The ice regime of Lake Baikal from historical and satellite data: Relationship to air temperature, dynamical, and other factors

Kouraev, Alexei V., Sergei V. Semovski, Michail N. Shimaraev, Nelly M. Mognard, Benoît Legrésy, Frédérique Rémy

Limnol. Oceanogr., 52(3), 2007, 1268-1286 | DOI: 10.4319/lo.2007.52.3.1268

ABSTRACT: We give an overview of the history of the ice cover studies in Lake Baikal and a detailed description of the temporal and spatial variability of Lake Baikal ice conditions based on satellite and historical data. We analyze the long-term evolution of ice conditions using historical data and recent observations from satellite altimetry and radiometry for 1992-2004 for northern, middle, and southern Baikal. These data show a recent (since the 1990s) tendency for colder winters, with earlier ice formation, later ice break-up, and ice duration increase. These observations are in agreement with the long-period cycles of air temperature variability (warming between the 1970s and 1990s, with a cooling phase afterwards). We then compare air temperature data from meteorological stations to ERA-40 reanalysis and suggest that ERA-40 data can be used to assess seasonal and interannual changes of air temperature for Lake Baikal. The ERA-40 data also indicate a recent tendency for colder winters and for warmer summers. We further analyze how the ice regime is influenced by air temperature and how this influence is affected by dynamic (wind field, currents) and other (bathymetry, precipitation, etc.) factors. We estimate the relationship between air temperature parameters and the timing of ice events (ice formation and fast ice duration) and show that air temperature has the strongest effect on the ice regime. Dynamic and other factors interfere with the thermal influence, resulting in a change of ice formation dates and ice duration compared to the relationship that takes into account only the influence of air temperature.

Article Links

Download Full-text PDF

Return to Table of Contents

Please Note