

## **Robert McCaffrey**

Department of Geology (Retired)

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### **Education**

- Boston College, Geophysics, B.S., 1976
- University of California, Santa Cruz, Geophysics, Ph.D., 1981 (Advisor: Eli A. Silver)
- Postdoctoral Research Associate, Massachusetts Institute of Technology, 1982-1985 (Advisor: Peter Molnar)

### **Professional Experience**

- Adjunct Research Professor, Portland State University, 2010-2017
- Full Professor, Rensselaer Polytechnic Institute, 1988-2010 (Chairman 1996-1999).
- Senior Geodetic Scientist, GNS Science, New Zealand 2007-2008
- Visiting Research Scientist (sabbatical), Institute of Nuclear and Geological Sciences, New Zealand, 2003.
- Visiting Professor, Ecole Normale Supérieure, Paris, Summer 2001
- Associate Professor, Rensselaer Polytechnic Institute, 1993-1999
- Visiting Associate Professor (sabbatical), Oregon State University, 1995-1996 academic year
- Assistant Professor, Rensselaer Polytechnic Institute, 1988 - 1993.
- Research Scientist, Massachusetts Institute of Technology, 1985-1988.
- Air Force Geophysics Scholar, Air Force Geophysics Laboratory, 1986-1988.
- Lecturer in Applied Geophysics, University of California, Santa Cruz, 1981.

### **Teaching**

Geology I (1988 -1992); Exploration geophysics (1988); Introduction to geophysics (1990-2000); Geodynamics (1989-1999, 2008); Geophysics II (1989-1992); Seismology (1989); Data analysis (1990); Global tectonics (1991-1997); Flow through porous media (1992-1994); Solid Earth geophysics (1993, 1998, 2009); Groundwater Contaminant Transport (1999); Planet Earth I (2001-2006); Geographic Information Systems (2000-2006, 2008), Natural Disasters (2009) and several graduate level seminar courses on various topics.

### **Research Advising**

*Graduate:* G. Abers (PhD, MIT, 1989); C. Kulig (MS, Boston College, 1989); D. van Valkenburg (MS, 1994); Fauzi (PhD, 1999); C. Stevens (PhD, 1999); Masturyono (MS, 1994; PhD, 2000); J. Vollick (MS, 2005)

*Undergraduate:* Tristan Madden (1988); Steve Hinterneder (1992); Roland Lapierre (1992-93); Ellen Bradley (1993); Jennifer Tatten (1997); Davienne Monbleau (1997-98); Cheryl Johnson

(1997-99); Maureen Long (1999-2000); Anna Smith (2000-2001); Karin Lackmann (2001), Jon Ganz (2001); Jesse Vollick (2003-2004); Sara Heller (2009); Matt Lancaster (2012)

*Secondary advisees:* D. Minkle (PhD, 1990); C. H. Lin (PhD, 1990-1994); G. Wall (1993); A. Chen (PhD, 1993-1998); I. Dricker (PhD, 1995-present); T. Cohen Kosanke (PhD, 1998); Don Minkel (PhD thesis committee, 1993); Peter Zwick (PhD Advisor); Alan Lin (PhD thesis committee, 1994); Dan Moore (PhD thesis committee, 1996); Tobi Cohen (PhD thesis committee, 1998); Arthur Chen (PhD thesis committee, 1998); Audra Nowosielski (PhD thesis committee, Economics, 2001); John Polimeni (PhD thesis committee, Economics, 2001); Linette Prawirodijiro (Scripps; 1999); Laura Wallace (UCSC; 2001); Suzette Payne (U Idaho; 2012); Shannon Graham (Univ Wisconsin; 2013).

