Curriculum Vitae of Chris H. Cramer

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***Contact Information:***

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***Objective:***

My goal is to contribute to the improvement of our understanding of seismic hazard and loss in the central U.S., the nation, and the world, and to credibly communicate this understanding to earth science professionals, engineers, emergency response planners, private industry, and the general public.

***Education:***

**School Major(s) Dates Attended Degree Year**

University of Puget Sound Physics/Math 9/65 - 6/69 B.S. 1969

Stanford University Geophysics 9/71 - 6/76 M.S. 1973

Stanford University Geophysics (Seismology) “ Ph.D. 1976

**Continuing Education**

Probabilistic Seismic Hazard Analysis (CDMG): 30 hours, 1990, Sacramento, CA

Radar Interferometry: Principles and Applications (UCLA Extension): 20 hours, 1996, Los Angles, CA

Evaluation and Mitigation of Seismic Hazards (UC Berkeley Geotechnical Engineering Program): 20 hrs, 1998, Los Angeles, CA

Advanced HAZUS Training for GIS Professionals (FEMA/RMS): 20 hrs, 1998, Menlo Park, CA

***Work Experience:***

**Summary:**

Jan. 2007 – present: Research Professor (Research Associate Professor prior to Sept. 1, 2016) with the Center for Earthquake Research and Information (CERI) at the University of Memphis, Memphis, TN, working on seismic hazard analysis, site amplification modeling, ground motion attenuation and modeling issues, and magnetotelluric studies of the New Madrid seismic zone and Mississippi embayment.

Nov. 1999 – June 2006: Research Geophysicist (highest grade: GS-14) with the U.S. Geological Survey (USGS) in Memphis at the Center for Earthquake Research and Information (CERI) working on seismic hazard research for the Urban Seismic Hazard Mapping Project (Memphis, TN; St. Louis, MO; Charleston, SC; and Evansville, ID), the National Seismic Hazard Mapping Project (CEUS, California, Pacific Northwest, and Intermountain West), and internationally (Bhuj, India; France).

1976 - Sept. 1999: Associate Seismologist with the then California Division of Mines and Geology (now California Geological Survey) working on tectonic studies, reservoir induced seismicity, and earthquake hazards evaluations (1976-1983); volcanic hazards monitoring (1979-1984); geothermal studies at Long Valley, California (1981-1982); geologic effects on earthquake ground motions (1984-1991), strong ground motion data studies (1991-1994), and probabilistic hazard and loss analysis projects and reviews (1994-1999).

1973-1976: Student appointment as a Research Geophysicist (GS-7 & GS-9) at the USGS working on marine geophysical data acquisition (gravity, magnetic, and seismic) and interpretation (magnetic), earthquake monitoring (field and interpretation), and earthquake prediction (Ph.D. thesis).

1972-1973: Teaching Assistant for the Geophysics Dept. at Stanford University (including teaching a geophysics laboratory course and assisting with the field geophysics course).

 1969-1971: Service in the U.S. Army

1966-1969: Undergraduate Student Assistant working on gravity and geodetic (leveling and triangulation) projects.

**Grants and Contracts:**

Principal Investigator: Establishing a Relation Among Seismicity, Density, and Resistivity Structures for the New Madrid Seismic Zone, CAS Research Grant, University of Memphis, July 2022 through June 2023.

Principal Investigator: Coastal Plain Amplification and Hazard Model for the National Seismic Hazard Model: Collaborative Research with University of Memphis, North Carolina State University, and Merrimack College, USGS NEHRP grant G22AP00018, January 1, 2022 through December 31, 2022.

Principal Investigator: Alaska Lg Tomography, Ground Motion Intensity Correlation Equation Development, and Subduction and Crustal GMM Alaska Regional Adjustments, USGS NEHRP grant G21AP10027, January 1, 2021 through December 31, 2021.

