MEASUREMENT METHOD OF TEMPERATURE DISTRIBUTION BY RADAR ECHO WITHIN THE ICE SHEET OF THE ANTARCTIC CONTINENT (ABSTRACT)

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The picture processing based on a correlation method for radar echo has been used in meteorological observation, traffic control, probing, and so forth.

But in recent years, a more accurate measurement method is required, for the following purposes: 1) Measurement of precipitation rate and determination of the kind of precipitation that are needed for analysis of the electro-magnetic wave propagation. 2) Measurement of temperature distribution within the ice sheet of the Antarctic Continent. 3) Measurement of the concentration of air pollution, and size distribution of pollutants, and determinations of the kind of pollution. 4) Probing of meteorites within the ice sheet of the Antarctic Continent. 5) Measurements of the pollution at the sea surface, the height of sea waves, the temperature of the sea surface, the water content of soil and the water vapor content of the atmosphere. 6) Other measurements.

The important factor in this analysis, is the dielectric constant within the ice sheet influencing attenuation and reflection coefficients which are related to depth, temperature and density of the ice sheet. So, we have assumed the density profile equivalent in character to Site II data, and calculated the temperature profile of the ice sheet using the radar echo. It has been revealed that the analysis with the radar echo of only one frequency cannot lead to a general solution, and that in order to obtain the temperature profile we need to know the surface temperature of the ice sheet. The present paper discusses the measurement method with active radar echo for the purpose of 2). In this case, the radar echo have contained some parameters (the density, the dielectric constant and the wave length).

So, the analysis with radar echo of two frequencies cannot always lead to the general solution, but the case of three frequencies can lead to the general solution with no assumption.

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A PROBING RADAR DESIGNED FOR SIMULATION OF RADAR ECHO OF A METEORITE WITHIN THE ICE SHEET OF THE ANTARCTIC CONTINENT (I) (ABSTRACT)

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We have simulated echoes from meteorite by means of a probing radar. Its purpose is to probe meteorites within the ice sheet of the Antarctic Continent.

The simulation is based on the following assumptions. 1) We have used temperature and density distribution within the ice sheet model with reference to measured and theoretical values near Syowa Station. 2) There are no cracks within the ice sheet. 3) We have considered a meteorite with one meter radious and a rock of a globular or a plane shape. 4) The dielectric constant of meteorite is approximated to the value of a medium-dry ground according to the CCIR data. 5) The antenna, set up one meter above the ground, has a gain of 8 dB. 6) The radar range used in the analysis is every 50 m within the ice sheet.

As a result, we have succeeded in developing the program for simulation of the probing radar echo. This paper explains the relation between the gain of receiving system or the shape of reflective matter and the probing ability.

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BOTTOM TOPOGRAPHY AND INTERNAL LAYERS IN EAST QUEEN MAUD LAND, EAST ANTARCTICA FROM 179 MHZ RADIO ECHO-SOUNDING (ABSTRACT)

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Extensive echo-sounding has been conducted in East Queen Maud Land during the 1984 field season. A 179-MHz radar with separate transmitting and receiving antenna was equipped and the echoes were recorded in a digital system to detect minute reflections. The results revealed the cross-sections of the ice sheet along traverse routes from 69° to 75°S. Detailed observations on the ground at Mizuho Station have shown the elliptical polarization in internal reflected echoes observed when two antennas, kept in parallel with each other, were rotated horizontally. The internal echoes were most clearly distinguished when the antenna azimuth was oriented perpendicular to the flow line of the ice sheet. The internal echoes of high reflection coefficient were detected at the depths of 500–700 m and 1000–1500 m at Mizuho Station. Since a distinct internal echo at the 500-m depth coincides in depth with a 5 cm thick volcanic ash-laden ice found in the 700 m ice core taken near the observation site, these echoes may correspond to the acidic ice layers formed by the past volcanic events in East Queen Maud Land.

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