*Post-docs:* Charles Williams (1998-2000); Anahita Tikku (2004-2006); Zhuqi Zhang (2010); Mohamed Aly (2010)

## **Field Work**

Global Positioning System in Papua New Guinea (1993, 1994), Eastern Indonesia (1992, 1993, 1994, 1996, 1997, 2002, 2004), Sumatra (1989, 1991, 1992, 1993, 2001), and US Pacific Northwest and Snake River Plain (1996-2004; 2008-2013); Biak RAMP aftershock array and GPS measurements (1996); Toba PASSCAL tomography array (1995); PASSCAL Northern Nevada Lithospheric Experiment (1986); Microearthquake surveys in the Molucca Sea and northern Sulawesi Indonesia, (1978), in the eastern Sunda Arc, Indonesia (1982), in northern Utah (1983), and in Papua New Guinea (1988); Gravity surveys of the Narragansett Basin edge in southeastern Massachusetts (1976), of the Sulawesi ophiolite complex, Indonesia (1977), and of the Ben Lomond Fault, Santa Cruz, California (1981); Marine geophysical surveys in the Molucca Sea (1977) and eastern Sunda Arc, Indonesia (1981)

## **Service to the profession**

- Ocean Drilling Program Panel on Tectonics and Climate (1998-1999)
- NSF proposal review panels (1994, 1999, 2012)
- Participated in PBO planning and Subduction sub-committee member
- Review manuscripts and proposals (Excellence in Refereeing award from AGU)
- Institute representative to SCEC, UNAVCO and IRIS
- Participant in Western US Consensus Velocity Working Group, National Seismic Hazards Map Project, SCEC Community Geodetic Model, UNAVCO Geodetic Data Services Advisory Committee
- Frequently visit schools to talk about science, interviews to television stations, radio stations and newspapers regarding my research and current geologic events.

## Related skills

- Languages – Indonesian, French (un peu)
- Equipment – can operate many types of GPS and seismic equipment
- Programming – Fortran, MapBasic, Visual Basic, csh scripting
- Software – GAMIT (GPS processing); GMT (mapping); MapInfo (GIS); author of SYN4/MT5 and DEFNODE/TDEFNODE

## Publications

(PDFs of many of these available at <https://robmccaffrey.github.io/pubs.html>)

- Silver, E.A., Y.S. Joyodiwiryo and R. McCaffrey, Gravity results and emplacement geometry of the Sulawesi ultramafic belt, Indonesia, *Geology*, **6**, 527-531, 1978.
- McCaffrey, R., E.A. Silver and R.W. Raitt, Crustal structure of the Molucca Sea collision zone, Indonesia, in *The Tectonic and Geologic Evolution of Southeast Asian Seas and Islands*, Geophys. Monogr. **23**, edited by D.E. Hayes, 161-178, AGU, Washington, D.C., 1980.
- McCaffrey, R., E.A. Silver and R.W. Raitt, Seismic refraction studies in the East Arm, Sulawesi-Banggai Islands region of eastern Indonesia, in *The Geology and Tectonics of Eastern Indonesia*, edited by A.J. Barber and S. Wiryosujono, *Geol. Res. Dev. Centre Indonesia, Spec. Publ. No. 2*, 321-325, 1981.
