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# Tsunami in Russian inland waters

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Tsunamis and phenomena similar to tsunami occur not only in seas and oceans but also in the so-called internal water basins, rivers, lakes, and other reservoirs. Three strongest tsunamis caused by landslides in Italian artificial water supply reservoirs are known very well: Vajont and Pontesei. One of the events in 1963 that took away about 2000 lives is described well in literature. Wave height in Vajont reservoir reached 235 m. We note that such events occurred in the Alps in prehistorical time. For example, in Lake Lucerne in Switzerland a wave whose height reached 3 m was generated by a landslide. Several cases of tsunamis of seismic origin occurred in Lake Kineret (Israel). Resonance oscillations in Lake Hebden, (Montana) 11.5 long were recorded after an earthquake with magnitude 7.5 and potential tsunami risk in Lake Tahoe in California-Nevada (USA) generated by strong earthquakes is recorded. Finally, we mention tsunamis of volcanic origin in lakes. For example, in 1305, a series of pyroclastic flows descended from Mount Tarawera to Lake Tarawera, which caused tsunami waves reaching 6-7 m on the opposite coast of the lake. Eruption of a volcano near Lake Taal in Philippines generated a 5-m tsunami. Similar events occurred also in Russia. By now we know that nine events were distinguished in different regions of Russia during the period from 1597 to 2006: 1) 1597, Volga River, Nizhniy Novgorod, landslide, Horizontal inundation of 50 m; 2) 1806, Volga River, Kozmodemiansk, earthquake, M = 3.7, “deliberate oscillation”; 3) 1839, Volga River, Syzran, landslide, Water oscillations; 4) 1862, Lake Baikal, earthquake, M = 7.1, Horizontal inundation of 2 km; 5) 1885, Irtysh River, landslide, Wave: 6) 1921, Lake Ladoga earthquake, M = 4.2, Small oscillations; 7) 1959, Lake Baikal earthquake, M = 6.5, Amplitude of 10 cm; 8) 1970, Krasnoyarsk water reservoir, landslide; 9) 1996, Lake Karymskoye, Kamchatka, Volcano eruption, Runup of 30 m. Therefore, the frequency

of their occurrence is approximately 45-50 years (during the last 200 years, tsunami appeared approximately each 25 years). Earthquakes and landslides are equiprobable sources of these events (each cause generated four tsunamis), and one event was caused by a volcano eruption. We should notice that such events can represent a great danger for people. The runup height of tsunami wave in Lake Karymskoye (1996) was about 30 meters. It confirms the existence of tsunami risk in all water reservoirs and the necessity of informing the population about this danger.