Principal Investigator: Charleston Area Earthquake Hazards Mapping Project Time History Database, Urban Hazard Maps, and Public Outreach: Collaborative Research with the University of Memphis and the College of Charleston, USGS NEHRP grant G19AP00022, January 1, 2019 through December 31, 2019.

Principal Investigator: Western Tennessee Seismic Hazard Mapping and Earthquake Early Warning Project, part of a NDRC grant from Department of Housing and Urban Development, May 1, 2017 through June 30, 2023.

Principal Investigator: Site Characterization for Seismic Hazard Analysis of the Sikeston, MO Power Plant, Contract with Haley and Aldrich, July-August, 2016.

Co-investigator: Post-Disaster Management of Freight Transportation Networks, FedEx Institute of Technology biologistics grant, January-December 2016.

Principal Investigator: Improving Regional Ground Motion Attenuation Boundaries and Models in the CEUS and Developing a Gulf Coast Empirical GMPE using EarthScope USArray Data. USGS NEHRP grant G14AP00049, June 1, 2014 through May 31, 2016.

Principal Investigator: Charleston, SC area Earthquake Hazards Mapping Project (CAEHMP) Workshop and Pilot Study: Collaborative Research with College of Charleston. USGS NEHRP grant G14AP00024, January 16, 2014 through January 15, 2015.

Principal Investigator: Updating Liquefaction Mobility Curves, Seismic Hazard Model, and Urban Seismic Hazard Maps with Public Outreach for Memphis and Shelby County, Tennessee. USGS NEHRP grant G14AP00099, August 1, 2014 through July 31, 2015.

Principal Investigator: A Proposal in Support of the St. Louis Area Earthquake Hazards Mapping Project: Completion of the Final 12 SLAEHMP Seismic and Liquefaction Hazard Maps. USGS NEHRP grant G13AP00046, July 1, 2013 through June 30, 2017.

Principal Investigator: Developing Empirical GMPEs for Eastern North America based on the NGA East Ground Motion Database and Additional M6-7 Ground Motion Estimates from Historical Earthquake Intensities. USGS NEHRP grant G13AP00030, June 1, 2013 through May 31, 2014.

Principal Investigator: Updating and Expanding Urban Seismic Hazard Maps and Public Outreach for the City of Memphis and Shelby County, Tennessee. USGS NEHRP grant G12AP20079, May 1, 2012 through April 30, 2013.

Principal Investigator: Improving Regional Ground Motion Attenuation Boundaries and Models Using EarthScope USArray Data. USGS NEHRP grant G12AP20018, January 1, 2012 through December 31, 2013.

Principal Investigator: Liquefaction Hazard Maps for the St. Louis Area Earthquake Hazards Mapping Project. USGS NEHRP grant G11AP20124, April 1, 2011 through March 31, 2012.

Principal Investigator: Completing NGA East ENA/SCR Ground Motion Database. PEER Center subagreement 7140, April 1, 2010 thorough April 30, 2012.

Principal Investigator: Completion of 12 St. Louis Area Earthquake Hazards Mapping Project Seismic Hazard Maps. USGS Cooperative Agreement G10AC00224, April 15, 2010 through April 14, 2013.

Principal investigator: St. Louis Area Earthquake Hazard Mapping Project: Update to Methodology and Urban Hazard Map Uncertainty Analysis. USGS NEHRP grant G09AP00008, Dec. 2008 through Nov. 2010.

Principal Investigator: Expected Value, Sensitivity, and Uncertainty Analysis of the USGS National Seismic Hazard Maps for South Carolina. Citadel subcontract agreement, Sept. 2008 through Nov. 2008.

Principal Investigator: Professional Seismic Services to Review Nuclear Site Applications. USGS cooperative agreement 08CRAG0020, Aug. 2008 through July 2016.

Investigator: Seismic hazard evaluation for the greater Memphis area portion of the Assissi Foundation Mass Shelter Project, May 2008 through April 2009.

Principal Investigator: St. Louis Area Earthquake Hazards Mapping Project: Suite of CEUS-Specific Hard-Rock Time-Histories and Seismic Hazard Model Updates. USGS NEHRP grant G08HQRG0016, Dec. 2007 through Nov. 2008.

