

FALL 2025 | VOLUME 46, NUMBER 3

New Mexico GEOLOGY



NEW MEXICO BUREAU OF GEOLOGY AND MINERAL RESOURCES

Contents

U-Pb Zircon Ages of the Knight Peak Outflow Sheet and Lava Sequence, Mogollon-Datil Volcanic Field, New Mexico, USA: Implications for Magmatism and Extension in the Southeastern Basin and Range Province

Jeffrey M. Amato, Vanessa M. Swenton, and Jaime Toro

The Knight Peak region of southwestern New Mexico between Silver City and Lordsburg contains dramatic exposures of ignimbrite outflow sheets and lava flows that are part of the southern Mogollon-Datil volcanic field. This package of rocks is over 1000 m thick and was deposited unconformably on a ca. 1.46 Ga granite. We used U-Pb zircon geochronology to date four of the previously undated volcanic units and a rhyolite dike that is part of a swarm that intruded the Proterozoic granite. The rhyolite dike had an age of 59 Ma and was likely related to ore-bearing Laramide intrusions such as the Tyrone pluton. The dike swarm orientations are consistent with northeast-southwest Laramide shortening. The volcanic rocks in the Knight Peak sequence had ages from 36.2 ± 0.4 to 32.6 ± 0.6 Ma. These include, from oldest to youngest, the JPB Mountain trachyte, the C-Bar Canyon tuff and tuff breccia (which forms the cliffs of the summit of Knight Peak), and the Malpais Hills basaltic trachyandesite lava flow. Most of the volcanic units had zircons reflecting inheritance from ca. 1.6 Ga Mazatzal province rocks, ca. 1.45 Ga A-type granites, and ca. 1.2 Ga Grenville igneous rocks, as well as a few Paleogene zircons derived from Laramide volcanic rocks. The abundance of xenocrystic zircon implies significant contamination of magmas by crustal rocks. The entire volcanic section, plus the lower part of the overlying Miocene–Pliocene (?) Gila Conglomerate, is tilted $30\text{--}45^\circ$ to the northeast on the southwest-dipping Knight Peak normal fault. This suggests that the Basin and Range topography in this area formed in the Miocene.



View of Knight Peak (rightmost summit) from the west. Knight Peak consists of the C-Bar Canyon rhyolite, dated with U-Pb zircon in this study at 35.2 Ma, which is one of four volcanic outflow sheets and lava flows that make up a >1000 m tilted volcanic section that overlies Proterozoic 1.46 Ga granite and is in turn overlain by a >1000 m section of Gila Conglomerate.

Photo by Jeffrey M. Amato

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A publication of the
NEW MEXICO BUREAU OF GEOLOGY
AND MINERAL RESOURCES

A research and service division of
NEW MEXICO INSTITUTE
OF MINING AND TECHNOLOGY

Science and Service
ISSN 2837-6420

Dr. Michael Jackson
Interim President, New Mexico Tech

Dr. J. Michael Timmons
*Director and State Geologist,
New Mexico Bureau of Geology*

801 Leroy Place
Socorro, New Mexico 87801-4796
(575) 835-5490

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Address inquiries to Shari Kelley, Geological Editor, New Mexico Bureau of Geology and Mineral Resources, 801 Leroy Place, Socorro, NM 87801. Inquiries may also be made by calling (575) 835-5306 or emailing nmbg-nmgeology@nmt.edu