SPACE-TIME PATTERNS IN SEISMICITY OF THE INTERMOUNTAIN REGION, WESTERN UNITED STATES

R. B. Smith and M. D. Wood

University of Utah
Salt Lake City, Utah
and
U. S. Geological Survey
Menlo Park, California

An interactive computer-generated film has been prepared which displays the space-time patterns of seismicity of the Intermountain region including the Intermountain Seismic Belt for events greater than about magnitude 3.5 during the 1961-1970 period. Four patterns of earthquake activity are outlined: (1) the central Nevada zone with most continuous activity, (2) sporadic activity along the north-trending Intermountain Seismic Belt, (3) episode activity along a west-trending zone from the Hebgen Lake-Yellowstone Park region into central Idaho, and (4) sporadic activity along a west-trending zone extending west from southern Utah into southern Nevada. Most of the major earthquake swarms of the northern ISB developed contemporaneously in 1963 and have been episodic to the present. Bursts of seismic activity along the Hebgen Lake-Yellowstone Park zone appear to migrate along the east-trending seismic zones. North-south migration of earthquakes along the ISB does not appear.

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CONTEMPORARY TECTONICS AND SEISMICITY OF THE INTERMOUNTAIN WEST

R. B. Smith and M. L. Sbar

University of Utah
Salt Lake City, Utah
and
Lamont-Doherty Geological Observatory of Columbia University
Palisades, New York

The Intermountain Seismic Belt (ISB) of the western United States is interpreted as an extensional zone developed along an intraplate boundary. Two east-trending seismic zones intersect the ISB, one in the vicinity of Yellowstone Park and one in southeastern Utah. The frequency of occurrence shows a b-value of 1.06 attributed to abundant earthquake swarms which are coincident with many geothermal features. Areas near Salt Lake City, Utah and Helena, Montana are noted as having unusually low seismicity. We consider these as areas of potentially higher seismic risk than the rest of the ISB. Seismicity and 29 fault determinations around the Great Basin and Northern Rocky Mountains outline lithospheric sub-plates. The Northern Rocky Mountain sub-plate appears to be moving northwest, while the Great Basin is moving westerly with respect to the stable part of the North American plate. The motions

can be explained as a response to a mantle plume in the Yellowstone Park area and a smaller plume in southern Utah. An alternate explanation outlines the Snake River plains as a continental rift representing north-south extension perpendicular to transform faults of an earlier period of deformation. These shear zones are suggested by successive lateral offsets on the San Andreas fault, the Walker Lane-Texas lineament, the Wallowa lineament, and the northern ISB.

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SEISMIC RISK IN UTAH & ARIZONA

S. T. Algermissen and D. M. Perkins

Earth Sciences Laboratories/NOAA
Boulder, Colorado

A seismic risk map was constructed, based on the cumulative probability distribution of acceleration at gridded points in the two-state area. The seismicity has been divided into several gridded source-regions, with the appropriate expected numbers of earthquakes of the magnitude levels corresponding to the various intensities observed historically. The accelerations at the affected points were calculated using the Schnabel and Seed attenuation curves. The risk map is presented in two forms: a) accelerations with 63% probability of exceedance in 50 years (the 50-year return period accelerations), and b) accelerations with 10% probability of being exceeded in 50 years. These latter accelerations range from .05 g to .6 g over the risk map area. In addition, the level of acceleration as a function of risk is displayed for several points, in order to illustrate how the acceleration at a chosen risk level is related to the "maximum possible" acceleration. The critical factors governing the form of the risk map are the rate of decrease of the attenuation curves, the rate of occurrence of middle-magnitude quakes, and the choice of boundary from one seismic region to another.

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SEISMICITY AND CONTEMPORARY TECTONICS OF THE YELLOWSTONE PARK-HEBGEN LAKE REGION

A. B. Trimble and R. B. Smith

University of Utah
Salt Lake City, Utah

Detailed earthquake monitoring was conducted throughout the western Yellowstone Park-Hebgen Lake region using portable high-gain seismographs. A zone of earthquake activity up to 20 km wide and trending N 80° W was defined from the Norris Geyser basin of Yellowstone Park west through the 1959 Hebgen Lake earthquake epicenter area terminating at the Madison Valley. Over 180 earthquakes of magnitude 0 to +2 were located. Rates of occurrence were as high

as 50 events/day
gen Lake epicenter.
area on the west
abrupt change in
lapse caldera.
regional north-south
three thrusting
Extensive earthquake
detected at the Upper

AN ANALYSIS OF

In recent years,
around the Nevada
motion produced by
currently being
explosion generated
surface of a layer
interface and 3)
been collected at
physical logging and
at these three
fine the effects of
are shown to be
linear, analytical

Transmission
may be treated as
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