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Deposits from the 2004 Indian Ocean Tsunami in three coastal lakes in Khao Lak, Thailand

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Following the 2004 earthquake (Mw 9.3), 160 km west of Sumatra, a destructive tsunami spread across the Indian Ocean, affecting many coastlines. Khao Lak (Phang Nga Province), ∼60 km north of Phuket, was the area of Thailand most heavily hit by the Indian Ocean Tsunami (IOT), as a result of its flat land, low rise buildings, many tourist resorts and lack of shelter. At least two wave arrivals with peak run-up heights of 12-14 m were registered in Khao Lak. The area was inundated up to ∼2 km inland, leaving traces in many different environments. While IOT deposits have been identified and described at several subaerial sites, subaqueous sites remain entirely unstudied. Here, we characterize deposits of the 2004 IOT in a shore-perpendicular transect of 3 coastal lakes in Khao Lak, using short (max. 1.5 m) sediment cores. These lakes, as well as many piles of spoil, are remnants of the area's tin mining history and date back to the last century. They acted as sediment traps during tsunami inundation and were able to preserve a high-resolution record of the 2004 event. Cores were subject to CT scanning, Multi-Sensor Core Logging (MSCL), XRF scanning and grain-size analyses. The overall fining-upward tsunami deposit has a thickness that ranges between 65 cm (ocean-proximal) and 20 cm (ocean-distal), and sharply interrupts fine-grained lacustrine sediments, which display deformation related to the energy of the first wave arrival. The base of the tsunami deposit consists of coarse beach sand and mining gravel. Rip-up clasts of the underlying substrate and organic fragments characterize the middle section, after which a clay cap marks the deposits' upper boundary. Post-event environmental changes are suggested by the shift in background sedimentology and the presence of marine bivalve species, caused by the input of large amounts of salt water.