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LATE CENOZOIC TOPOGRAPHIC REJUVENATION IN THE CENTRAL APPALACHIANS: GEOMORPHIC CONSTRAINTS AND GEOPHYSICAL RELATIONSHIPS FROM THE MAGIC PROJECT

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The persistence of topography in the Appalachian Mountains remains an outstanding problem in landscape evolution. Elevations reach >1000 m along much of the range yet it has been ~200 m.y. since rifting and the development of eastern North America into a passive margin. Geomorphologic evidence for late Cenozoic topographic rejuvenation exists, however the cause of this rejuvenation remains unknown. Here, we present preliminary results from the Mid-Atlantic Geophysical Integrative Collaboration (MAGIC) project, a joint effort among geomorphologists, seismologists, and geodynamicists to explore the relationships among surface processes, crustal and lithospheric structure, and mantle flow beneath eastern North America. First, we present the evidence for topographic rejuvenation in the Susquehanna River basin, which crosses the Piedmont, Valley and Ridge, and Appalachian Plateau provinces. Stream longitudinal profiles record two distinct waves of transient erosion (100-150 m) associated with migrating knickpoints and increasing local relief in all three provinces. Inverse modeling, using a stream power erosion coefficient calibrated using erosion rates from cosmogenic ^{10}Be inventories of modern stream sediment and measurements of channel steepness, suggests erosion rates increased from ~20 to ~50 m/m.y. during the middle Miocene, and then increased to >100 m/m.y. in the Plio-Pleistocene. These results are consistent with periods of increased terrace incision on the lower Susquehanna River and changes in deposition in the Salisbury embayment. Second, we show similar evidence for rejuvenation in drainage basins south of the Susquehanna (e.g., Potomac, Rappahannock, and James Rivers), closer to the MAGIC Flexible Array broadband seismic deployment. Although some drainage divide migration, stream capture, and climate change likely contribute to the transient nature of erosion, the broad similarities in stream chi plots in all of these basins, across a range of rock types, point to a shared fluvial response to relative base level fall. Lastly, we present preliminary seismological and geodynamic model results, and consider possible driving mechanisms that have contributed to topographic rejuvenation in the region.

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P5. Appalachian Geomorphology I
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Room 327/328/329 (Baltimore Convention Center)

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