

“Enhancing PANGA (Pacific Northwest Geodetic Array) for Urban Seismic Risk Assessment: Collaborative Research with Central Washington University, Oregon State University, and University of Washington” Proposal dated Spring, 2000.

Annual Project Summary  
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Key Words: GPS-Continuous, Regional Modeling, Neotectonics, Seismotectonics

## **Investigations Undertaken**

NEHRP funded one CWU proposed tasks in FY 2003, convening the PANGA investigator community meeting (planned for January 2003).

### *PANGA Investigator Meeting:*

A 2-day PANGA investigator community meeting is planned at Dunsmuir Lodge near Pacific Geoscience Centre, Sidney, British Columbia, February 6-7, 2004. The agenda includes technical reports, scientific investigations, and workshops on implementation of Plate Boundary Observatory in Cascadia.

## **Results**

### *PANGA Investigator Meeting:*

The PANGA investigator meeting will be held during February, 2003. Herb Dragert and Tim Melbourne have agreed to co-sponsor the meeting and workshop which will be held at Dunsmuir Lodge in Sidney, B.C. . Approximately 30 investigators are expected with an interest in PANGA and its scientific applications.

## **Non-technical summary**

Global Positioning System (GPS) geodesy allows us to study fault motions and related deformation of the earth's surface. In the Pacific Northwest, seismic risk is posed by both a very large fault off shore, where ocean floor is consumed under the edge of the North American plate, and by smaller, and shallower faults that lie closer to

population centers within the edge of the continent. This project uses GPS geodesy to characterize real-time deformation of the Earth's surface in the Pacific Northwest and to better characterize earthquake hazards in the region. This project supports an annual scientific workshop for investigators interested in Pacific Northwest geodesy.

## **Reports published**

### *Journal publication:*

- M. Meghan Miller, Tim Melbourne, Daniel J. Johnson, and William Q. Sumner, 2002, Periodic slow earthquakes from the Cascadia subduction zone. *Science*. v. 295, n. 5564: p 2423.
- Stephane Mazzotti, Herb Dragert, Roy D. Hyndman, M. Meghan Miller, and Joseph A. Henton, 2002, GPS deformation in a region of high crustal seismicity: North Cascadia forearc. *Earth and Planetary Science Letters*, v. 198, p. 41-48.

### *Theses:*

- Kenneth Emil Austin, 2001, The co-seismic displacement fields for the 1992 Landers and 1999 Hector Mines earthquakes, from regional GPS observations. M.S. Thesis, Central Washington University, Ellensburg, Washington. 54 p.
- Cynthia Journey, 2001, Refining the measured frequency of great earthquakes along the Cascadia subduction zone. M.S. Thesis, Central Washington University, Ellensburg, Washington. 78 p.

### *Abstracts:*

- M. Meghan Miller, Daniel J. Johnson, Kenneth E. Austin, Andrew Miner, W. Q. Sumner, 2002, The February 28, 2001, Nisqually earthquake: Geodetic signature of the foundering Juan de Fuca slab. *Seismological Research Letters*, v. 73, p. 213.
- Daniel J. Johnson, T. Melbourne, M. Meghan Miller, W. Q. Sumner, 2002, Periodic silent earthquakes. *Seismological Research Letters*, v. 73, p. 234.
- M. Meghan Miller, Daniel J. Johnson, 2002, Fate of the Eastern California shear zone along the Cascadia margin and entrainment of the Cascadia fore-arc in oblique subduction. *Geological Society of America Abstracts with Programs*, v. 34, p A 106.
- M. Meghan Miller, Daniel J. Johnson, T. Melbourne, and William Q. Sumner, 2002, Evidence for periodic silent earthquakes along the Cascadia plate interface from the Pacific Northwest Geodetic Array. *Geological Society of America Abstracts with Programs*, v. 34, p A 36.
- Charles Ardoin and M. Meghan Miller, 2002, Vertical deformation near Willapa Bay, Washington. *Geological Society of America Abstracts with Programs*, v. 34, p. 376.
- M. M. Miller, 2002, Earthscope Science Target: Temporal and spatial patterns of silent earthquake recurrence along the Cascadia plate interface from the Pacific Northwest

Geodetic Array. Eos, Transactions, American Geophysical Union, v. 83, T72-06. Invited.

T. I. Melbourne, F. H. Webb, and M. M. Miller, 2002, Preseismic, postseismic and slow faulting in subduction zones. Eos, Transactions, American Geophysical Union, v. 83, G61A-0973.

W. Q. Sumner and M. M. Miller, 2002, Aseismic slip and the Nisqually earthquake. Eos, Transactions, American Geophysical Union, v. 83, G61A-0974.

M. M. Miller, D. J. Johnson, and A. M. Miner, 2002, Five years of GPS observations along the length of the Cascadia margin: fate of the Eastern California shear zone and entrainment of the Cascadia fore-arc in oblique subduction. Eos, Transactions, American Geophysical Union, v. 83, G22A-07.

M. E. Caron, M. M. Miller, and D. J. Johnson, 2002 Neotectonic crustal deformation and seismic hazard in the Puget Sound area of the Cascadia fore-arc, Washington State. Eos, Transactions, American Geophysical Union, v. 83, S22B-1027.

### **Data Availability**

These data are freely available from the ftp site at <ftp://panga.cwu.edu>. The data are in standard RINEX format and any questions regarding data can be directed to Dan Johnson, 509/963-2822, [dan@geology.cwu.edu](mailto:dan@geology.cwu.edu). The resulting velocity field will be posted to <http://www.geodesy.cwu.edu/> and links contained there as soon as the above referenced Tectonics paper is accepted for publication.