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Opportunities for EarthScope-Leveraged 3-D "Superexperiment" in the Southern Rocky Mountains of the United States.

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The more than decade-long deployment of the EarthScope USArray transportable array (400 simultaneously deployed broadband seismographs with a mean station spacing of 75 km), in conjunction with the flexible array (200 broadband, 200 short period, and 2000 single-channel instruments) offers unique opportunities for pioneering lithospheric-scale imaging experiments. During 2004 multiple National Science Foundation (NSF) workshops were held to discuss these opportunities in the context of the structure and evolution of the lithosphere beneath the southwestern United States, including the Basin and Range, Colorado Plateau, Great Plains, Rio Grande Rift, and southern Rocky Mountain provinces. The southern Rocky Mountains consists of Proterozoic accreted arc assemblages that have been extensively altered during the past 60 My, first by flat-slab Laramide subduction, with associated hydration and compression, and subsequently by post-Laramide magmatism and extension. Prior and ongoing IRIS PASSCAL and NSF-supported seismic imaging efforts in the region (Deep Probe, RISTRA, CD-ROM) have produced tantalizing and remarkably high resolution 2-D images of the lithosphere showing great mantle complexity involving velocity contrasts across relatively sharp (several km scale) boundaries. However, the resolution and interpretation of these images has been fundamentally limited by their primarily 1-dimensional deployment and 2-dimensional imaging geometries. The most pressing and intriguing question is the extent to which the velocity domains and boundaries represent active asthenospheric convection, versus compositional heterogeneities corresponding to older lithospheric tectonic provinces. The moving deployment of the transportable array across the conterminous United States offers a

unique opportunity during the next ten years for associated densification deployments of flexible array and other instruments at unprecedented scales and in novel configurations in areas of targeted special interest. An example is a 2-dimensional deployment in the southern Rocky Mountains that could, in association with the archived data from previous experiments, produce 3-dimensional images that resolve the true geometric complexities of mantle structure. The most ambitious possibilities would extend well beyond the capabilities of the flexible array alone and open the door for significant international partnerships.