Principal Investigator: Initial Design and Implementation of a Database for Central and Eastern U.S. Ground Motions. USGS cooperative agreement 07CRAG0015, Aug. 2007 through Aug. 2009.

Principal investigator: Savannah River Site, SC, adding site effects to previous probabilistic seismic hazard analysis. DOE contract for $6,000 through USGS, 2006.

Principal investigator: Savannah River Site, SC, probabilistic seismic hazard analysis including an uncertainty analysis. DOE contract for $41,000 through USGS, 2004.

Co-investigator: Twenty-nine nuclear reactor site probabilistic seismic hazard and uncertainty analysis. NRC contract (Art Frankel principal investigator) for $18,000 (my portion of contract only) through USGS, 2003-2004.

Co-investigator: Probabilistic seismic hazard uncertainty analysis for the Y-12 Facility, Oakridge, Tennessee. DOE contract (Art Frankel principal investigator) for $4,000 (my portion of contract only) through USGS, 2003.

Principal investigator: Earthquake ground motion study with uncertainty (probabilistic with effect of local geology) of the Mississippi embayment and surrounding area. NRC contract for $26,000 through the USGS, 2003-2004.

Principal investigator: Earthquake hazard study (probabilistic and deterministic) with uncertainty analysis at Wappapello Dam, Missouri. USACE contract for $8,000 through USGS, 2003.

Principal investigator: A detailed microearthquake survey of Long Valley, California, known geothermal resource area, July-September, 1981. DOE grant for $50,000 with matching state funding for $50,000, 1981-1982.

Co-principal investigator: Reservoir induced seismicity study at Aswan, Egypt. USGS grant in the early 1980’s.

Co-principal investigator: Reservoir induced seismicity study at Oroville Dam, CA. USGS grant in the late 1970’s.

***Teaching Experience:***

2018, 2020, and 2022 Spring Semesters: Taught CERI 7214/8214 Near Surface Geophysics, a four-credit course.

2009, 2010, 2012, 2013, 2015, 2017, 2019, 2021, and 2023 Spring Semesters: Taught ESCI 7204 (now GEOP7204), a three-credit course on probability and earthquake hazards.

2014 Fall Semester: Co-lead ESCI 7702 Seminar in Seismology with Christine Powell, a three-credit course on induced seismicity and earthquake early warning.

2012 Fall Semester: Helped teach ESCI 7205, a three-credit course on data analysis computer tools (my contribution was on FORTRAN, C, High Performance Computing, and unix make command).

2007 and 2008 Spring Semesters: Taught three-credit probability and earthquake hazards course as independent study to Jerry Kutliroff (2007 – CERI student) and Arash Zandieh (2008 – Civil Engineering student).

2002 Fall Semester: Taught one-credit seminar on Probability and Statistics in Earth Science at the University of Memphis as an adjunct professor.

2001 Spring Semester: Co-taught one-credit seminar on paleoliquefaction and probabilistic seismic hazard analysis at the University of Memphis as an adjunct professor.

2004-present: Taught single classes on earthquake hazards as guest lecturer on five occasions, once for Arlene Hill and four times for Shahram Pezeshk (one or two years apart).

***Student Guidance:***

2023 Spring Semester – present: Member of Chidozie Opara’s M.S. committee.

2022 Fall Semester – present: Temporary Graduate Advisor for Ayomiposi Falade’s Ph.D. committee.

2022 Spring Semester – present: Graduate Advisor for Zohreh Hafshejani’s Ph.D. committee.

2022 Fall Semester – present: Member of Mohsen Akhani’s Ph.D. committee in Civil Engineering.

2021 Fall Semester – present: Member of Hamed Tohidi’s Ph.D. committee in Civil Engineering.

2021 Fall Semester – present: Graduate advisor for Sadia Rinty’s Ph.D. committee until 2022 Spring Semester. Continued at member of committee.

