A tectonic context for EarthScope studies of Midcontinent United States: GIS synoptic maps of subsurface faults and of basement topography

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Midcontinent United States is part of the continental-interior platform, a portion of North America's craton in which a veneer of Phanerozoic strata largely covers Precambrian basement. The basement includes Precambrian convergent/accretionary orogens, anorogenic igneous provinces, and rifts. At the close of the Precambrian, erosion produced a continent-wide unconformity, the so-called "great unconformity," that serves as an ideal marker surface for characterizing epeirogenic movements (broad, gradual upwarps and downwarps) of the lithosphere's surface. These movements yielded intracratonic basins, domes, and arches. Displacements of marker horizons within the Phanerozoic cover indicate that faults throughout the craton have undergone pulses of reactivation during the Phanerozoic, and have warped the cover strata into monoclinal folds. In association with our EarthScope Flexible Array project (OIINK), we are producing a synoptic maps to illustrate "basement topography" (the 3-D shape of the great unconformity), as well as the distribution of faults and folds in cratonic-platform crust of the United States. The region covered by our maps extends from the Appalachian front on the east to the Wasatch front on the west, and thus includes the Midcontinent as well as the Rocky Mountains and the Colorado Plateau. Our maps, which are being prepared using ArcGIS, permit visualization of epeirogenic features in 3-D and illustrate relationships between these features and fault-and-fold zones. Overlaying other data sets (magnetic anomalies, gravity anomalies, heat flow, earthquake epicenters, surface topography, and bedrock geology) on our maps reveal links among many geo-tectonic phenomena, and provide a basis for interpreting relationships among deep-crustal and mantle inhomogeneities and boundaries, and upper-crustal geologic features that are now being documented by EarthScope's USArray.