

# **Deformation Monitoring via Remote Sensing: Applications to Landslides and Liquefaction**

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Landslides and liquefaction are two important geologic hazards that impact the built environment. The deformations associated with these phenomena can induce significant economic losses, which motivates research into accurately predicting these hazards. Our understanding of the complex interactions associated with landslide and liquefaction-induced deformations is hampered by the limited field data that are available and its low spatial and temporal resolution. However, advances in optical imagery correlation techniques and the availability of very high resolution optical satellite imagery now allows us to measure deformation patterns at high resolution and gain insights not available before. This presentation will describe our efforts to apply optical imagery correlation to active landslides and earthquake-induced liquefaction/lateral spreading. Analysis of the Portuguese Bend Landslide, located on the Palos Verdes Peninsula in Southern California, will be presented and the deformation rates from optical image correlation will be compared with those from field GPS. Optical image correlation also is applied to the 2011 Christchurch, New Zealand earthquake to measure the lateral spreading deformations associated with liquefaction. These analyses provide lateral spread deformations at a spatial resolution never obtained before. The potential use of these measurements to improve our understanding of the main drivers for liquefaction movements will be discussed.

## **BIO**

Ellen M. Rathje, Ph.D., P.E. is the Warren S. Bellows Centennial Professor in the Department of Civil, Architectural, and Environmental Engineering at the University of Texas at Austin, USA. Her research encompasses the areas of seismic site response analysis, seismic slope stability, field reconnaissance after earthquakes, and remote sensing of geotechnical phenomena. She has published over 100 papers on these topics and has supervised the research of over 30 graduate students. Her research has been funded by the U.S. Geological Survey, the U.S. Nuclear Regulatory Commission, the U.S. National Science Foundation, and the United Nations Development Programme.

Dr. Rathje is a founding member and current Co-Chair of the Geotechnical Engineering Extreme Events Reconnaissance (GEER) Association, an organization that coordinates geotechnical investigations after extreme events such as earthquakes and floods. She was a member of the Board of Directors of the Earthquake Engineering Research Institute (EERI) from 2010-2013, and a member of the Scientific Earthquake Studies Advisory Committee of the U.S. Geological Survey from 2007-2013. She has been honored with various research awards, including the Huber Research Prize from the American Society of Civil Engineers in 2010, the Hogentogler Award for outstanding paper from ASTM Committee D18 in 2010, the Shamsheer Prakash Research Award in 2007, the Shah Innovation Prize from EERI in 2006, and the Casagrande Award from ASCE in 2002.