



Water level and ice monitoring of large and middle-sized lakes of Russia

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Studying of water level and ice cover of large and medium sized lakes are of interest because they represent natural reservoirs of fresh water and are associated with human economic activity. Moreover, the water level variations and ice cover duration are important indicators of climate changes. In addition to in situ observations satellite methods of monitoring have certain advantages connected with the global coverage, instantaneous observations of large water areas and relatively low cost. However, the use of satellite methods for inland waters is often difficult because of their spatial resolution comparable to or greater than the size of water reservoirs. Remote sensing with high spatial resolution is often associated with a large repeat period of data (ICESat), or with a significant dependence of the quality of data on weather conditions (Landsat). In this regard, the use of Jason -2 satellite equipped with dual-frequency (13.6 GHz and 5 GHz) radar altimeters and passive three-frequency (18, 21 and 37 GHz) microwave radiometers is of interest, because the footprint diameter of their altimeters in Ku-band is about 10 km and the repeat period of observations is ten days, that make it suitable for observations of large and medium-sized inland waters.

In this work we use the data of three mentioned above satellites to determine the water level variations and ice-cover régime of 8 lakes in Russia, water areas of which are intersected by the tracks of these satellites. Variations in water level is calculated on the base of retracking method [1] taking into account the fact that the waveforms of altimetry pulses of satellites Jason-2 and ICESat are distorted due to the influence of land. Satellite data are compared with available in situ observations and the correlation coefficient with in situ observations is calculated. The ice regime of lakes is determined using a new method [2] based on the analysis of the difference between the brightness temperatures of land and water in summer and winter periods. For validation of this method visual images of the lakes from Landsat satellites and in situ data are used.

[1] Yu.Troitskaya et al., "Adaptive retracking of Jason-1 altimetry data for inland waters: the example of the Gorky Reservoir", Int. J. Rem. Sens., vol. 33, pp. 7559-7578, 2012.

[2] Rybushkina G., Troitskaya Yu., Soustova I., "Ice and snow regimes of the Volga River reservoirs on the base of Jason-1,2 satellite observations", Living Planet 2014 Symposium, Edinburg (UK), 9-13 Sept., 2013.