2021 Fall Semester – present: served as member of Alamgir Hosain’s Ph.D. committee.

2021 Fall Semester – present: served as a member of Rizwanul Hasan’s Ph.D. committee in the Department of Earth Sciences.

2021 Spring Semester – present: Graduate advisor for Navin Thapa’s Ph.D. committee until 2021 Fall Semester. Continued as member of committee.

2020 Fall Semester – 2021 Spring Semester: served as member of Ryann Lam’s Ph.D. committee

2020 Fall Semester – present: served as member of S.M. Ariful Islam’s Ph.D. committee.

2020 Spring Semester – 2021 Spring Semester: served as member of Zoya Farajpour’s Ph.D. committee in Civil Engineering.

2019 Fall Semester – present: Graduate advisor for Kaushik Sarker’s Ph.D. committee.

2019 Fall Semester – present: Graduate advisor for Anuradha Mahanama’s PhD. committee.

2019 Fall Semester – present: served as member of Roshan Koirala’s Ph.D. committee.

2019 Spring Semester – 2020 Fall Semester: served as member of Ali Farhadi’s Ph.D. committee in Civil Engineering.

2019 Spring Semester – present: Served as member of Yixin Zhang’s Ph.D. committee.

2019 Spring Semester – 2019 Summer Semester: Served as member of Khurram Aslam’s Ph.D. committee.

2019 Spring Semester – 2021 Summer Semester: Served as member of Christopher Marlow’s Ph.D. committee.

2018 Fall Semester – present: Graduate Student Advisor for Roshan Bhattarai’s Ph.D. committee.

2018 Fall Semester – 2021 Summer Semester: Served as member of Yu Geng’s Ph.D. committee.

2018 Fall Semester – 2021 Summer Semester: Graduate Advisor for Benjamin Gembalia’s M.S. committee.

2018 Spring Semester – 2022 Summer Semester: Served as member of Oluwaseyi Bolarinwa’s Ph.D. committee.

2017 Fall Semester – 2019 Summer Semester: Graduate Student Advisor for Jabir Rahman’s M.S. committee.

2017 Fall Semester – 2020 Spring Semester: Served as member of Nima Nazemi’s Ph.D. committee in Civil Engineering

2017 Summer Semester – 2019 Summer Semester: Served as member of Arash Yarahmadi’s Ph.D. committee in Civil Engineering

2016 Fall Semester –Summer 2018: Served as member of Elizabeth Gilmore’s M.S. committee.

2016 Fall Semester – 2018 Spring Semester: Served as member of Farhad Sedegheti’s Ph.D. committee in Civil Engineering.

2015 Fall Semester – Fall Semester 2018: Graduate Student Advisor for Eric Jambo’s Ph.D./M.S. committee.

2014 Fall Semester – 2017 Spring: Graduate Student Advisor for Chungyu Liu’s Ph.D. committee through Spring 2015, afterward still served on his committee until Spring 2017.

2014 Fall Semester – 2015 Spring Semester: Served as a member of Urbi Basu’s Ph.D. committee.

2014 Spring Semester – Fall Semester 2018: Served as a member of Shima Azizzadeh Roodpish’s Ph.D. committee and graduate advisor since late Fall 2016.

2014 Spring Semester – Spring 2017: Served as a member of Alireza Haji Soltani’s Ph.D. committee in Civil Engineering.

2014 Fall Semester – Spring 2017: Served as a member of Yang Yang’s Ph.D. committee.

2013 Fall Semester – Fall Semester 2018: Graduate Student Advisor for Naeem Khoshnevis’s Ph.D. committee through Spring 2015, now still serving on his committee.

2013 Fall Semester: Served as member of Xiaochuan Tian’s M.S. committee.

2013 Spring Semester – 2015 Spring Semester: Served as member of Alireza Shohjouei’s Ph.D. thesis committee in Civil Engineering and M.S.

