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SIR, *Reply to Mr J. G. Paren's comments on "Dielectric relaxation in temperate glaciers"*

Paren (1968) has formulated the theory for my capacitance measurements made with two wires laid on a glacier surface (Gribbon, 1967). He pointed out the difficulties in sampling the ice properties deep inside the glacier in the presence of high d.c. conductivity, and concluded that the wires tended to provide information on the snow close to their surface and could not detect any discontinuity within the glacier readily.

His conclusions are confirmed by further measurements made by W. T. Band, D. T. Meldrum, R. M. Nisbet and myself during the 1967 University of St Andrews expedition to Upernivik Ø (lat. 71° N., long. 52° W.) when we found that our fixed buried wire systems of separation $b = 0.2$ m and $b = 20$ m placed just below the surface of a soaked facies *névé* layer overlying glacial ice to a depth of 1.5 m gave identical results. If the wide wires had sampled below the *névé*–ice discontinuity, the apparent relaxation frequency f_m would be different from that for the close wires but no difference was detected between the time-averaged apparent relaxation frequencies of the two wire systems.

For comparison we also used a parallel plate capacitor imbedded at different depths in the layer and found similar f_m values to those measured with the wires. In this simple geometry we found that both f_m and f_r (the relaxation frequency defined for a conductivity equal to the mean of the static and high frequency conductivities) depended on the depth of the capacitor, with a minimum f_r value occurring at a region of high conductivity snow at its melting point. Higher ϵ' and ϵ'' values were found with wet snow than with the same sample frozen, indicating that surface conduction rather than bulk conduction effects influenced the wet snow results markedly. However, the wire measurements were insensitive to these localized effects and could not detect any depth variations so lending further support to Paren's conclusions on the validity of the wire measurements.

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