



CENTRAL WASHINGTON UNIVERSITY

PREDICTING EARTH HAZARDS: THE CWU GEODESY LAB

Central Washington University is the only facility in the Pacific Northwest focused exclusively on measuring, monitoring, and mitigating earthquake hazards.

For nearly 15 years, CWU's Geodesy Laboratory has been the national collection point for data about changes in the earth's crust that may predict a "geologic event" – an earthquake.

Much of Washington's population lives in the heart of earthquake country. Great earthquakes 5,000 times the size of the 2001 Nisqually event, giant tsunamis, volcanic eruptions, and landslides are a few of the natural threats poised to strike through-out the Puget Sound region.

In 1995, NASA, the USGS, and the National Science Foundation selected CWU to develop an early-warning system for earthquake and tsunamis. The Pacific Northwest Geodetic Array (PANGA) is the only research facility in the state focused exclusively on measuring, monitoring, and mitigating Washington's natural hazards with Global Positioning System (GPS) technology.

CWU is now *the* state source for continuous information about even the tiniest changes in the earth's crust. Nearly 400 GPS stations throughout the Pacific Northwest and western Canada generate data that CWU scientists use to predict catastrophic events and to monitor their impact as they unfold. By contrast, seismographs, like those at the UW, measure how big an earthquake was only *after* it has occurred and only up to a magnitude of 6.0; PANGA is equipped to measure quakes of up to magnitude 9.

Emergency responders throughout the state now depend on PANGA. It informs the risk maps emergency responders need for disaster planning and response. PANGA also provides GPS corrections to response crews for rapid recovery after a large urban earthquake. Public-sector agencies that depend upon PANGA data include:

- King, Pierce, Thurston, and Snohomish Counties;
- The cities of Seattle, Tacoma, Everett, Vancouver, and Olympia; and
- The Washington State Department of Transportation and the Department of Ecology.

CWU also is the sole facility in Washington that:

- **Monitors public infrastructure with real time GPS.** PANGA operates stations on the Alaskan Way Viaduct; the I-90 and 520 floating bridges and Tacoma Narrows Bridge; Seattle's Columbia Tower; the Tolt, Howard Hansen and Columbia River dams; and ferry piers.

- **Estimates the timing and rate of sea-level rise.** The Dept. of Ecology uses PANGA's coastal subsidence measurements to assess risks to coastal communities from tsunamis and increases in sea-level due to climate change.

- **Measures groundwater depletion** throughout the Yakima River Basin. Groundwater withdrawal results in surface land subsidence, which PANGA measures with GPS.

Central constantly receives information from global positioning system (GPS) monitors in more than 1200 locations around the Northwest, including the Alaskan Way Viaduct in Seattle. The so-called Pacific Northwest Geodetic Array (PANGA) detects earth movement with sensitive GPS set in concrete and lodged in bedrock. When the earth moves, so do the bedrock and the GPS instruments lodged within it. The systems pick up movement of the earth, no matter how small.

No other university or public agency on the West coast receives this continuous information about earth movement. CWU collects the data, interprets it, and makes it available to nearly 50 universities and agencies in Europe, Japan, India, and South America. Using data from the U.S. Geological Survey in Colorado, the University of Washington can tell where an earthquake *has* occurred. But the CWU Geodesy Lab uses real-time data to report what is happening now, and to predict where an earthquake *will* occur.

The Pacific Northwest Geodetic Array (PANGA) at CWU is an integral link in the world's GPS information backbone. North America floats on massive chunks of earth called the North American and Juan de Fuca tectonic plates. When these plates slip past each other we feel it as an earthquake. CWU scientists carefully analyze the data to get precise information about the movement of North American and Juan de Fuca tectonic plates.

WHY IS PANGA AT CENTRAL WASHINGTON UNIVERSITY?

Because the ground under CWU is rock solid. Located in Ellensburg, 100 miles from the earthquake-prone Puget Sound region, central Washington is arguably the best place in the state for catastrophic earthquake monitoring. PANGA won't be disabled after a massive earthquake and scientists can continue to feed critical data to first responders during and after a catastrophic seismic event.

The seismic network at the University of Washington failed during the 2001 Nisqually Earthquake, leaving emergency managers in the dark for 45 minutes until USGS scientists in Colorado located the earthquake. Nisqually registered 6.8 on the Richter Scale—*5,000 times smaller than the magnitude 9 earthquake now gathering just 30 miles beneath Puget Sound.*

SHOULDN'T PANGA BE AT A RESEARCH UNIVERSITY?

CWU's faculty have always performed research in a host of issue areas. PANGA director Timothy Melbourne, who earned his Ph.D. at the California Institute of Technology, is a leader in the field of Northwest seismology and tectonics. Melbourne's research, recently published in *Geophysical Research Letters*, established that the next big earthquake will strike within 50 miles of Seattle, much closer than previously thought.

For more information on the The Pacific Northwest Geodetic Array at Central Washington University

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