ИНСТИТУТ ГЕОЭКОЛОГИИ им. Е. М. СЕРГЕЕВА РАН (ИГЭ РАН)

ГЕОХИ

Rapid Arctic Transitions due to Infrastructure and Climate (RATIC)

RAPID ARCTIC TRANSITIONS DUE TO INFRASTRUCTURE & CLIMATE — RATIC

Influence of the climatic factor on the mechanical properties of frozen soils (region of the Yuribey river, Yamal Peninsula)

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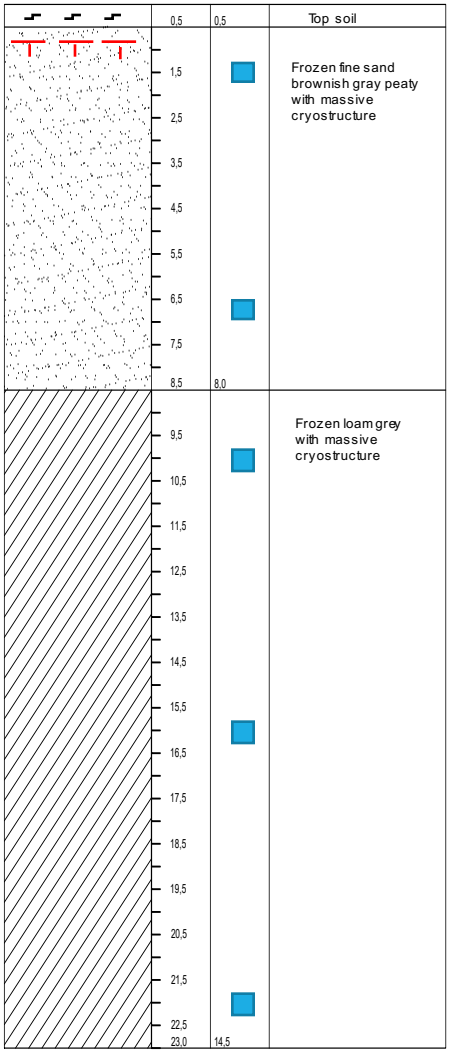
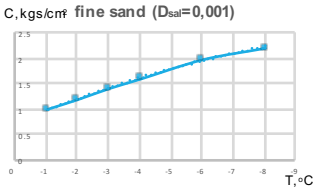
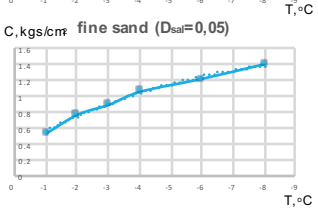
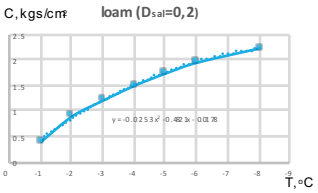
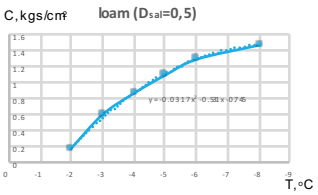
Throughout the existence of the Earth, cyclical climate changes took place: glacial epochs were replaced by interglacial periods. Today, climate warming is abnormally fast, one of the theories explaining global warming is the greenhouse effect. In the arctic regions, an increase in temperature is particularly dangerous due to an increase in, or even thawing, permafrost temperature. The temperature change of permafrost soils affects their structure and as a result their mechanical properties. This paper presents results of the research of the temperature influence on the strength properties of frozen soils of the area near r. Yuribey (middle Yamal). Strength properties (cohesion) determined by triaxial shear test at temperatures from -1 to -8 ° C.

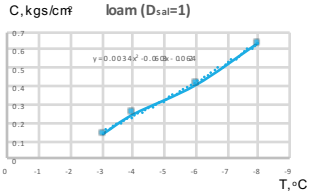












Triaxial shear test equipment

1. cooling chamber; 2. thermostat; 3. volume load system generation and strain measurement system; 4. compressor; 5. registration unit; 6. power supply; 7. uninterrupted power supply unit; 8. computer.

When soil freezes cryogenic concentration occurs as a result of which salinity increases from top to bottom along the section from 0.01 to 1%. Along with increasing salinity down the section decreases the magnitude of cohesion. As a result of cryogenic concentration at a depth of 20-23 m, cryopeg formed, soils in the cryopeg zone have salinity of 1%, and the minimum cohesion value appears at a temperature of -3 ° C.

Results

Research results show patterns of cohesion change with increasing temperature and increasing salinity in loam and in fine sand. In the fine sands with an increase in salinity from 0.01 to 0.05, the cohesion decreases by half at a temperature of -1 ° C. Loams with a salinity of 0.5% have minimal cohesion at 0.17 MPa at a temperature of -2 ° C, and when the temperature rises -1 ° C almost no clutch.

Thus, the work evaluates the effect of temperature and salinity on the cohesion values of soils in the study area r. Yuribey. The important point is that frozen soils can significantly lose their strength without going into a thawed state.

The obtained data will be used for further experimental studies of the influence of changes in climatic and geocryological conditions on the properties of the permafrost soils of the Arctic zone.