L-BAND MEASUREMENTS OF BOREAL SOIL

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1. INTRODUCTION

Soil moisture is an important parameter in climate models, since it affects the surface energy balance and exchange of water between land surface and atmosphere. The European Space Agency (ESA) launched the SMOS (Soil Moisture and Ocean Salinity) satellite on 2 Nov 2009 with a purpose of measuring soil moisture globally and frequently. The single payload of SMOS is the first space-borne microwave interferometric radiometer, MIRAS (Microwave Imaging Radiometer using Aperture Synthesis). As a part of the calibration and validation activities of SMOS mission, ESA has deployed three Elbara-II [1] instruments in Spain, Germany and Finland. The Arctic Research Centre of the Finnish Meteorological Institute (FMI-ARC) in Sodankylä, Finland, hosts one of the Elbara-II instruments in a round-the-year campaign.

Several studies of soil brightness temperature have been published recently, e.g. [2-3], focusing on different soil types. Here we present the first autumn and winter of Elbara-II measurements, and concentrate on the freezing and thawing effects of soil.

2. DATA AND METHODOLOGY

Elbara-II is a dual polarized L-band (1.4 GHz) radiometer manufactured by GAMMA Remote Sensing, Switzerland. In FMI-ARC it is mounted on a 5-m observation tower and monitors the soil with incidence angles of 30º-70º every three hours. Close to the tower, a snow depth, an air temperature and several soil moisture and temperature sensors have been installed. In 180 m distance, soil moisture and temperature profile and also snow temperature profile are measured at every 10 cm. There are also numerous other manual and automatic reference measurements on the FMI-ARC area.

Figure 1: Elbara-II mounted on a 5-m tower (in home position between measurements).

In this study we present the first results of the Elbara-II measurements during winter 2009-2010. The acquired data set enables monitoring of soil freezing during autumn and thawing in spring with both microwave remote sensing and buried in-situ sensors.

3. RESULTS

The relationship of brightness temperature to soil and snow parameters is investigated. As an example, Figure 2 presents the brightness temperature at 55º incidence angle against soil moisture at 2 cm depth in September and October before first snow.

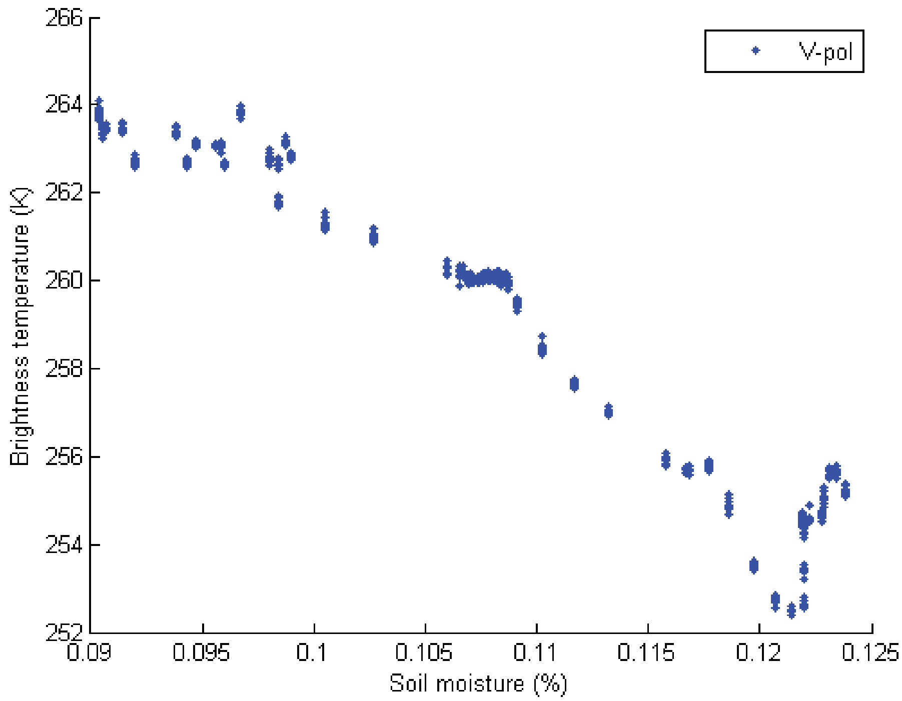

Figure 2: Elbara measurements at 55° incidence angle vs. soil moisture at 2 cm depth before first snow.

4. REFERENCES

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