

Earthquake Monitoring in Alaska and Notable Alaskan Earthquakes of 2006

Natalia A. Ruppert

Geophysical Institute, University of Alaska Fairbanks, Fairbanks AK 99775-7320;
email: natasha@gi.alaska.edu; tel: 907-474-7472

Alaska is by far the most seismically active state in the U.S. Seismic hazards in Alaska come from several sources. The largest earthquakes in the state are caused by subduction of the Pacific plate beneath the North American plate. Three of the seven largest earthquakes in the 20th century occurred in Alaska (1957 Andreanof Islands, 1964 Prince William Sound, and 1965 Rat Islands). A second type of hazard comes from the smaller magnitude 6.8 to 8.0 earthquakes, which occur in many regions of Alaska. These events, while smaller, occur at more frequent intervals, and in locations that cannot always be predicted. A third hazard exists from the many smaller events that often occur near populated areas. While these events are too small to cause widespread damage, they are relatively common and thus pose a continuous threat to urban areas.

Earthquakes in Alaska are monitored by the regional seismic network. The Alaska Earthquake Information Center (AEIC) records and analyzes data from several networks comprising about 400 sites throughout Alaska and the surrounding regions. Many of these stations are in very remote areas with extreme climatic conditions and can only be reached by helicopter, late in summer after the snow has melted. Of these, about 180 sites are operated by the Alaska Volcano Observatory (AVO), 18 by the West Coast and Alaska Tsunami Warning Center (WC/ATWC), 3 by IRIS, and 2 are newly installed as part of the ANSS (Advanced National Seismic System) network. In addition, AEIC is exchanging real-time data with Canadian regional network augmenting station coverage in the Alaska/Canada border region. AEIC also receives data from six Global Seismic Network sites in Eastern Russia.

The real-time earthquake locations and magnitudes are determined within 2-5 minutes of the event occurrence. AEIC maintains a 24/7 seismologist-on-duty schedule. Earthquake alarms are based on the real-time earthquake detections. Significant events are reviewed by the seismologist on duty within 30 minutes of the occurrence with information releases issued for significant events. This information is disseminated immediately via websites, e-mail, cell phone and pager notifications, fax broadcasts and recorded voice-mail messages. In addition, automatic regional moment tensors are determined for larger events. This information is posted on the public website. ShakeMaps are being calculated in real-time with the information currently accessible via a password-protected website. AEIC is designing an alarm system targeted for the critical lifeline operations in Alaska.

In 2006, the AEIC reported nearly 20,000 seismic events in the state. The largest earthquake (M6.6) occurred on July 8 in Andreanof Islands. It was located in the area between the rupture zones of the 1965 M8.7 Rat Islands earthquake to the west and the 1957 M8.6 Andreanof Islands earthquake to the east. An unusual sequence of strong crustal earthquakes (M6.2-6.4) occurred in June in Rat Islands. In the western Aleutians, the crust is partitioned into rotating blocks, such as Buldir and Near blocks. These recent crustal events could be related to the block rotation processes. Another unusual earthquake (M5.4) occurred on February 5 in the Yukon Flats, normally aseismic region. The source parameters of the mainshock and larger aftershocks indicate strike-slip faulting, either left-lateral on a NE-striking focal plane or right-lateral on a SE-striking plane. The latter is consistent with the sense of motion along the Tintina fault. The former is similar to the NNE-trending seismic zones located farther south between the Denali and Tintina faults. These events prove that earthquakes in Alaska can occur in unexpected places as well as within the known source regions of seismicity.