Study of the lake size-distribution in the West-Siberian permafrost based on integration of data from satellite images of medium and high resolution

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The methodological issues of synthesizing two histograms for the distribution of lake areas are briefly considered, one of which is obtained from medium resolution images, the other is from high-resolution photographs on a limited set of test sites in the study area. For the construction of histograms, the images of the medium resolution of LandSat-8 and high-resolution images of Kanopus-V, BKA and Alos were used. Remote studies on high resolution images were carried out on 66 test sites, located fairly evenly in the territory of the permafrost zone of Western Siberia. As a result, a synthesized histogram of the lake size-distribution in a very wide range of their sizes from 50 m^2 to 20,000 hectares has been obtained. Statistical analysis showed that the empirical lake size-distribution, according to the Pearson criterion, corresponds to the lognormal distribution law with probability 0.99. The parameters of the lognormal distribution law of lake areas were determined from empirical data. Relationship between the cumulative frequency (the number of lakes versus lake area) of lakes and the lake surface area for the whole territory of West Siberian lowland (WSL) is represented as the size-distribution graph on figure (this study, solid red line 1), in comparison with lake distribution in Sweden (solid blue line 2, Cael and Seekell, (2016)) and in the world (solid violet line 3, Cael and Seekell, 2016). The dotted and dashed lines represent power law approximation of western Siberia (red line 4), Sweden (blue line 2) and the whole world (violet line 6). As can be seen from the figure, the power law of distribution gives a significant excess of the number of lakes in comparison with the lognormal law in the range of small lakes.

Keywords: remote sensing, permafrost, lake, size-distribution, satellite images