- McCaffrey, R., Lithospheric deformation within the Molucca Sea arc-arc collision zone: Evidence from shallow and intermediate earthquake activity, *J. Geophys. Res.*, **87**, 3663-3678, 1982.
- McCaffrey, R. and R. Sutardjo, Reconnaissance microearthquake survey of Sulawesi, Indonesia, *Geophys. Res. Lett.*, **9**, 739-796, 1982.
- McCaffrey, R., Seismic wave propagation beneath the Molucca Sea arc-arc collision zone, Indonesia, *Tectonophysics*, **96**, 45-57, 1983.
- Silver, E.A., D.R. Reed, R. McCaffrey and Y. Joyodiwiryo, Backarc thrusting in the eastern Sunda Arc, Indonesia: A consequence of arc-continent collision, *J. Geophys. Res.*, **88**, 7429-7448, 1983.
- Silver, E.A., R. McCaffrey and R.B. Smith, Collision, rotation, and the initiation of subduction in the evolution of Sulawesi, Indonesia, *J. Geophys. Res.*, **88**, 9407-9418, 1983.
- Silver, E.A., R. McCaffrey, Y. Joyodiwiryo and S. Stevens, Ophiolite emplacement by collision between the Sula platform and the Sulawesi island arc, Indonesia, *J. Geophys. Res.*, **88**, 9419-9435, 1983.
- Stanley, R. G. and R. McCaffrey, Extent and offset history of the Ben Lomond fault, Santa Cruz County, California, in *Tectonics and Sedimentation Along Faults of the San Andreas Fault System*, edited by D.W. Andersen and M. J. Rymer, Pacific Section, Society of Economic Paleontologists and Mineralogists., 79-90, 1983.
- McCaffrey, R., R. Sutardjo, R. Susanto, R. Buyung, B. Sukarman, M. Husni, Suciono, D. Satuju, and E. Sukanto, Local earthquake surveys of the Molucca Sea and Sulawesi, Indonesia, *Bull. Geol. Res. Dev. Centre Indonesia*, **7**, 13-23, 1983.
- McCaffrey, R., H. Lyon-Caen, P. Molnar, S. Roecker, J.L. Chatelain, K. Hardjawidjaksana, Y. Joyodiwiryo, E. Kertapati, T. Kuntoro, J. Nasution, A. Sukarna, J. Kartusuwita, S. Patmowidodo, P.Y. Prih Haryadi, M. Riyadi, and D. Reed, Preliminary results of the 1982 microearthquake survey in Nusa Tenggara Timur, Indonesia, *Bull. Geol. Res. Dev. Centre Indonesia*, **10**, 1-9, 1984.
- McCaffrey, R., and J. Nabelek, The geometry of backarc thrusting along the eastern Sunda Arc, Indonesia: Constraints from earthquake and gravity data, *J. Geophys. Res.*, **89**, 6171-6179, 1984.
- McCaffrey, R., P. Molnar, S. Roecker, and Y. Joyodiwiryo, Microearthquake seismicity and fault plane solutions related to arc-continent collision in the eastern Sunda arc, Indonesia, *J. Geophys. Res.*, **90**, 4511-4528, 1985.
- McCaffrey, R., and J. Nabelek, Seismological evidence for shallow thrusting north of the Timor Trough, *Geophys. J. Royal Astr. Soc.*, **85**, 365-381, 1986.
- McCaffrey, R., and J. Nabelek, Earthquakes, gravity and the origin of the Bali Basin: An example of a nascent continental fold-and-thrust belt, *J. Geophys. Res.*, **92**, 441-460, 1987.
- Nelson, M. R., R. McCaffrey, and P. Molnar, Source parameters for 11 earthquakes in the Tien Shan, Central Asia, determined by P and SH waveform inversion, *J. Geophys. Res.*, **92**, 12,629-12,648, 1987.

