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A first step in constructing a long multi-lake paleoseismic record in Southern Alaska for revealing the recurrence rate of megathrust earthquakes along the Alaskan-Aleutian subduction zone

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On March 27, 1964, the "Good Friday" Earthquake ruptured an 800 km-long segment of the Alaskan-Aleutian megathrust, representing the largest measured earthquake in North America (Mw 9.2). Recurrence rates of such megathrust earthquakes are typically in the order of hundreds of years. The development of a reliable assessment of seismic hazards evidently requires statistically much more robust earthquake recurrence data. For this, high-quality paleoseismological records are necessary, which are able to extend the historical evidence much further back in time. The current knowledge of the paleoseismicity along the megathrust segment around Prince William Sound is inferred from records of abrupt changes in coastal elevation.

Lake sediments can also produce excellent paleoseismological records. Seismically induced subaquatic landslides generate distinct resedimentation deposits that are interbedded in between the background sediments. During a reconnaissance survey in 2012, we collected short cores and high-resolution seismic data in several glacial lakes in Southern Alaska. The short gravity cores reveal a clear sedimentary imprint of the 1964 Earthquake in different sub-basins of the investigated lakes, and the seismic profiles show the presence of older mass-wasting deposits with similar large volumes. Multiple landslide deposits and associated turbidites at several stratigraphic levels imply that these deposits were also triggered by strong earthquake shaking. The length (i.e. entire Holocene) and high-resolution chronology (i.e. Pb/Cs data reveal that the core laminations represent varves) of the lacustrine record will allow to generate a unique, high-quality dataset of megathrust earthquake recurrences along the Prince William Sound segment of the Alaskan-Aleutian subduction zone.

In winter of 2014, long cores (ca. 15 meters) will be taken at key locations in Skilak Lake, Eklutna Lake and possibly Kenai Lake. Analyzing and dating these sediment cores will make it possible to construct a multi-lake paleo-earthquake record for the last ca. 10000 years, from which an estimate of the recurrence rate, mode and pattern of megathrust earthquakes around the Kenai Peninsula can be inferred. This will be crucial for understanding the seismic hazard of Southern Alaska and in particular the more densely populated city of Anchorage.