

## Structure and dynamics of the mid-Atlantic Appalachians from seismology, geodynamics, and geomorphology: Preliminary results from the MAGIC project

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The Mid-Atlantic Geophysical Integrative Collaboration (MAGIC) is an EarthScope-funded project that involves a collaborative effort among seismologists, geodynamicists, and geomorphologists to understand the relationships among surface processes, crustal and lithospheric structure, and deep mantle flow beneath eastern North America. This passive continental margin has been modified by multiple episodes of orogenesis and rifting through several cycles of supercontinent assembly and breakup over the past 1.3 billion years of Earth history. It is unclear to what extent deep structures in the crust and mantle lithosphere have persisted over this timeframe, and what controls the pattern of mantle flow beneath the passive continental margin. Furthermore, the persistence of Appalachian topography remains a major outstanding problem in the study of landscape evolution; there is evidence for relatively recent rejuvenation of this topography, which may be connected to deep mantle flow. Here we report on progress made during the initial stages of the MAGIC project and describe preliminary results from the seismic deployment, geodynamical modeling, and geomorphological investigations. The MAGIC FlexibleArray broadband seismic deployment started in October 2013, with the main phase of the deployment taking place in October 2014. As of late 2014 the experiment had 23 stations running, with an additional 5 to be installed in June 2015; the stations will operate through October 2016. We have also investigated SKS splitting at Transportable Array stations in the MAGIC study area and throughout the eastern US, which reflects a combination of present-day flow in the asthenospheric mantle and past lithospheric deformation. Preliminary geodynamical models based on global tomography are currently being compared with these measurements; future models will incorporate seismic constraints from the MAGIC experiment. We are also currently undertaking a regional analysis of channel profiles and knickpoint distribution for the eastern United States, with the goal of identifying regional patterns in transient topographic change whose association with crustal and/or mantle features might illuminate the causes of topographic rejuvenation. A major component of the MAGIC seismic deployment involves outreach to colleges and universities in our field area, many of which are primarily undergraduate institutions and most of which do not otherwise have active ties to the EarthScope initiative.