- Denham, D., L.G. Alexander, I.B. Everingham, P.J. Gregson, R. McCaffrey and J.R. Enever, The 1979 Cadoux earthquake and intraplate stress in Western Australia, *Australian J. Earth Sci.*, **34**, 507-21, 1987.
- Abers, G.A., C. Bryan, S. Roecker, and R. McCaffrey, Thrusting of the Hindu Kush over the Tadjik Basin, Afghanistan: Evidence from two large earthquakes, *Tectonics*, **7**, 41-56, 1988.
- Fredrich, J., R. McCaffrey, and D. Denham, Source parameters of seven large Australian earthquakes determined by body waveform inversion, *Geophys. J.*, **95**, 1-13, 1988.
- Abers, G., and R. McCaffrey, Active deformation in the New Guinea fold-and-thrust belt: Seismological evidence for strike-slip faulting and basement-involved thrusting, *J. Geophys. Res.*, **93**, 13,332-13,354, 1988.
- McCaffrey, R., Active tectonics of the eastern Sunda and Banda arcs, *J. Geophys. Res.*, **93**, 15,163-15,182, 1988.
- McCaffrey, R., Teleseismic investigation of the January 22, 1988 Tennant Creek, Australia, earthquakes, *Geophys. Res. Lett.*, **16**, 413-416, 1989.
- Wu, F.T., K-C Chen, J.H. Wang, R. McCaffrey, and D. Salzberg, Focal mechanisms of recent large earthquakes and the nature of faulting in the Longitudinal Valley of eastern Taiwan, *Proc. Geol. Soc. China*, **32**, 157-177, 1989.
- McCaffrey, R., Seismological constraints and speculations on Banda arc tectonics, *Proc. Snellius-II Symp., Netherlands J. Sea Res.*, **24**, (2/3), 141-152, 1989.
- McCaffrey, R., Earthquakes and ophiolite emplacement in the Molucca Sea collision zone, Indonesia, *Tectonics*, **10**, 433-453, 1991.
- McCaffrey, R., and G.A. Abers, Orogeny in arc-continent collision: the Banda arc and western New Guinea, *Geology* **19**, 563-566, 1991.
- McCaffrey, R., Slip vectors and stretching of the Sumatran fore arc, *Geology* **19**, 881-884, 1991.
- McCaffrey, R., Oblique plate convergence, slip vectors, and forearc deformation, *J. Geophys. Res.* **97**, 8905-8915, 1992.
- McCaffrey, R., On the role of the upper plate in great subduction zone earthquakes, *J. Geophys. Res.* **98**, 11,953-11,966, 1993.
- Kulig, C., R. McCaffrey, G. Abers, and H. Letz, Shallow seismicity of arc-continent collision near Lae, Papua New Guinea, *Tectonophysics* **227**, 81-93, 1993.
- Abers, G.A., and R. McCaffrey, Active arc-continent collision: Earthquakes, gravity anomalies and fault kinematics in the Huon-Finisterre collision zone, Papua New Guinea, *Tectonics* **13**, 227-245, 1994.
- McCaffrey, R., Global variability in subduction thrust zone - forearc systems, *Pure Appl. Geophys.* **142(1)**, 173-224, 1994.
- Tregoning, P., F. Brunner, Y. Bock, S.S.O. Puntodewo, R. McCaffrey, E. Calais, J. Genrich, J. Rais, and C. Surabaya, First geodetic measurement of convergence across the Java trench, *Geophys. Res. Letters* **21**, 2135-2138, 1994.
- McCaffrey, R., Dependence of earthquake size distributions on convergence rates at subduction zones, *Geophys. Res. Letters* **21**, 2327-2330, 1994.
- Puntodewo, S.S.O., R. McCaffrey, E. Calais, Y. Bock, J. Rais, C. Subarya, R. Poewariardi, C. Stevens, Fauzi, J. Genrich, and P. Zwick, GPS measurements of crustal deformation within the Pacific-Australia plate boundary zone in Irian Jaya, Indonesia, *Tectonophysics* **237**, 141-153, 1994.
- McCaffrey, R., and C. Goldfinger, Forearc deformation and great subduction earthquakes: Implications for Cascadia offshore earthquake potential, *Science* **267**, 856-859, 1995.
- McCaffrey, R., Estimates of modern arc-parallel strain rates in fore arcs, *Geology* **24**, 27-30, 1996.
- Fauzi, R. M., R. McCaffrey, D. Wark, P.Y. Prih Haryadi, and Sunarjo, Lateral variation in slab orientation beneath Toba caldera, northern Sumatra, *Geophys. Res. Letters* **23**, 443-446, 1996.
- Genrich, J., Y. Bock, R. McCaffrey, E. Calais, C. Stevens, and C. Subarya, Accretion of the southern Banda arc to the Australian plate margin determined by Global Positioning System measurements, *Tectonics*, **15**, 288-295, 1996.
- McCaffrey, R., Slip partitioning at convergent plate boundaries of SE Asia, *Tectonic Evolution of Southeast Asia Symposium, Geol. Soc. London Special Publication No. 106*, 3-18, 1996.
- McCaffrey, R., Influences of recurrence times and fault zone temperatures on the age-rate dependence of subduction zone seismicity, *J. Geophys. Res.* **102** 22839-22854, 1997.
- McCaffrey, R., Statistical significance of the seismic coupling coefficient, *Bull. Seismol. Soc. Amer.* **87**, 1069-1073, 1997.
- Prawirodirdjo, L., Y. Bock, R. McCaffrey, J. Genrich, E. Calais, C. Stevens, S. S. O. Puntodewo, C. Subarya, J. Rais, P. Zwick, and Fauzi, Geodetic observations of interseismic strain segmentation at the Sumatra subduction zone, *Geophys. Res. Letters* **24**, 2601-2604, 1997.
- McCaffrey, R., and J. Nabelek, Role of oblique convergence in the active deformation of southern Tibet, *Geology* **26**, 691-694, 1998.