2012 Fall Semester – present: Graduate Student Advisor for Md. Monsurul Huda’s M.S. through Spring 2013. Still serving first on Monsurul’s M.S. committee and now on his Ph.D. committee.

2012 Fall Semester – 2017 Spring: Graduate Student Advisor for Mostafa Mousavi’s Ph.D. though Spring 2013. Afterward still served on Mostafa’s Ph.D. committee.

2012 Summer Term – Summer 2017: Graduate Student Advisor for Mahesh Dhar’s Ph.D. here at CERI. Also 2012 Spring Semester served on Mahesh’s Ph.D. committee.

2012 Spring Semester – 2014 Spring Semester: Served as member of Mehrdad Hosseini’s Ph.D. thesis committee in Civil Engineering.

2012 Spring Semester – Fall Semester 2018: Graduate Student Advisor for Philip Ogweno for his M.S. and now Ph.D. here at CERI.

2011 Fall Semester – present: Graduate Student Advisor for Md. Nayeem Al Noman for his M.S. and now Ph.D. here at CERI.

2011 Fall Semester – 2013 Spring Semester: Served as a member of Mojtaba Malekmohammadi Ph. D. thesis committee in Civil Engineering.

2010 Fall Semester – 2011 Summer Term: Served as a member of Arash Zandieh’s Ph. D. thesis committee in Civil Engineering.

2009 Summer and Fall Semester: Served as a member of Ali Shabazian-Ahari’s Ph.D. thesis committee in Civil Engineering.

2008 Fall Semester – 2014 Fall Semester: Graduate Student Advisor for Donny Dangkua for his Ph.D. program here at CERI.

2008 Fall – 2009 Spring Semester: Served as a member of Zach Lawerence’s Ph.D. committee.

2007 Spring Semester-Summer 2017: Graduate Student Advisor for Jerry Kutliroff, including his M.S. thesis and Ph.D. research on the seismic hazard of the Middle East.

2005 Spring Semester-2008 Spring Semester: Served as a member of Ting-Li Lin’s advisory and Ph.D. thesis committee.

2005 Fall Semester-2007 Summer Semester: Graduate Student Advisor for Allison Shumway, including guiding her M.S. research on the tectonics of the northern New Madrid seismic zone.

2003 Fall Semester-2004 Spring Semester: Graduate Student Advisor for Sandy Keller, including guiding her research.

2001 Summer Semester: Served as member of Megan Dockter’s thesis committee reviewing and approving her Master’s thesis.

***Professional Service:***

CERI Committees:

 O & E Committee – Member (August 2016 – August 2022)

 FDL Committee – Member (Aug 2014 – August 2016); Chair (Sept 2017 – present)

 Academic Program Committee – Member (Aug 2014 – present)

 Curriculum Committee – Member (Jan 2012 – August 2014)

 New Madrid Bicentennial – Chair (Jan 2008 – May 2012)

 CERI/USGS Interaction – Chair (Jan 2008 – Aug 2014)

 Policy – Member (Sept. 2008 – Sept. 2015)

Interdepartmental Committees:

 Engineering Seismology Program Committee – Member (Apr 2013 – present)

USGS Working Groups:

 Coastal Plain Amplification working group ­– Member (Jan 2021 – present)

 Monthly online meetings: main group, subgroup A, and NEHRP grant group.

CERI Faculty Search Committees:

 Engineering Seismologist – Member (Nov 2011 – Sept 2012), chair (Oct 2012 – Mar 2013)

 Seismologists (2) – Member (August 2018 – June 2019)

Urban Hazard Mapping Technical Working Groups (TWG) – Quarterly meetings/ Monthly conference calls:

 Charleston TWG (leader) – Jan 2014 to Jan 2015; Jan 2019 to Dec 2019

 Memphis TWG (leader) – May 2012 to May 2017

 Evansville TWG – May 2008 to August 2012

 St. Louis TWG – Jan 2007 to May 2017

February 2015 – December 2015: chair and participant of the Meeting Organizing Committee for the 2015 Eastern Section, Seismological Society of America annual meeting in Memphis on October 5-8, 2015.

