



Results of surface heat balance and active soil layer observations at the Tiksi Hydrometeorological Observatory and the Research Station “Ice Base “Cape Baranova”

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Based on meteorological measurements collected from 2013-2016 at HMO Tiksi and the Bolshevik Island, estimates of the components of the surface heat balance have been calculated. A number of methods which utilize different parameterizations and measurement strategies are compared. A description is provided of methods for determining turbulent heat fluxes that use recently developed parameterizations of the turbulent energy-mass transfer processes. Results are presented showing a remarkably large range between the magnitude and sign of the latent heat fluxes that occur during the summer; these appear to result from the specifics of the atmospheric humidity in the near surface layer as well as the characteristics of the underlying soil at the two sites.

A comparison of temperature regimes of the active soil layer measured at four different areas of the tundra in HMO Tiksi region shows significant differences for sites separated by no more than 1 km and influenced by common atmospheric conditions. Differences between tundra areas covered by vegetation and tundra areas with shale (typical also for the Bolshevik Island) is clearly evident. In rocky areas the amplitude of seasonal temperature variation has twice the magnitude and the duration of the zero curtain effect (a measure of the energy transfer between the atmosphere and underlying surface) is attenuated by a factor of 3-7 times.

To provide context for the direct observations the active layer temperature structure and thaw depths for the sand/gravel/clay soils observed at Tiksi and the Bolshevik island are modeling and trends are calculated for 1950-2012.

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