- Miller, M., H. Dragert, E. Endo, J.T. Freymueller, C. Goldfinger, H.M. Kelsey, E.D. Humphreys, D.J. Johnson, R. McCaffrey, J.S. Oldow, A. Qamar, and C.M. Rubin, Precise measurements help gauge Pacific Northwest's earthquake potential, *EOS* **79**, 269, 275, 1998.
- Stevens, C., R. McCaffrey, E. Silver, Z. Sombo, P. English, and J. van der Kevie, Mid-crustal detachment and ramp faulting in the Markham Valley, Papua New Guinea, *Geology* **26**, 847-850, 1998.
- Stevens, C., R. McCaffrey, Y. Bock, J. Genrich, C. Vigny, C. Subarya, S.S.O. Puntodewo, and Fauzi, GPS evidence for rapid rotations about a vertical axis in a collisional setting: the Palu fault of Sulawesi, Indonesia, *Geophys. Res. Letters*, **26**, 2677-2680, 1999.
- McCaffrey, R., M. D. Long C. Goldfinger, P. Zwick, J. Nabelek C. K. Johnson, and C. Smith, Rotation and plate locking along the southern Cascadia subduction zone, *Geophys. Res. Letters*, **27**, 3117-3120, 2000.
- McCaffrey, R., P. Zwick, Y. Bock, L. Prawirodirdjo, J. Genrich, C. W. Stevens, S. S. O. Puntodewo, and C. Subarya, Strain partitioning during oblique plate convergence in northern Sumatra: Geodetic and seismologic constraints and numerical modeling, *J. Geophys. Res.* **105**, 28,363-28,376, 2000.
- Genrich, J.F., Y. Bock, R. McCaffrey, L. Prawirodirdjo, C.W. Stevens, S.S.O. Puntodewo, C. Subarya, and S. Wdowinski, Distribution of slip at the northern Sumatra fault System, *J. Geophys. Res.* **105**, 28,327-28,341, 2000.
- Masturyono, R. McCaffrey, D. A. Wark, S. W. Roecker, Fauzi, G. Ibrahim, and Sukhyar, Distribution of magma beneath Toba Caldera, North Sumatra, Indonesia, Constrained by 3-dimensional P-wave velocities, seismicity, and gravity data, *Geochemistry, Geophysics & Geosystems* **2**, 2001.
- Williams, C. A. and R. McCaffrey, Stress rates in the central Cascadia subduction zone inferred from an elastic plate model, *Geophys. Res. Lett.*, **28**, 2125-2128, 2001.
- McCaffrey, R., Crustal block rotations and plate coupling, in *Plate Boundary Zones*, S. Stein and J. Freymueller, editors, AGU Geodynamics Series 30, 101-122, 2002.
- Stevens, C. W., R. McCaffrey, Y. Bock, J. F. Genrich, M. Pubellier, and C. Subarya, Evidence for Block Rotations and Basal Shear in the World's Fastest Slipping Continental Shear Zone in NW New Guinea, in *Plate Boundary Zones*, S. Stein and J. Freymueller, editors, AGU Geodynamics Series 30, 87-99, 2002.
