ELECTROMAGNETIC REFLECTION FROM MULTI-LAYERED MODELS

By WILLIAM I. LINLOR
(NASA–Ames Research Center, Moffett Field, California, U.S.A.)

ABSTRACT. The remote sensing of snowpack depth, density, and wetness with an airborne system would have important applications in water resource management and flood prediction. In this paper, the electromagnetic response of multi-layered models is analyzed. Normally-incident plane waves are assumed at frequencies ranging from 10^6 to 10^{10} Hz, and reflection amplitudes are calculated for models having various layer combinations. Each layer can have arbitrary thickness, and its own dielectric constant and conductivity, each of which can vary with frequency. Thus "lossy" media as well as "perfect" dielectrics can be employed in the models. An outline of the theory for the calculations is presented for an *n*-layered model. Because of the complexity of the equations, interpretation is accomplished by illustrative models, selected from seven snow types and seven earth types. The objective of this type of calculation is to establish the dependence of the reflection coefficient on the impedance transitions between two half-spaces. This paper is a theoretical study only, and does not include consideration of the size, weight, estimated cost, and other physical attributes of a flight system. These, and other matters of a practical nature, are being treated in other papers.

A revised version of this paper is being published in full in another issue of the *Journal of Glaciology*.

DISCUSSION

M. V. BERRY: Your theoretical treatment neglects wavefront curvature, interface undulations, and bulk inhomogeneities. To what extent do these effects threaten the applicability of your proposed method?

W. I. LINLOR: For typical snow packs the radiation wavelength is greater than the snowpack depth so the roughness should be no great problem. A treatment including curved waves would be rather complicated, but should be done for practical situations. In principle, the treatment is similar to the plane-wave case.

AN EXPERIMENT IN ICE PROFILING IN NARES STRAIT AND THE ARCTIC OCEAN

By R. T. LOWRY
(Defence Research Establishment Ottawa, Ottawa, Ontario, K1A 0Z4, Canada)

ABSTRACT. This paper discusses the work being done at the Defence Research Establishment Ottawa (DREO) on profiling of Arctic sea ice using airborne laser profilometers. Data from a flight in March 1973 have been partially analyzed and some results are presented. These include representative ridge counts and power spectra for chosen areas in Nares Strait and the Arctic Ocean. Some work has been done to try to improve the operation of the laser profilometer using real-time data processing. The basic ideas behind this scheme are outlined.