

Geology Lecture Series

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Spokane Community College
Lair-Student Center Auditorium

1810 N Greene Street, Spokane, Washington

The 1999 Turkey earthquake and a decade of urban earthquakes: What happened and what have we learned?

by

Dr. Thomas L. Holzer

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Presentation

The 1999 earthquake in northwest Turkey killed about 40,000 people. That earthquake was one of the latest in a decade of earthquakes that heavily damaged major urban areas. Five earthquakes were particularly significant: 1989 Loma Prieta in the San Francisco Bay region, 1994 Northridge in the Los Angeles region, 1995 Kobe, Japan, 1999 Kocaeli, Turkey, and 1999 Chi-Chi, Taiwan. Each of these earthquakes caused loss of life, billions of dollars of damage, and prompted significant research efforts. What happened in these earthquakes and what have we learned? First and foremost, these earthquakes demonstrated the potential for catastrophic losses from earthquakes even in modern urban areas. This realization has both drastically altered how earthquake insurance is priced and sold in the United States and prompted renewed efforts by society to reduce the impact of earthquakes, particularly on transportation systems.

These earthquakes also have influenced how earthquake hazards are studied. First, scientists have largely abandoned efforts to predict earthquakes and now emphasize long-term prediction or what is known as forecasting. By reconstructing the past history of faulting from both geologic and historic studies, earthquake scientists have developed forecasts of the likelihood of future earthquakes. This has challenged geologists to develop new insights into how to recognize evidence of earthquakes in the geologic record. A major discovery of this research is the significant earthquake hazard in the Pacific Northwest.

Second, the ability to predict ground shaking in future earthquakes has been improved. Instrumental observations of ground shaking in these five earthquakes have revealed how both local ground conditions and the way a fault ruptures as it generates the earthquake, can greatly affect the level of shaking. Both factors are now incorporated to some degree into new building codes. And third, the importance of liquefaction and landslides during the Loma Prieta earthquake has led to new mapping and regulations in California that affect construction in particularly hazardous areas. The Turkey earthquake confirmed how important these efforts are to the safety of those who live in areas where earthquakes occur.

Speaker

Dr. Thomas L. Holzer is an engineering geologist with the U.S. Geological Survey in Menlo Park, California. Since 1987, he has been involved in numerous domestic and foreign post-earthquake investigations. He led the USGS teams that investigated the 1989 Loma Prieta, California, and 1999 Kocaeli, Turkey, earthquakes. He received his Ph.D. from Stanford University and his B.S.E. from Princeton University. He taught at the University of Connecticut from 1970 to 1975 and is currently an adjunct professor at Stanford University. When not pursuing earthquakes, Dr. Holzer's research interests are in predicting and mapping liquefaction hazards and earthquake loss modeling. He was the 1998 Richard H. Jahns Distinguished Lecturer in Engineering Geology and the 1995 recipient of the Distinguished Service Award of the Hydrogeology Division of the Geological Society of America. He also has been a recipient of the Public Service and Superior Service Awards of the U.S. Department of Interior. He has authored more than 80 technical publications.



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