Waves generated by landslides in rivers: data of Nizhniy Novgorod region

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Gravity flows have been recognized worldwide as the important source of tsunami waves since 1998 when the underwater landslide generated 15-m wave at the coast taking away more than 2200 lives (McSaveney et al., 2000; Synolakis et al., 2002). In 1999 a shore slump in the Izmit Bay, Turkey generated a 2.5 m high damaging wave (Altinok et al., 2001).

Russian coasts have a reach history of landslides and associated tsunami-like events. Didenkulova and Pelinovsky (2006) collected descriptions and records of phenomena similar to tsunami in Russian internal basins: rivers, lakes, and artificial water supply and showed that landslides and earthquakes are responsible for the main part of the events. According to (Didenkulova and Pelinovsky, 2006) one third of reliable events occurred in the Volga region where the landslide hazard is particularly high. For example, in 1597 the landslide destroyed the Pechersky Monastery located a few km from the Kremlin of Nizhniy Novgorod and slid down into the Volga River causing "terrible waves"; the anchored vessels down the monastery were thrown ashore over almost 50 m (Gatsisky, 2001). The slopes of Volga River in Nizhniy Novgorod region remain dangerous nowadays being the area of repetitive landslides, and among them the landslide occurred on April 13, 2011 when 500 m3 ground slid down. Studying regional characteristics of landslide and associated tsunami hazard and informing the population about possible consequences of visiting the coasts of the basins is necessary.

Tsunami hazard associated to landslide dynamics in Nizhniy Novgorod region is analyzed. Using analytical and numerical models, the estimation of waves generated by landslides reported during 2004-2011 are given; the attempt to establish probabilistic map of their impact in the Nizhny Novgorod region is performed.