

Basic Principles of Arrangement and Management of Geoenvironmental Monitoring for Permafrost

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The permafrost zone occupies about two thirds of the territory of Russia. The low stability of surface and geological space to outside influences (natural changes of climate, anthropogenic loading) is caused in the permafrost by a high ice content (to 80% of volume) and low negative temperatures (to -16°C). The objects for monitoring in the permafrost are: (1) seasonally thawed layer; a layer of annual thermal turnovers; thickness of perennially frozen rocks; supra-, intra- and subpermafrost waters; cryopegs; ground- and deposit-forming ice; (2) engineering-geological processes and phenomena of a non-cryogenic group; (3) cryogenic and post-cryogenic processes (intensity, forms of manifestation, degree of territory affectedness); (4) natural landscape complexes (facies, tracts, localities, landscape provinces); (5) anthropogenically formed geological bodies. Thermal and moisture regime of rocks is determined by the following fast-changing parameters: moisture, temperature, depth of thawing/freezing, heat fluxes. Cryogenic geological processes are characterized by the parameters of thermal-moisture regime of rocks and groundwater, parameters of the cryogenic process itself and natural objects.

A reference geocryological monitoring network includes stations, profiles, observation posts, boreholes, fixed points. By the beginning of 1990s the network of geocryological stations has begun to be installed in the European North-East, Northern West Siberia, Central Yakutia, and in the South of Siberia; the stationary hydrogeological network in the permafrost is localized.