DISCRETE PROPERTIES OF QUASI-LIQUID WATER FILM IN THE ICE PREMELTING RANGE. 1. TEMPERATURE DEPENDENCES OF WATER NANOFILM THICKNESS AND VISCOELASTIC PROPERTIES OF POLYCRYSTALLINE ICE

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S u m m a r y

Peculiarities in the temperature dependences of the properties of quasiliquid water films on the surface of ice crystallites have been studied experimentally under ice premelting conditions. Viscoelastic properties of polycrystalline ice in the temperature interval from −60 to 20 °C have been analyzed. Peculiarities in the temperature dependences of the water nanolayer thickness, $L(T)$, and the imaginary part of the shear modulus (modulus of viscous losses), $G_2(T)$, are found. Quasiequidistant temperature variations of the viscous loss modulus are revealed for the first time. A comparison of the results obtained with literature data on the temperature dependences $L(T)$, the density of water in nanolayers, and the ice surface roughness allowed us to associate the observed features with a discrete cluster structure of quasiliquid water nanofilms. Temperature intervals of the enhanced stability for a cluster structure of water nanofilms are revealed, which manifest themselves in the form of extrema in viscoelastic ice parameters in the premelting interval. The interrelation between the phenomena of ice premelting and temperature discretization at the melting in ice nanolayers is considered for the first time.