June 2013 – October 2013: member of CUSEC Memphis Building Code Forum organizational committee for October 17th Memphis Forum at the University of Memphis.

November 2011: participated in seismic hazard evaluation for the Tennessee Association of Utility Districts by CCS Group, Inc

October 2009 – October 2017: Served as Secretary for two years, Vice President for two years, President for two years, and Past-President for two years of the Eastern Section of the Seismological Society of America.

June 3-5, 2009: One of seven invited speakers at an AEG Shlemon Conference on central US time histories. Also co-convener and organizer of the conference. The conference was held at the University of Memphis, Memphis, TN.

Sept. 2008: Participated in two-day Mmax workshop in Golden, CO held jointly by USGS and NRC.

August 2008: Lead presentation of four invited speakers at Swiss Re Acadamy in Chicago on CEUS earthquake hazards. Audience was the insurance community.

July 2008 – present: Participated in CUSEC New Madrid Bicentennial planning conference calls and will be serving on several subcommittees. Co-chaired New Madrid Bicentennial Committee with Jim Wilkinson of CUSEC. Continuing as facilitator of the follow-on New Madrid Coordination Committee.

June 2008: Developed scenario ground motions with effects of geology for FEMA Catastrophic Planning Exercises at the request of USGS.

April – June 2008: participated in seismic hazard evaluation for Memphis International Airport by Thornton Tomasetti, Inc.

March 2008: participated in seismic hazard evaluation for Germantown, TN by CCS Group, Inc

Feb. 2008: Invited speaker on CUS earthquake hazards during West Tennessee Earthquake Awareness week.

Jan. 2008 – June 2009: Co-organizer of a three-day AEG Shlemon Conference on CEUS Time Histories scheduled here at the University of Memphis for June 3-5, 2009.

Nov. 2007 – March 2008: PSHA expert member of URS design review board for redesign of Taum Sauk pump-storage dam in Missouri. URS was hired by the insurers after the dam failed by overtopping in 2005.

2007 to December 2014: Participant in EERI New Madrid Bicentennial scenario development project.

***Professional Memberships and Licenses:***

**Memberships:**

Seismological Society of America (since 1974)

Earthquake Engineering Research Institute (since 1989)

American Geophysical Society (since 1973)

**Licenses:**

Registered Geologist #4403 with the State of Tennessee

Registered Geophysicist #1018 with the State of California

***Awards:***

1990 – California Department of Conservation: Sustained Superior Accomplishment Award for work and service during the Turkey Flat Site Effects Experiment.

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1997 – California Department of Conservation: Sustained Superior Accomplishment Award plus $250 for work as a member of CDMG’s scientific review team involved in appraising the California Earthquake Authority’s seismic hazard and risk model used in setting earthquake insurance rates in California, including expert testimony at State of California rate hearings.

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June 2000 – USGS “Star” award ($750) for contributions to the central and eastern U.S. workshop on seismic hazard on June 13-14, 2000. The award was for an improved uncertainty analysis of model alternatives for the New Madrid and Charleston areas, and leadership in presenting and discussing the analysis at the workshop.

August 2001 – USGS “Star” award ($750) for contributions to the CEUS hazard team efforts during the preceding year. The award was for leadership in dealing with hot earthquake hazard issues in tight time frames.

November 2002 – USGS “Star” award ($5000) for contributions to the Memphis Urban Hazards Mapping Project. The award was for scientific expertise and an ability to work with all disciplines of collaborators and potential users of the maps, and for moving the development of the seismic hazard maps forward toward completion in a very timely manner.

August 2004 - USGS “Star” award ($500) for being a contributing member of a USGS team reviewing three nuclear power plant early site permits for the NRC in the course of a few months.

February 2014 – University of Memphis Faculty Millionaire award for over $1 million in research grants as the principal investigator.

June 2018 – Jesuit Seismological Association Award from the Eastern Section of the Seismological Society of America for outstanding contributions to the understanding of earthquakes and ground motions in Central and Eastern North America.

