# SAR Image for remote sensing

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## Abstract

***Radar was developed to detect objects and determine their range (or position) by transmitting short bursts of microwaves. Radar senses electromagnetic waves that are a reflection of an active transmission; radar is considered an active remote sensing system. Passive remote sensing refers to the sensing of electromagnetic waves which did not originate from the satellite or sensor itself. The sensor is just a passive observer Also, microwaves can penetrate light rain, clouds and be used to detect sea ice during the day and night, regardless of cloud cover. Radar interferometer is a technique that enables digital elevation mapping of Earth's surface. This paper is to understand the radar signal of SAR for remote sensing.***

**Keywords:** *SAR Images.Interferometry, Soil moisture remote sensing.*

## 1.Introduction

RADAR stands for RAdio Detection And Ranging. Figure 1 as shown above A radar is essentially a ranging or distance measuring device. It consists fundamentally of a transmitter, a receiver, an antenna, and an electronics system to process and record the data.The transmitter generates successive short bursts (or pulses of microwave (A) at regular intervals which are focused by the antenna into a beam (B). The radar beam illuminates the surface obliquely at a right angle to the motion of the platform. The antenna receives a portion of the transmitted energy reflected (or backscattered) from various objects within the illuminated beam (C). By measuring the time delay between the transmission of a pulse and the reception of the backscattered "echo" from different targets, their distance from the radar and thus their location can be determined. Radar systems are basically 38 categorized into three classes: imaging radars, scatterometers, and altimeters. Imaging radar is the most commonly used radar in remote sensing application.Scatterometers and spaceborne altimeters are used for specialized application such as wind measurements at sea and monitoring of ocean respectively.Imaging radar is an active illumination system,

Synthetic Aperture Radar (SAR): SAR is a coherent, microwave imaging system that improves radar resolution by focusing the image through a process known as synthetic aperture processing. As the radar moves, a pulse is transmitted at each position. The return echoes pass through the receiver and are recorded in an echo store. The amplitude and phase of the signals returned from objects are recorded in the echo store throughout the time period in which the objects are within the beam of the moving antenna. By processing the return signals according to their Doppler shifts, a very narrow effective antenna beamwidth can be achieved, even at far ranges, without requiring a physically long antenna or a short operating wavelength. The energy of the radar pulse is scattered in all directions at the Earth's surface, with some reflected back to the antenna. The surface's roughness—i.e., the irregularity of the terrain vertically and horizontally—determines the return signal's amplitude. Surfaces can be classified as smooth, slightly rough, moderately rough or very rough. Bright areas in a SAR image are strong reflec- tors, such as buildings in urban areas, while dark parts of the image represent surfaces that reflect little or no energy, such as water surfaces or oil film on an ocean. Use of SAR image for Moisture retrival. Recent investigations have indicated that roughness variables estimated on the basis of field measurement data and simulations are very sensitive to profile length [ 2-4]. The collected radar image will provide for direct viewing of vertical profile of radar backscattering through soil volume. By collection temporal sequence of soil moisture changes we will be able to fully understand the behavior of SAR signal both Phase and amplitude.The radar backscattering coefficient in decibels can be written as the sum of two functions : the first one, f (linear), describes the dependence of radar signal on volumetric surface soil moisture, while the second, g (exponential), illustrates the dependence of $\sigma°$ on surface roughness [5-6 ].

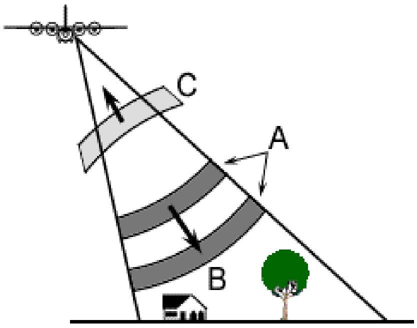


**Figure 1** Radar image.

## 2.METHOD

Interferometric systems use two antennas, separated in the range dimension by a small distance, both recording the returns from each resolution cell. The two antennas can be on the same platform (as with some airborne SARs), or the data can be acquired from two different passes with the same sensor, such has been done with both airborne and satellite radars.

## 3.RESULT AND DISCUSSION

The SAR Image is from sentinel satellites.ESA Euperean space agency.

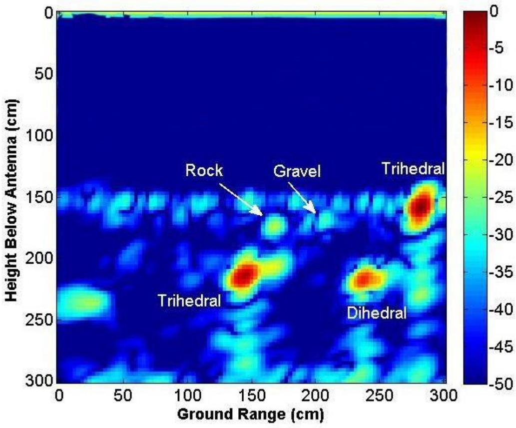


**Figure 2.** Laboratory Radar image of soil detailing the return of from the surface (150cm) and within the volume. The trihedral and dihedral are specially place reference targets.

Figure 2 shown above is radar image of soil which By measuring the exact phase difference between the two returns (A), The phase difference between adjacent resolution cells, is illustrated in this interferogram,.The position of the resolution cell, including its elevation, can be determined. Where colours represents the variations in height. It is usually optically case radar is directly responsible for moisture content of the soil and the brighter return the wet the soil . it directly related to roughness the surface of soil having same soil moisture.

## 4.CONCLUSION

Using Interferometer Technique SAR images benefit to understand existing moisture content and wet on soil surface and used to radar soil model.

## 5.ACKNOWLEDGEMENT

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