Assessing Intraplate Earthquake Hazards from Satellite Geopotential Field Observations

Ralph R.B. von Frese, Mohammad F. Asgharzadeh, Orlando Hernandez
School of Earth Sciences, The Ohio State University, Columbus, OH, 43210, USA

Hyung Rae Kim
NASA Planetary Geodynamics Branch, GSFC, Greenbelt, MD, 20771, USA

Jeong Woo Kim
Dept. of Geoinformation Emgineering, Sejong University, Korea

Satellite-altitude magnetic and gravity anomalies reflect lateral long-wavelength contrasts in magnetization and density, respectively, related to petrological, structural, and thermal variations of the crust and mantle. Relative to previous missions, the new generation Ørsted, CHAMP, and GRACE satellites provide geopotential measurements with vastly improved accuracy, and spatial and temporal resolution. The integration of these satellite observations with near-surface geopotential data and seismic, GPS, and magnetotelluric observations can greatly improve geological studies of intraplate continental regions. Seismic data that define crustal thickness variations are especially important because the poorly known regional magnetic and density variations of the crust and mantle recorded at satellite altitudes are each a product of the integrated physical property times the layer thickness. We use these results to investigate the Transcontinental Magnetic Anomaly along the 38th parallel lineament and its influence on crustal stress and earthquake activity in the conterminous US. We also combine gravity and seismic observations to obtain an improved model of crustal stress variations that influence the intraplate seismicity of the US midcontient. The gravity data further reveal mantle density variations to constrain thermal plumes or regions of mass flow that may drive North American plate tectonics.