UNIVERSITY OF CALIFORNIA, SAN DIEGO

Seismogeodesy and Rapid Earthquake and Tsunami Source Assessment

A dissertation submitted in partial satisfaction of the requirements for the degree

Doctor of Philosophy

in

Earth Science

by

Diego Melgar Moctezuma

Committee in charge:

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University of California, San Diego

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DEDICATION

To two, the loneliest number since the number one.

EPIGRAPH

A careful quotation conveys brilliance.
—Smarty Pants

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PUBLICATIONS

- Crowell, B.W., **Melgar, D.**, Bock, Y., Haase, J.S, and Geng, J., "Earthquake Magnitude Scaling using Seismogeodetic Data", *Geophys. Res. Lett*, 40(23), 2013.
- **Melgar, D.** and Bock, Y. "Near-Field Tsunami Models with Rapid Earthquake Source Inversions from Land- and Ocean-Based Observations: The Potential for Forecast and Warning", J. Geophys. Res., 118(11), 2013.
- Geng, J., Melgar, D., Bock, Y., Pantoli, E., and Restrepo, J.I., "Recovering coseismic point ground tilts from collocated high-rate GPS and accelerometers", *Geophys. Res. Lett*, 40(19), 2013.
- Melgar, D., Pantoli, E., Bock, Y., and Restrepo, J.I., "Displacement Acquisition for the NEESR:BNCS Building Shaketable Test via GPS Sensors", *Network for Earthquake Engineering Simulation (distributor)*, DOI:10.4231/D3V97ZR5H, 2013.
- **Melgar, D.**, Crowell, B.W., Bock, Y., and Haase, J.S, "Rapid modeling of the 2011 Mw 9.0 Tohoku-oki earthquake with seismogeodesy", *Geophys. Res. Lett*, 40(12), 2013.
- Geng, J., Bock, Y., **Melgar, D.**, Crowell, B.W., and Haase, J.S, "A new seismogeodetic approach applied to GPS and accelerometer observations of the 2012 Brawley seismic swarm: Implications for earthquake early warning", *Geochem. Geophys. Geosyst*, 14(7), 2013.
- Melgar, D., Bock, Y., Sanchez, D., and Crowell, B.W., "On Robust and Reliable Automated Baseline Corrections for Strong Motion Seismology", *J. Geophys. Res.*, 118(3), 2013.
- Perez-Campos, X., **Melgar, D.**, Singh, S.K., Cruz-Atienza, V., Iglesias, A., and Hjorleifsdottir, V., "Determination of tsunamigenic potential of a scenario earthquake in the Guerrero seismic gap along the Mexican subduction zone", *Seism. Res. Lett*, 84(3), 2013.

Crowell, B.W., Bock, Y., and **Melgar, D.**, "Real-time inversion of GPS data for finite fault modeling and rapid hazard assessment", *Geophys. Res. Lett*, 39(9), 2012.

Singh, S.K., Perez-Campos, X., Iglesias, A., **Melgar, D.**, "A Method for Rapid Estimation of Moment Magnitude for Early Tsunami Warning Based on Coastal GPS Networks", *Seism. Res. Lett*, 83(3), 2012.

Melgar, D., Bock, Y., and Crowell, B.W., , "Real-Time Centroid Moment Tensor Determination for Large Earthquakes from Local and Regional Displacement Records", *Geophys. J. Int.*, 188(2), 2012.

Bock, Y., **Melgar, D.**, and Crowell, B.W., "Real-Time Strong-Motion Broadband Displacements from Collocated GPS and Accelerometers", *Bull. Seism. Soc. Am.*, 101(6), 2011.

Melgar, D. and Perez-Campos, X., "Imaging the Moho and Subducted Oceanic Crust at the Isthmus of Tehuantepec, Mexico, from Receiver Functions", *Pure Appl. Geophysics*, 168, 2010.

ABSTRACT OF THE DISSERTATION

Seismogeodesy and Rapid Earthquake and Tsunami Source Assessment

by

Diego Melgar Moctezuma

Doctor of Philosophy in Earth Science

University of California, San Diego, 2014

Yehuda Bock, Chair

This dissertation will be abstract.

Chapter 1

Introduction

This is only a test.

1.1 Early Warning and Rapid Response in Natural Hazards

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1.1.1 More Stuff

Blah

*

Figure 1.1: A figure of Vonnegut.

- 1.2 Geodesy and Seismology
- 1.3 Earthquake and Tsunami Hazards

Chapter 2

Stupid

This is only a test.

2.1 Early Warning and Rapid Response in Natural Hazards

Lorem ipsum [Agnew and Larson, 2007] dolor sit amet, consectetuer adipiscing elit. Nulla odio sem, bibendum ut, aliquam ac, facilisis id, tellus. Nam posuere pede sit amet ipsum. Etiam dolor. In sodales eros quis pede. Quisque sed nulla et ligula vulputate lacinia. In venenatis, ligula id semper feugiat, ligula odio adipiscing libero, eget mollis nunc erat id orci. Nullam ante dolor, rutrum eget, vestibulum euismod, pulvinar at, nibh. In sapien. Quisque ut arcu. Suspendisse potenti. Cras consequat cursus nulla.

2.1.1 More Stuff

Blah

*

Figure 2.1: A figure of Vonnegut.

- 2.2 Geodesy and Seismology
- 2.3 Earthquake and Tsunami Hazards

Bibliography

[Agnew and Larson, 2007] Agnew, D. C. and Larson, K. M. (2007). Finding the repeat times of the gps constellation. GPS solutions, 11(1):71-76.