

Earthquake Intensities

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Investigations

Tom Bodle completed a masters thesis entitled "The Relation of Earthquake Intensity to Surface Geology and Elevation in Western Washington State". Approximately 4000 intensity reports were analyzed from a shallow, $M= 5.5$ earthquake in 1981 and the 59 km deep $M= 6.5$ Seattle/Tacoma earthquake of 1965. Chi-squared tests were performed to check the association between geology and intensity and the results were mixed. For both earthquakes site geology was found to contribute significantly to the variation in earthquake intensity for the region around Olympia, WA. However, in the Seattle region, a significant dependence of intensity on geology was evident in the 1981 data but not in the 1965 data. One possible reason for the lack of a dependent relation in the 1965 data, favored by Bodle, is the ambiguity of questions in the questionnaire distributed in the Seattle region in 1965.

This year we have shifted the emphasis of the research to an investigation of historical earthquakes before 1928. The goal is to reestimate epicenter locations, focal depths and magnitude of early earthquakes from a library search of available earthquake reports. We are reviewing existing earthquake catalogs including Holden (1898), Earthquake History of the US, Bradford (1935), Townley and Allen (1939), Rasmussen (1967), Berg and Baker (1963), Milne (1956). We are reviewing all significant earthquakes before 1928 by compiling existing isoseismal maps, collecting reports to allow construction of new isoseismal maps, and reviewing reports of foreshocks/aftershocks. The presence of aftershocks may be a useful discriminant of earthquake depth in the northwest.

The following represents material examined so far:

Review of The Oregonian; A subject index (1850-1910) to the Oregonian created by Leslie Scott (Oregonian Editor during that period) allowed us to conveniently locate articles. This listing was referenced by Berg and Baker, but not by Rasmussen. We have transcribed all the articles verbatim; they will form an appendix to our final report and be available to future investigators.

Review of various newspapers for articles on specific earthquakes. All reports found have been transcribed verbatim, and will be available in our final report.

Review of Washington Standard articles referenced by Rasmussen.

Review of Washington Historical Quarterly for articles of interest.

Articles found of interest include reports of drowned forests in the Columbia Gorge (communicated to Robert Schuster (USGS)), and a second-hand contemporaneous account of the 1872 Ribbon Cliffs landslide.

The most interesting result we have had to date concerns an earthquake which occurred on May 1, 1882, that was reported to have intensity III in Portland by both Rasmussen and Berg & Baker but which appears to have been much stronger than previously believed. Accounts of this event in the *Oregonian* indicate that it was felt over a very considerable area, from Salem, Oregon to Port Townsend, WA with the strongest shaking in Astoria where reports indicate damage to crockery etc. on store shelves and considerable damage to plaster also. This earthquake apparently caused widespread alarm in Portland, although no damage was reported. We plan to report this earthquake at the December AGU meeting.

Publications

Bodle, T, The Relation of Earthquake Intensity to Surface Geology and Elevation in Western Washington State, masters thesis. Geophysics Program, University of Washington, Seattle, WA, 1990.

Abstracts

Bodle, T, The Relation of Earthquake Intensity to Surface Geology and/or Elevation in Western Washington State, Fourth Annual NEHRP Workshop, Seattle WA, April 16-19, 1990. of Washington, Seattle, WA, 1990.