***Publications:***

Bwambale, B., R.D. Andrus, T. Heidari, J. Gathro, and C.H. Cramer, 2022 Influence of Source-to-Site Distance and Diagenesis on Liquefaction Triggering of 200,000-year-old Beach Sand, *Engineering Geology* **295**, https://doi.org/10.1016/j.enggeo.2022.106557.

Reichenbach, R., R. Van Arsdale, R. Cox, and C. Cramer, 2022, Geomorphology, Tree-Dimensional Geology, and Seismologic Hazards of the New Madrid Seismic Zone in Dyer County, Tennessee, *Environmental and Engineering Geology* **28**, pp 147-171.

Goulet, C.A., T. Kishida, T.D. Ancheta, C.H. Cramer, R.B. Darragh, W.J. Silva, Y.M.A. Hashash, J. Harmon, G.A. Parker, J.P. Stewart, and R.R. Youngs, 2021, PEER NGA-East Database, *Earthquake Spectra* **37**, 1331-1353.

Cramer, C.H., 2020, Updated GMICE for central and eastern North America extending to higher intensities, *Seis. Res. Lett.* **91**, 3518-3527.

Cramer, C.H., S.C. Jaume, and N.S. Levine, 2019, Final Technical Report: Charleston area earthquake hazards mapping project time history database, urban hazard maps, and public outreach workshop: collaborative research with University of Memphis and the College of Charleston, USGS grant G19AP00021 and G19AP00022, March 31, 2020, 49 pp (available at http://earthquake.usgs.gov/cfusion/external\_grants/reports/G19A00022.pdf).

Ogweno, L.P., M.M. Withers, and C.H. Cramer, 2019, Earthquake early warning feasibility study for the New Madrid seismic zone, *Seis. Res. Lett.* **90**, 1377-1392.

Cramer, C.H., and E. Jambo, 2019, Impact of a larger fore-arc region on earthquake ground motions in south-central Alaska including the 2018 M7.1 Anchorage inslab earthquake, *Seis. Res. Lett.* **91**, 174-182.

Azizzadeh-Roodpish, S., and C.H. Cramer, 2018, Visibility graph analysis of Alaska crustal and Aleutian subduction zone seismicity: an investigation of the correlation between b value and k-M slope, *Pure and Applied Geophysics* **175**, 4241-4252.

Cramer, C.H., M.S. Dhar, and D. Arellano, 2018, Update of the urban seismic and liquefaction hazard maps for Memphis and Shelby County, Tennessee: liquefaction probability curves and 2015 hazard maps, *Seis. Res. Lett.* **89**, 688-701.

Cramer, C.H., 2017, Gulf coast regional Q and boundaries from USArray data, *Bull. Seism. Soc. Am.* **108**, 437-449, published online 19 December 2017.

Dhar, M.S., and C.H. Cramer, 2018, Probabilistic seismic and liquefaction hazard analysis of the Mississippi embayment incorporating nonlinear effects, *Seis. Res. Lett.* **89**, 253-267, published online 13 December 2017.

Cramer, C.H., 2017, Brune stress parameter estimates for the 2016 Mw 5.8 Pawnee and other Oklahoma earthquakes, *Seis. Res. Lett.* **88**, 1005-1016.

Cramer, C.H., R.A. Bauer, J. Chung, J.D. Rogers, L. Pierce, V. Voigt, B. Michell, D. Gaunt, R.A. Williams, D. Hoffman, G.L. Hempen, P.J. Steckel, O.S. Boyd, C.M. Watkins, K. Tucker, and N. McCallister, 2017, St. Louis area earthquake hazards mapping projects: seismic and liquefaction hazard maps, *Seis. Res. Lett.* **88**, 206-223.

Ogweno, L.P., and C.H. Cramer, 2017, Improved CENA regression relationships between modified Mercalli intensities and ground-motion parameters, *Bull. Seism. Soc. Am.* **107**, 180-197.