- Vigny, C., H. Perfettini, A. Walpersdorf, W. Simons, D. van Loon, B. Ambrosius, C. W. Stevens, R. McCaffrey, Y. Bock, P. Morgan, C. Subarya, P. Manurung, J. Kahar, H. z. Abidin, and S. H. Abu, Migration of seismicity and earthquake interactions monitored by GPS in SE Asia triple junction, Sulawesi, Indonesia, *Journal of Geophysical Research*, **107**, 2231, doi:10.1029/2001JB000377, 2002.
- Bock, Y., L. Prawirodirdjo, J. F. Genrich, C. W. Stevens, R. McCaffrey, C. Subarya, S. S. O. Puntodewo, and E. Calais, Microplate tectonics of Indonesia from Global Positioning System measurements, 1989-1994, *Journal of Geophysical Research*, **108**, 2367, doi:10.1029/2001JB000324, 2003.
- Wallace, L. M., C. W. Stevens, E. Silver, R. McCaffrey, W. Loratung, S. Hasiata, R. Curley, R. Rosa, J. Taugaloidi, and H. Davies, GPS constraints on active tectonics and arc-continent collision in Papua New Guinea: evidence for edge-driven microplate rotations, *Journal of Geophysical Research* **109**, B05404, doi:10.1029/2003JB002481, 2004.
- Wallace, L. M., J. Beavan, R. McCaffrey, and D. Darby, Subduction zone coupling and tectonic block rotations in the North Island, New Zealand, *Journal of Geophysical Research* **109**, B12406, doi:10.1029/2004JB003241, 2004.
- McCaffrey, R., Block kinematics of the Pacific - North America plate boundary in the southwestern US from inversion of GPS, seismological, and geologic data, *Journal of Geophysical Research* **110**, B07401, doi:10.1029/2004JB003307, 2005.
- Wallace, L.M., R. McCaffrey, J. Beavan, and S. Ellis, Rapid microplate rotations and backarc rifting at the transition between collision and subduction, *Geology* **33**, 857-860, 2005.
- Subarya, C., M. Chlieh, L. Prawirodirdjo, J.-P. Avouac, Y. Bock, K. Sieh, A. J. Meltzner, D. H. Natawidjaja, and R. McCaffrey, Plate-boundary deformation of the great Aceh-Andaman earthquake, *Nature* **440**, p. 46-51, doi:10.1038, 2006.
- Socquet, A., W. Simons, C. Vigny, R. McCaffrey, C. Subarya, D. Sarsito, B. Ambrosius, W. Spakman, Micro block rotations and fault coupling in SE Asia triple junction (Sulawesi, Indonesia) from GPS and Earthquake Slip Vector data, *Journal of Geophysical Research*, **111**, B08409, doi:10.1029/2005JB003963, 2006.
- Wallace, L. M., J. Beavan, R. McCaffrey, K. Berryman, and P. Denys, Balancing the plate motion budget in the South Island, New Zealand, using GPS, geological and seismological data, *Geophysical Journal International*, doi:10.1111/j.1365-246X.2006.03183.x, 2006.

