PolSAR), and polarimetric interferometric SAR (PolInSAR) are complex and can be difficult to explain to the public.

APPLICATIONS

Synthetic Aperture Radar (SAR) satellites provide images independent of sunlight and are unaffected by cloud cover. The European Space Agency's Sentinel-1 satellites, the Canadian Space Agency's Radarsat Constellation Mission and the Japan Space Agency's Advanced Earth Observation Satellite 2 (JAXA) are some examples of current SAR missions. In addition, the NASA-Indian Space Research Organization (NISAR) SAR mission and JAXA's ALOS-4 will be launched shortly, and many commercial satellite companies are beginning to provide SAR data as well.

RADAR BENEFITS



Synthetic Aperture Radar is fast becoming a key dataset in geospatial investigation. Unlike many other observation methods, SAR is not limited by lightning or cloud cover. In recent years, due to an increasing number of orbital SAR instruments - and more to come - there has been a significant increase in data quality and availability, requiring the evolution of the processing software.

As a result, automated SAR-based analytical workflows can now be run at scale to solve problems across a wide range of disciplines, including disaster preparedness and response, urban development and land use, agriculture, change detection and land monitoring and at sea.

As a general rule it can be assumed that the larger the aperture, the higher the resolution of the image becomes, regardless of physical or synthetic aperture - this allows SAR to create high resolution images with relatively small physical antennas.

BUT WHAT IS THIS "SAR" FOR?

An SAR satellite forms images from the echoes of electromagnetic signals sent by its antennas. These SAR images are used to study the changing shape and properties of the Earth's surface and therefore can be valuable for a wide variety of applications, from forest fire monitoring, flood mapping, understanding earthquakes to glacier displacement. Thanks to one of these radars, you can sit on the couch reading this document without worrying about a possible surprise earthquake.