CHALMERS

BorealScat

A TOWER-BASED TOMOGRAPHIC AND POLARIMETRIC RADAR EXPERIMENT IN THE BOREAL FOREST

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Introduction

BorealScat is a tower-based radar campaign situated in a hemi-boreal forest site in Remningstorp, Sweden. In this experiment, long-term time series radar data at P-band (435 MHz) and L-band (1270 MHz) will be collected. The aim is to monitor the polarimetric, tomographic and Doppler radar signatures as they vary over time scales ranging from seconds to years in varying environmental conditions. This experiment will provide fundamental information about the electromagnetic scattering mechanisms in boreal forests, which will be beneficial for upcoming space-borne synthetic aperture radar (SAR) missions such as BIOMASS and SAOCOM-CS.

Objectives

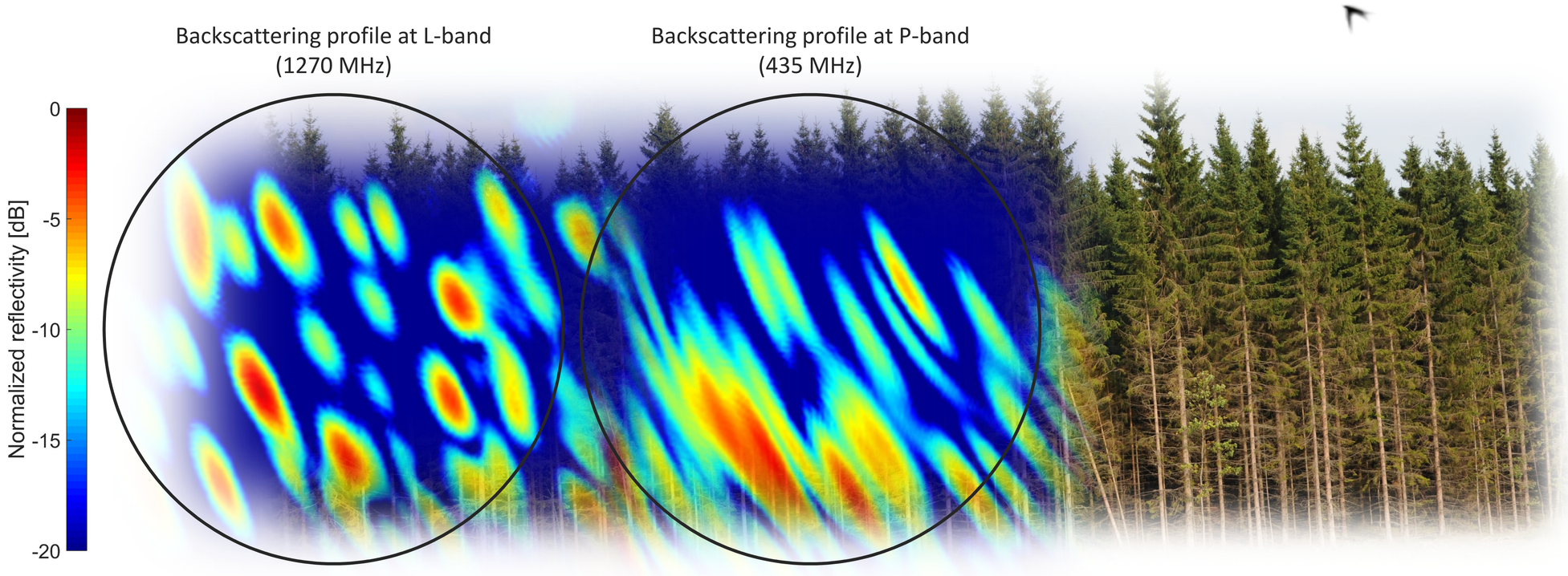
- Investigate how forest electromagnetic scattering mechanisms change over time
- Gain a better understanding of the effects of moisture on radar measurements
- Develop models for the mitigation of these effects in SAR imaging of boreal forests

Instrumentation

- 20-port vector network analyzer
- 20 wideband log-periodic antennas
- Microwave switch matrix for calibration
- Meteorological instruments
- Soil moisture sensors
- Tree stem moisture sensors
- Web cameras

Tomographic antenna array

The 50-m high tower will be equipped with an array of 20 antennas with different orientations. This will allow reconstructions of vertical backscattering profiles of the forest (see figure below) for all polarimetric combinations. These backscattering profiles will be used to investigate height-dependent changes in the forest. The array allows unambiguous imaging up to L-band while minimizing mutual coupling between the antennas and limiting the backscatter contribution of the tower.



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