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Mass movement deposit and Tsunami in Lake Geneva (Switzerland-France) caused by a rockslide in 563 AD

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Steep continental margins are known to collapse, producing submarine landslides that can generate Tsunamis. At smaller scale, the same can happen in lake basins. Lake sediments are excellent archives of such events. The study of mass movement deposits in lake sediments allows a better knowledge of past natural hazards in intracontinental regions at historic and prehistoric timescales.
In Lake Geneva (Switzerland-France), more than 100 km of high resolution seismic reflection profiles reveal two distinct sequences in the lakes' late Holocene sedimentation history. The first sequence consists mainly of a succession of five large lens-shaped seismic units (A to E), characterized by transparent/chaotic seismic facies with irregular lower boundaries, interpreted as mass-movement deposits. These units are interbedded with parallel, continuous and strong amplitude reflections, interpreted as the 'background' lake sediment. The largest and most recent unit (E) is 5 m thick, covers an area of 50 km2 and has an estimated minimum volume of 0.25 km3, making it the largest sub-lacustrine mass-movement unit in Switzerland. The second sediment sequence consists of 5 m of 'background' seismic facies with parallel geometry, varying at small scale between chaotic/transparent and continuous, high amplitude reflections, which is interpreted as alternating turbidite and hemipelagic layers, respectively.
Four 10 m long sediment cores confirm the seismic interpretation and show that the 5 m thick deposit can be described as a co-genetic debrite turbidite (Talling et al., 2004). Radiocarbon dating of plant macro-remains reveals that the unit E deposit may be linked to the Tauredunum rockslide of 563 AD in Rhone delta area. The induced sediment failure in the Rhone delta triggered a tsunami wave destroying parts of the Geneva Burgudian city and other villages at the lake borders as described in historical records. Numerical simulations, based on the shallow water equations, performed here, confirm that this mass movement would have generated a large Tsunami (about 5 m high) along the lake margins and particularly in Geneva.

Talling P.J., Amy L.A., Wynn R.B., Peakall J., Robinson M., 2004, Beds comprising debrite sandwiched within co-genetic turbidite: origin and widespread occurrence in distal depositional environments, Sedimentology 51, 163-194.

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