The GEODES Field Expedition to Kilbourne Hole and Potrillo Volcanic Field in New Mexico. N. Schmerr¹, J. Richardson², K. Young², P. Whelley¹,², M. Wasser², C. Barry², E. Bell¹,², C. Braccia¹, L. Wike¹, H. Huang¹, S. Rees³, J. West³, J. Hurtado³, T. Sweeney³, N. Valenzuela³ ¹Univ. of Maryland, College Park (nschmerr@umd.edu), ²Goddard Space Flight Center, ³Arizona State Univ., ⁴Navarro Research and Engineering, ⁵Univ. of Texas, El Paso.

Introduction: In early November of 2021, members of the GEODES team joined the RISE2 team in a joint SSERVI field expedition to the Potrillo Volcanic Field (PVF) in southern New Mexico (Fig. 1). The PVF is a monogenetic cinder cone field, and hosts a wide variety of cinder cones, maar craters and associated ash deposits, lava flows, several lava tubes, and shield volcanoes. Our team worked at Kilbourne Hole, a maar crater located to the east side of the PVF, and a well known mantle xenolith locality. Kilbourne Hole has been used extensively by the RISE2 team for operational exploration studies and astronaut simulations.

Field Activities: At the site, GEODES team members conducted a series of co-located geophysical surveys, including 2-D active source refraction/reflection seismic profiles, 200 and 400 MHz GPR transects, and total field magnetic profiles, all combined with geological sampling of the different units on the rim of the crater (Fig. 2). Our goal was to determine the geophysical properties of the eruption deposits, both in-situ in the field and in hand samples in the laboratory through experimental rock physics.

Furthermore, the geophysical surveys were designed to be analogous to similar surveys that might be conducted during future missions to the Moon and served as an opportunity to familiarize astronaut training participants from RISE2 with geophysical equipment, methods, and active source sounding techniques. The expedition also provided GEODES graduate students with their first field experiences, enabling them to interact with and observe the geological structures in a volcanic field, collect data, and pursue a wide diversity of science and exploration objectives from the GEODES and RISE2 field teams.

Collaboration: We worked to coordinate GEODES field activities with RISE2. For example, our geophysical lines were placed inside the scan areas of LiDAR and drone photogrammetry conducted by team members of RISE2. We also hosted a prototype field instrument, Tomo-XRF (led by H. Huang), who tested a joint micro-computed tomography and X-ray fluorescence 3-D scanning system on field samples. We plan to exchange data with the RISE2 team and further coordinate visualization products and digital elevation maps into our data analysis. The data generated by these activities will be shared with the scientific community in the Online Planetary Analog Database and Digital Repositories at the University of Maryland.

Figure 1. Field activities conducted by the GEODES team in the field at Kilbourne Hole, NM. Images by J. Richardson.

Figure 2. Locations of the GEODES study sites on the rim of Kilbourne Hole. The lines show GPS tracks collected during team activities in the field area over a background topographic map. Outside the primary and secondary sites, the team deployed a temporary network of 4 nodal seismometers (upper left). High resolution lidar scans, geological samples, and GPR transects were also collected on the three primary geologic units in the field area.