Cramer, C.H., and M.N. Al Noman, 2016, Final Technical Report: Improving regional ground motion attenuation boundaries and models in the CEUS and developing a Gulf Coast empirical GMPE using EarthScope USArray data for use in the National Seismic Hazard Mapping Project, USGS grant G14AP00049, August 17, 2016, 52 pp (available at http://earthquake.usgs.gov/research/external/reports/G14A00049.pdf).

Cramer, C.H., G. Patterson, and David Arellano, 2015, Final Technical Report, Updating Liquefaction Probability Curves, Seismic Hazard Model, and Urban Seismic Hazard Maps with Public Outreach for Memphis and Shelby County, Tennessee, USGS grant G14AP00099, October 30, 2015, 42 pp (available at http://earthquake.usgs.gov/research/external/reports/G14AP00099.pdf).

Ramirez-Guzman, L., R.W. Graves, K.B. Olsen, O.S. Boyd, C. Cramer, S. Hartzell, S. Ni, P. Somerville, R.A. Williams, and J. Zhong, 2015, Ground-motion simulations of 1811-1812 New Madrid earthquakes, central United States, *Bull. Seism. Soc. Am.* **105**, 1961-1988.

Al-Noman, M.N., and C.H. Cramer, 2015, Empirical ground-motion prediction equations for eastern North America (Chapter 8), in *NGA-East: Median Ground-Motion Models for the Central and Eastern North America Region*, Pacific Earthquake Engineering Research Center, PEER Report No. 2015/04, University of California, Berkeley, CA., 193-212.

Cramer, C.H., S.C. Jaume, and N.S. Levine, 2015, Final Technical Report, Charleston Area Earthquake Hazards Mapping Project (CAEHMP) Workshop and Pilot Study: Collaborative Research with the College of Charleston and the University of Memphis, USGS grants G14AP00023 and G14AP00024, April 15, 2015, CERI, 46 pp (available at <http://earthquake.usgs.gov/research/external/reports/>G14AP00024.pdf).

Cramer, C.H., and M.N. Al Noman (2015). First Year Technical Report, Improving Regional Ground Motion Attenuation Boundaries and Models in the CEUS and Developing a Gulf Coast Empirical GMPE Using EarthScope USArray Data for Use in the National Seismic Hazards Mapping Project, USGS grant G14AP00049, April 15, 2015, CERI, 16 pp).

Goulet, C.A., T. Kishida, T.D. Ancheta, C.H. Cramer, R.B. Darragh, W.J. Silva, Y.M.A. Hashash, J. Harmon, J.P. Stewart, K.E. Wooddell, and R.R. Youngs, 2014, *PEER NGA-East Database*, Pacific Earthquake Engineering Research Center, PEER Report No. 2014-17, University of California, Berkeley, CA.

Cramer, C.H., and O.S. Boyd, 2014, Why the New Madrid earthquakes are M7–8 and the Charleston earthquake is ~M7, *Bull. Seism. Soc. Am.* **104**, 2884-2903.

Boyd, O.S., and C.H. Cramer, 2014, Estimating earthquake magnitudes from reported intensities in the Central and Eastern United States, *Bull. Seism. Soc. Am.* **104**, 1709-1722.

Cramer, C.H., R.B. Van Arsdale, M.S. Dhar, D. Pryne, and J. Paul, 2014, Updating of urban seismic-hazard maps for Memphis and Shelby County, Tennessee: geology and Vs observations, *Seis. Res. Lett.* **85**, 986-996.

Ogweno, L.P., and C.H. Cramer, 2014, Comparing the CENA GMPEs using NGA-East ground motion database, *Seis. Res. Lett.* **85**, 1377-1393.

Mousavi, S.M., C.H. Cramer, and C.A. Langston, 2014, Average QLg, QSn, and observation of Lg-blockage in the continental margin of Nova Scotia, *J. Geophys, Res.*, doi:10.1002/2014JB011237, 23 pp.

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