- Galgana, G., M. Hamburger, R. McCaffrey, E. Corpuz and Q. Chen, Crustal deformation in Luzon Island, Philippines using terrain models, geodetic observations and focal mechanisms, *Tectonophysics*, **432**, 63-87, 2007.
- McCaffrey, R., A. I. Qamar, R. W. King, R. Wells, Z. Ning, C. A. Williams, C. W. Stevens, J. J. Vollick, and P. C. Zwick, Plate locking, block rotation and crustal deformation in the Pacific Northwest, *Geophysical Journal International*, doi:10.1111/j.1365-246X.2007.03371.x, 2007.
- McCaffrey, R., The Next Great Earthquake, *Science*, **315**, 1675-1676, 2007.
- McCaffrey, R., L. M. Wallace, and J. Beavan, Slow slip and frictional transition at low temperature at the Hikurangi subduction zone, *Nature Geoscience*, **1**, 316-320, 2008.
- McCaffrey, R., Global frequency of magnitude 9 earthquakes, *Geology*, **36**, 263-266, 2008.
- Payne, S. J., R. McCaffrey, and R.W. King, Strain rates and contemporary deformation in the Snake River Plain and surrounding Basin and Range from GPS and seismicity, *Geology*, **36**, 647-650, 2008.
- François-Holden, C., and 10 others, The Mw 6.6 Gisborne earthquake of 2007: records and general source analysis, *Bulletin of the New Zealand Society for Earthquake Engineering*, **41**, 266-277, 2008.
- Petersen, T., J. Beavan, P. Denys, M. Denham, B. Field, C. François-Holden, R. McCaffrey, N. Palmer, M. Reyners, J. Ristau, S. Samsonov, and The GeoNet team, The Mw 6.7 George Sound earthquake of October 15, 2007: Response and preliminary results, *Bulletin of the New Zealand Society for Earthquake Engineering*, **42**, 129-141 2009.
- Wallace, L. and 21 others, Characterizing the seismogenic zone of a major plate boundary subduction thrust: Hikurangi Margin, New Zealand, *Geochimistry Geophysics Geosystems*, **10**, Q10006, doi:10.1029/2009GC002610, 2009.
- McCaffrey, R., Time-dependent inversion of three-component continuous GPS for steady and transient sources in northern Cascadia, *Geophysical Research Letters*, **36**, L07304, doi:10.1029/2008GL036784, 2009.
- McCaffrey, R., The tectonic framework of the Sumatran subduction zone, *Annual Reviews of Earth and Planetary Sciences*, **37**, 345-366, 2009.
- Pearson, C., R. McCaffrey, J. L. Elliott, R. Snay, HTDP 3.0: Software for coping with the coordinate changes associated with crustal motion, *Journal of Survey Engineering*, **136**, 2, 80-90, 2010
- Prawirodirdjo, L., R. McCaffrey, C. D. Chadwell, Y. Bock, and C. Subarya, Geodetic observations of an earthquake cycle at the Sumatra subduction zone: The role of interseismic strain segmentation, *Journal of Geophysical Research*, **115**, B03414, doi:10.1029/2008JB006139, 2010.
- McCaffrey, R., Earthquakes and Crustal Deformation, in Harsh K. Gupta (ed.), *Encyclopedia of Solid Earth Geophysics*, DOI 10.1007/978-90-481-8702-7, Springer Science+BusinessMedia B.V., p. 218-226, 2011.
- Payne, S. J., R. McCaffrey, R.W. King, and S. A. Kattenhorn, A new interpretation of deformation rates in the Snake River Plain and adjacent basin and range regions based on GPS measurements, *Geophysical Journal International*, doi:10.1111/j.1365-246X.2012.05370.x, 2012.
- Zhang, Z., R. McCaffrey, and P. Zhang, Relative motion across the eastern Tibetan plateau: contributions from faulting, internal strain rates and rotation, *Tectonophysics*, **584**, 240–256, 2013.
- McCaffrey, R., R. W. King, S. J. Payne, and M. Lancaster, Active Tectonics of Northwestern US inferred from GPS-derived Surface Velocities, *J. Geophys. Res.*, **118**, doi:10.1029/2012JB009473, 2013.
- Payne, S. J., McCaffrey, R., and Kattenhorn, S. A., Extension Driven Right-lateral Shear in the Centennial Shear Zone Adjacent to the Eastern Snake River Plain, Idaho, *Lithosphere*, v. 5, p. 407-419, 2013.
- Parsons, T., K. M. Johnson, P. Bird, J.M. Bormann, T.E. Dawson, E.H. Field, W.C. Hammond, T.A. Herring, R. McCaffrey, Z.-K. Shen, W.R. Thatcher, R.J. Weldon II, and Y. Zeng, Appendix C—Deformation models for UCERF3, **USGS Open-File Report**, v. 2013–1165, 66 pp, 2013.
- Wells, R., and R. McCaffrey, Rotation of the Cascade Arc, *Geology*, **41**, 1027-1030, doi: 10.1130/G34514.1 2013.
- McCaffrey, R., Interseismic locking on the Hikurangi subduction zone: Uncertainties from slow-slip events, *Journal of Geophysical Research*, **119**, doi:10.1002/2014JB010945, 2014.
- Dixon, T.H., Y. Jiang, R. Malseversi, R. McCaffrey, N. Voss, M. Protti and V. Gonzalez, Earthquake and tsunami forecasts: Relation of slow slip events to subsequent earthquake rupture, *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1412299111, 2014.
- Pearson, C. F., R. S. Snay, R. McCaffrey, Towards an integrated model of the interseismic velocity field along the western margin of North America, in C. Rizos and P. Willis (eds.), *Earth on the Edge: Science for a Sustainable Planet*, International Association of Geodesy Symposia 139, DOI 10.1007/978-3-642-37222-3\_20, 2014.
- Petersen, M. D., Y. Zeng, K. M. Haller, R. McCaffrey, W. C. Hammond, P. Bird, M. Moschetti, Z.-K. Shen, J. Bormann and W. Thatcher, Geodesy- and geology-based slip-rate models for the Western United States

