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University of Nevada, Reno technology used for NASA quake monitoring test

Nevada Geodetic Lab operates largest GPS network processing system in world

RENO, Nev. – GPS technology developed and implemented at the University of Nevada, Reno will be the centerpiece of a major test this year by NASA to pinpoint the location and magnitude of strong earthquakes along the West Coast of the United States. The project was announced by NASA today.

“We invented the technique to predict tsunamis using GPS, and it will be used in real-time with a network of 500 reporting stations along the West Coast,” said Geoff Blewitt, professor in the University’s Nevada Bureau of Mines and Geology and director of the Nevada Geodetic Laboratory. “This is intended to see abrupt changes in GPS station positions, such as from a great earthquake, though we have recorded movements using GPS in a magnitude 5.0 earthquake – the smallest earthquake ever recorded by GPS.”

The software processes information from satellite reporting stations to show changes in ground positions greater than 10 centimeters in real-time, and processing the next day using better information on the GPS satellite orbits can be extremely accurate, calculating changes as small as one centimeter.

“This allows us to see large rapid ground motions that can then be used to predict tsunamis,” he said.

The NASA monitoring network project runs along the Cascadia fault line that extends from California to Vancouver, Canada and the San Andreas Fault in California. Its development is supported by the National Science Foundation, the Department of Defense, NASA and the U.S. Geological Survey. It is an augmentation of the global monitoring framework developed and maintained by Blewitt and his geodesy team at the University, which was funded by NASA and in concert with the Jet Propulsion Laboratory.

The University of Nevada, Reno has the largest GPS data-processing center in the world, which processes information from about 10,000 stations around the globe continuously, 24/7.

“The information is freely available to anyone on the Internet,” Blewitt said. “We have all GPS data going back to 1996 and are reprocessing all 15-million data files as new data streams come in – every 30 seconds – solving for tens of thousands of parameters at once. It enables real-time positioning for any users.”

“The data is like a gold mine, we keep digging for new discoveries,” he said. “People around the world use it extensively for research such as modeling earthquakes and volcanoes.”

Blewitt is currently presenting results of his team’s research at the European Geosciences Union General Assembly in Vienna, Austria. “Our research has an international impact, and is enabled by strong international collaboration in geodesy,” he said.

Blewitt is teaching a new geodesy course at the University of Nevada, Reno in the fall 2012 semester that is designed for students in physics, geophysics, electrical engineering and geological engineering. The upper-division and graduate-level course, “Special Topics in Physics: Physics and Engineering of GPS,” covers the principles of the GPS for millimeter-precision positioning and sub-nanosecond timing. Topics include: GPS system design, geodesy and the Earth’s changing shape, gravity field and rotation in space, reference systems, satellite orbits, satellite signals, special and general relativity and physical models for positioning.

For more information on Blewitt, go to <http://www.nbmj.unr.edu/Staff/Blewitt.html>. For the Nevada

Geodetic Laboratory and geodetic information about the Tohoku earthquake go to <http://geodesy.unr.edu/index.php>.

The NASA news release is available at <http://www.nasa.gov/topics/earth/features/earth20120424.html>.

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Photo Cutline: Geoff Blewitt, professor in the University's Nevada Bureau of Mines and Geology and director of the Nevada Geodetic Laboratory, works on a GPS installation atop 8,600-foot-elevation Ward Peak at Lake Tahoe. Photo by Jean Dixon, courtesy of University of Nevada, Reno.

Nevada's land-grant university founded in 1874, the University of Nevada, Reno has an enrollment of 18,000 students and is ranked in the top tier of the nation's best universities. Part of the Nevada System of Higher Education, the University has the system's largest research program and is home to the state's medical school. With outreach and education programs in all Nevada counties and with one of the nation's largest study-abroad consortiums, the University extends across the state and around the world. For more information, visit www.unr.edu.

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