

THE RESULTS OF PRELIMINARY MEASUREMENTS OF SNOW AND WATER ICE MICROWAVE REFLECTION AND EMISSION ANGULAR DEPENDENCES AT 5,6GHZ

Astghik K. Hambaryan, Artashes K. Arakelyan, Hrant G. Muradyan, Vanik V. Karyan, Gagik G. Hovhannisyanyan, Arsen A. Arakelyan, Melanya L. Grigoryan, Izabela K. Hakobyan, and Mushegh R. Manukyan

ECOSERV Remote Observation Centre Co. Ltd.
2 G.Njdeh Str., #24, Yerevan, 0006, Armenia
Phone: (374 10) 421 877 / 425 088; Fax: (374 10) 421 877 / 440 566;
E-mail: arakelyanak@yahoo.com, ecoservroc@yahoo.com

In this paper preliminary results of simultaneous and spatially collocated measurements of soil snow cover and experimental pool water surface ice and snow covers microwave reflective (radar backscattering coefficient) and emissive (brightness temperature) characteristics angular dependences at 5,6GHz will be represented. For the measurements a C-band, dual polarization, combined scatterometer-radiometer system were used. The structure and operational features of the utilized system will be discussed in the paper too. The main characteristics of the C-band, dual polarization, combined scatterometer-radiometer system are:

Central Frequency - $\sim 5,6\text{GHz}$;
Radar Pulse duration - $\sim 25\text{ns}$
Radar pulse power - $50\text{mW} - 1\text{W}$
Polarization:
 radar channel - "vv" and "vh" or "hh" and "hv"
 radiometric channel - "v" and "h"
Radar receiver's bandwidth - $\sim 40\text{MHz}$;
Radiometer receivers bandwidth - $\sim 600\text{MHz}$;
Parabolic antenna with a beamwidth -5° ;
Radar receivers noise factor - $\sim 2\text{dB}$;
Radiometer receiver's noise factor - $\sim 250\text{K}$;
Radar channel's sensitivity at 1s - $\sim 0.1\text{dB}$;
Radiometer Channel's sensitivity at 1s - $\sim 0.15\text{K}$.

The principal peculiarities of the utilized device are its originality in spatio-temporally combining of functionality of microwave active-passive channels of observation under short range sensing application condition. The minimum operational range for the system's scatterometer is 5m, at a far zone condition of sensing. The system has as well middle (50-300m)

and long distance (150-1500m and more) application features. These features allow to use the system from a vessel and an aircraft.

The measurements of soil snow cover's and experimental pool water ice cover's microwave emission and reflection characteristics were carried out in the ECOSERV ROC Company's experimental site, from a stationary, quarter-circle shaped measuring platform of 6.5m of radius. This measuring complex allows to carry out angular measurements of the observed surfaces microwave active and passive characteristics under quasi-field, controlling laboratory conditions. The measuring platform allows simultaneously research angular dependences of microwave reflective and emissive characteristics of the same area of the observed surface, under various polarizations of scatterometer and radiometer signals. The measurements were carried out under various snow moisture and temperature, snow and ice thickness, ice temperature, water and air temperatures, surface roughness and melting parameters, snow and ice covers' and densities, etc.

The methodology of experiments' performance and field calibration of the measuring system and the measured results will be discussed in this paper. Relationships between soil snow cover's and experimental pool water surface ice and snow cover's radar backscattering coefficients, brightness temperatures and the observed surfaces parameters will be built, under various conditions of observation (angle of incident and polarization), moisture, surface and air temperatures, density and thickness and surface roughness parameters. As well as correlative properties between soil snow cover's and water surface ice-snow cover's radar backscattering coefficients and brightness temperatures due to the change of observed surface structure, density, moisture, surface and air temperatures, roughness and melting parameters will be presented.