- (excluding California) national seismic hazard maps: U.S. Geological Survey *Open-File Report 2013–1293*, 80 p., <http://dx.doi.org/10.3133/ofr20131293>, 2014.
- Schmalzle, G.M., McCaffrey, R., Creager, K., Central Cascadia subduction zone creep, Geophysics, Geochemistry, Geosystems, doi: 10.1002/2013GC005172, 2014.
- Graham, S. E., C. DeMets, E. Cabral-Cano, V. Kostoglodov, A. Walpersdorf, N. Cotte, M. Brudzinski, R. McCaffrey, L. Salazar-Tlaczani, (2014). GPS constraints on the 2011–2012 Oaxaca slow slip event that preceded the 2012 March 20 Ometepec earthquake, southern Mexico, *Geophys. J. Int.* 197(3), 1593–1607, doi: 10.1093/gji/ggu019.
- Graham, S. E., C. DeMets, E. Cabral-Cano, V. Kostoglodov, A. Walpersdorf, N. Cotte, M. Brudzinski, R. McCaffrey, L. Salazar-Tlaczani, (2014). GPS constraints on Mw = 7.5 Ometepec earthquake sequence, southern Mexico: coseismic and postseismic deformation, *Geophys. J. Int.* 199(1), 200–218, doi: 10.1093/gji/ggu167.
- Li, S., J. Freymueller, and R. McCaffrey, Slow slip events and time-dependent variations in locking beneath Lower Cook Inlet of the Alaska-Aleutian subduction zone, *J. Geophys. Res.*, 121, doi:10.1002/2015JB012491, 2016.
- Graham, S. E., C. DeMets, E. Cabral-Cano, V. Kostoglodov, B. Rousset, A. Walpersdorf, N. Cotte, C. Lasserre, R. McCaffrey and L. Salazar-Tlaczani, Slow slip history for the MEXICO subduction zone: 2005 through 2011, *Pure Appl. Geophys.*, doi 10.1007/s00025-015-1211-x, 2015.
- McCaffrey, R., R. W. King, R. E. Wells, M. Lancaster and M. M. Miller, Contemporary deformation in the Yakima fold and thrust belt estimated with GPS, *Geophys. J. Int.*, 207, doi:10.1093/gji/ggw252, 2016.
- Ellis, A., et al., GPS constraints on deformation in northern Central America from 1999 to 2017, Part I - Time-dependent modelling of large regional earthquakes and their post-seismic effects, *Geophys. J. Int.* 214, 2177–2194, 2018.
- Ellis, A., DeMets, C., McCaffrey, R., & 16 others, GPS constraints on deformation in northern Central America from 1999 to 2017, Part 2: Block rotations and fault slip rates, fault locking, and distributed deformation, *Geophys. J. Int.*, 218, 729–754, 2019.
- Lisowski, M., R. McCaffrey, C.W. Wicks, and D. Dzurisin, Geodetic constraints on a 25-year magmatic inflation episode near Three Sisters, central Oregon, *J. Geophys. Res.*, 126, <https://doi.org/10.1029/2021JB022360>, 2021.
- Cosenza-Murales, B., C. DeMets, B. Marquez-Azua, O. Sanchez, J. Stock, E. Cabral-Cano, and R. McCaffrey, GPS-derived interseismic fault locking along the Jalisco-Colima segment of the Mexico subduction zone, *Geophys. J. Int.*, <https://doi.org/10.1093/gji/ggab436>, 2021.
- Cosenza-Murales, B., C DeMets, B. Marquez-Azua, O. Sanchez, J. Stock, E. Cabral-Cano, and R. McCaffrey, Coseismic and postseismic deformation for the 1995 Colima-Jalisco and 2003 Tecoman thrust earthquakes, Mexico subduction zone, from modelling of GPS data, *Geophys. J. Int.*, <https://doi.org/10.1093/gji/ggab435>, 2021.
- Ozbey, V., M. S. Ozeren, P. Henry, E. Klein, G. Galgana, H. Karabulut, D. Lange and R. McCaffrey, Kinematics of the Marmara Region: a fusion of continuum and block models, *Mediterranean Geoscience Reviews*, <https://doi.org/10.1007/s42990-021-00051-y>, 2021.

## Software contributions

- McCaffrey, R., and G. Abers, SYN3: A program for inversion of teleseismic body waveforms on microcomputers, Air Force Geophysics Laboratory Technical Report, *AFGL-TR-0099*, Sci. Report #1, 15 pp., 1988.
- McCaffrey, R., G.A. Abers, and P. Zwick, Inversion of teleseismic body waves, in *Digital Seismogram Analysis and Waveform Inversion*, edited by W.H.K. Lee, Int. Assoc. Seismol. Phys. Earth Inter. Software Library, 3, 81–166, 1991. ([http://web.pdx.edu/~mccaf/index\\_mt5.html](http://web.pdx.edu/~mccaf/index_mt5.html))
- McCaffrey, R., DEFNODE/TDEFNODE, 1995–. (<http://web.pdx.edu/~mccaf/www/defnode>)