Geophysical Research Abstracts
Vol. 19, EGU2017-8357, 2017
EGU General Assembly 2017

Late Holocene paleoseismology of Shuyak Island, Kodiak Archipelago, Alaska - surface deformation and plate segmentation within the 1964 Alaska M 9.2 earthquake rupture zone

Martin Brader (1), Ian Shennan (1), Natasha Barlow (2), Frank Davies (1), Chris Longley (1), and Neil Tunstall (1)

(1) Department of Geography, Durham University, Durham, United Kingdom (m.d.brader@durham.ac.uk), (2) School of Earth and Environment, University of Leeds, Leeds, United Kingdom

Recent paleoseismological studies question whether segment boundaries identified for 20th and 21st century great, >M 8, earthquakes persist through multiple earthquake cycles, or whether smaller segments with different boundaries rupture and cause significant hazards. The smaller segments may include some that are currently slipping rather than locked. The 1964 Alaska M 9.2 earthquake was the largest of five earthquakes of >M 7.9 between 1938 and 1965 along the Aleutian chain and coast of southcentral Alaska that helped define models of rupture segments along the Alaska-Aleutian megathrust. The 1964 M 9.2 earthquake ruptured ∼950 km of the megathrust, involving two main asperities focussed on Kodiak Island and Prince William Sound and crossed the Kenai segment, which is currently creeping.

Paleoseismic studies of coastal sediments currently provide a long record of previous large earthquakes for the Prince William Sound segment, with widespread evidence of seven great earthquakes in the last 4000 years and more restricted evidence for three earlier ones. Shorter and more fragmentary records from the Kenai Peninsula, Yakataga and Kodiak Archipelago raise the hypothesis of different patterns of surface deformation during past great earthquakes.

We present new evidence from coastal wetlands on Shuyak Island, towards the hypothesised north-eastern boundary of the Kodiak segment, to illustrate different detection limits of paleoseismic indicators and how these influence the identification of segment boundaries in late Holocene earthquakes. We compare predictions of co-seismic uplift and subsidence derived from geophysical models of earthquakes with different rupture modes. The spatial patterns of agreement and misfit between model predictions and quantitative reconstructions of co-seismic submergence and emergence suggest that no earthquake within the last 4000 years had the same rupture pattern as the 1964 M 9.2 earthquake.