



Climate change and modification of the inland water bodies ice regime in the moderate climatic zone

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Problems of the modification of ice parameters and ice regime features in the large lakes and other inland water bodies situated in the moderate climatic zone are studied by using multi-spectral remote radar and passive microwave data. The analysis of ERS/RADARSAT/Envisat SAR images is based on the results of long-term studies of the thermal structures and peculiarities of their variability in fall-winter hydrological seasons, on calculations of heat supply of lakes. 1993-2007 NERSC/NIERSC SAR archive and materials of sub-satellite experiments onboard research aircraft are used. Shipborne and in situ observations and measurements were used for validation of multi-level data. The thematic interpretation of satellite data shows that SAR signature of ice could be applied as a tracer of various natural processes and phenomena, including climatically and ecologically important ones. Dependence of winter hydrology and ice formation from the type of winter severity and climate change was assessed instrumentally. Seasonal variability of ice and water exchange between the “basin” of large lakes and gulfs due to variability of the wind parameters - intensity and direction - is studied. Satellite radar survey allows produce subsurface sounding of snow and ice and provides classification of signatures of ice and detects phase change of freeze-up in nowadays. Studies of winter hydrology, ice dynamic and regional features of currents and under the ice circulations, study of its present-day modification owing to climate change are based on the series of consecutive SAR observations. Revealed the vortex structure during the open water and ice season allows assessing the scale of

self-clearing phenomena and fixing natural forcing of the ice in the Ladoga and Onega lakes in RF, as well in the Sevan Lake in Armenia and other large lakes and reservoirs situated in the moderate climatic zone of the former USSR. Long-term satellite radar observations allows to reveal the thinning of ice in nowadays and growth the number of fractures, polynyas and openings in ice as well intensification of rafting, ridging and humocking of ice. Applying of satellite radar and passive microwave data allows to fix documental other dangerous ice phenomena and its strengthening, including origin of “ice river” and formation of vast zones of rotten ice in the Pskov-Chudskoye Lake. Study of annual modification of SAR “portrait” of the Ladoga Lake and Lake Teyloye (NW part of RF) allows authorize rotten ice formation with the seiche phenomena and connect its scale with the modification the type of atmospheric circulation during the mild fall-winter season.