

**Tianqing Cao**

**Education:**

1960 – 1965 (B.S.)

Chinese University of Science and Technology in Beijing, B.S. in Theoretical Nuclear Physics.

1983 – 1986 (Ph. D.)

Massachusetts Institute of Technology, Cambridge, MA, Ph.D. in Geophysics (seismology), June 1986. Thesis title: "Simulation of Seismicity Pattern and Recurrence Behavior on a Heterogeneous Fault Using Laboratory Friction Laws". Thesis supervisor: Professor Keiiti Aki.

**Experience:**

2007 – present

Senior Seismologist, NRC/NMSS

DOE Yucca Mountain license review – performed confirmatory calculations on seismic ground motion responses, drift thermal degradation, criticalities, engineering slope stability, and interlock failure rate (using population-variability distribution method); wrote the seismic and drift degradation sections of NUREG-1949, Vol. 2 and Vol. 3

NRC Response to Fukushima earthquake -- worked on NRC's seismic response (seismic recommendation 2.1) project after the Japanese Fukushima earthquake (reevaluating the seismic hazards at 105 US nuclear power plants); calculated the seismic hazards for six power plants (Arkansas, Braidwood, Byron, Duane Arnold, LaSalle, and Wolf Creek) in 2014.

Reviewed mathematical portions of NUREG-2115, Central and Eastern United States Seismic Source Characterization for Nuclear Facilities.

Reviewed RIL 09-001, Preliminary deterministic analysis of seismic hazard at Diablo Canyon nuclear power plant from newly identified 'Shoreline Fault' (2013).

Worked on the DECOVALEX (**DE**velopment of **CO**upled Models and Their **VAL**idation against **EX**periments) project, which is an international workshop. Wrote a paper deriving the mass balance equation for a single crack system and corrected a mistake in previous literatures (2013).

Installed the USGS seismic hazard calculation code for the NRC Office of Research (RES) to allow comparison of old hazard evaluations with new ones

2000 – 2007

Senior Seismologist, California Geological Survey, Probabilistic Seismic Hazard Mapping Program (2000 –2007)

Worked with USGS scientists to update the California hazard map and provided help to the state wide public and private sectors on seismic hazard issues.

1987 – 2000

Associate Seismologist, Strong Motion Instrumentation Program of California Geological Survey.

Worked on strong motion data analysis, record processing, and digitization. Digitized, processed, and analyzed over thousand strong motion records, updated data processing and digitization software packages,

1986 – 1987

Research Associate, Department of Geological Science, University of Southern California. (Supervisor: Keitti Aki)

1981 – 1982

Visiting scientist at the Department of Earth and Planetary Sciences, MIT

1974 – 1980

Assistant researcher at the Seismological Bureau of Liaoning Province, China. Studied seismicity and other precursors for earthquake prediction (geodetic measurement, radon, ground water level, and ground tilt measurements), which led to the prediction of the 1975 Haicheng Earthquake (M=7.3).

1970 – 1974

Engineer at the Chemical Plant of Chifeng, Inner Mongolia, China.

### **Publications:**

Petersen, M, T. Dawson, R. Chen, T. Cao, C. Wills, D. Schwartz, and A. Frankel (2011). Fault Displacement Hazard for Strike-Slip Faults, *Bull. Seism. Soc. Am.*, 101, 805-825.

Cao, T. (2007). Disaggregation of seismic hazard extended to disaggregation of annualized loss ratio, *Bull. Seism. Soc. Am.*, 97-1B, 365-376.

Petersen, M., T. Cao, K. Campbell, and A Frankel (2006). A time-independent and time-dependent model for the state of California, *Seism. Res. Lett.*, Vol. 78, No. 1, 99-109.

Cao, T., and M. Petersen (2006). Uncertainty of earthquake losses due to model uncertainty of input ground motions in the Los Angeles area, *Bull. Seism. Soc. Am.*, 96, 365-376.

Cao, T., M. Petersen, and A. Frankel (2005). Model Uncertainties of the 2002 update of California seismic hazard maps, *Bull. Seism. Soc. Am.*, 95, 2040-2057.

Cramer, C., M. Petersen, T. Cao, T Topozada, M. Reichle (2000). A time-dependent probabilistic seismic-hazard model for California, *Bull. Seism. Soc. Am.*, 90, 1-21.

Cao., T., M. Petersen, C. Cramer, T. Topozada, M. Reichle, and J. Davis (1999). The calculation of expected loss using probabilistic seismic hazard, *Bull. Seism. Soc. Am.*, 89, 867-876.

Cao, T., M. Petersen, and M. Reichle (1996). Seismic hazard estimate from background seismicity in Southern California, *Bull. Seism. Soc. Am.*, 86, 1372-1381.

Petersen, M.D., W.A. Bryant, C.H. Cramer, T. Cao, M.S. Reichle, A.D. Frankel, J.J. Lienkaemper, P.A. Mccrory, and D.P. Schwartz (1996). Probabilistic seismic hazard assessment for the State of California: California Division of Mines and Geology Open-file Report 96-08 (USGS Open-file Report 96-706).

Shakal, A.F., M.J. Huang, and T. Cao (1988). The Whittier-Narrows, California earthquake of October 1, 1987 – CSMIP strong motion data, *Earthquake Spectra*, Vol. 4, no. 1, 75-100.

Cao, T., and K. Aki (1987). Physical basis for the magnitude cut-off dependence of seismicity quiescence, U. S. Geological Survey, Open-file Report 87-591, 934-957.

Cao, T. (1987). Emergency response following 1976 Tangshan, China earthquake, *California Geology*, December, 1987.

Li, V.C., S.H. Seale, and T. Cao (1987). Time-dependent postseismic stress alterations due to fluid flow: Control of aftershock distributions, *Tectonophysics*, 144, 37-54.

Cao, T., and K. Aki (1986). Effect of slip rate on stress drop, *PAGEOPH*, vol. 124, no. 3, 515-529.

Cao, T., and K. Aki (1986). Seismicity simulation with a rate and state dependent friction law, *PAGEOPH*, vol. 124, no. 3, 487-513.

Jin, A., T. Cao, and K. Aki (1985). Regional changes of coda Q in the oceanic lithosphere, *J. Geophys. Res.*, 90, 8651-8659.

Cao, T., and K. Aki (1984/85). Seismicity simulation using a mass-spring model characterized by the displacement hardening-softening friction law, *PAGEOPH*, 122, 10-24.

Cao, T., and K. Aki (1983). Assigning probability gain for precursors of four large Chinese earthquakes, *J. Geophys. Res.*, 88, 2185-2190.

Yuzo, I., C. Zhu, and T. Cao (1983). On some characteristics of strong aftershocks of the 1976 Tangshan, 1975 Haicheng, and 1976 Yanyuan – Ninglang earthquakes, *Acta Seismol. Sinica*, 5(1), 15-30.

Gu, H.D., and T. Cao (1980). Precursory earthquake swarm and the polarization of S-wave, *Acta Seismol. Sinica*, 2(4), 343-355.