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December 13, 2000
Contract No. NRC-02-97-009
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U.S. Nuclear Regulatory Commission
ATTN: Deborah A. DeMarco
Office of Nuclear Material Safety and Safeguards
Two White Flint North, Mail Stop 8 A23
11555 Rockville Pike
Rockville, MD 20852

Subject: Submittal of Poster—The Carrara Fault: The Northeastern Edge of the Walker Lane in South Central Nevada

Dear Mrs. DeMarco:

Attached is a poster for presentation at the 2000 National Geologic Society of America (GSA) Meeting. This poster is based on work done by Peter La Femina, John Stamatakos, and Chuck Connor of the CNWRA. The poster describes the CNWRA's current interpretation of magnetic and gravity anomalies, and geologic mapping southwest of Bare Mountain. The abstract for this poster, The Carrara Fault: The Northeastern Edge of the Walker Lane in South Central Nevada, was approved by the NRC in an e-mail from P. Justus on August 10, 2000. This poster was presented at the GSA National Meeting in November. Submission of this poster was delayed due to printer problems.

If you have any questions please contact Dr. John Stamatakos at 210-522-5247 or me at 210-522-5252.

Sincerely,

Budhi Sagar
Technical Director

rae

Attachment

cc: J. Linehan, W. Reamer, B. Leslie, E. Whitt, B. Meehan, J. Greeves, J. Holonich, S. Wastler, T. Essig, P. Justus, W. Patrick, CNWRA Dirs/EMs, J. Stamatakos, P. La Femina, C. Connor, T. Nagy

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The Carrara Fault: The Northeastern Edge of the Walker Lane in South Central Nevada

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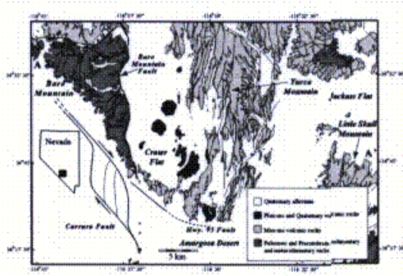
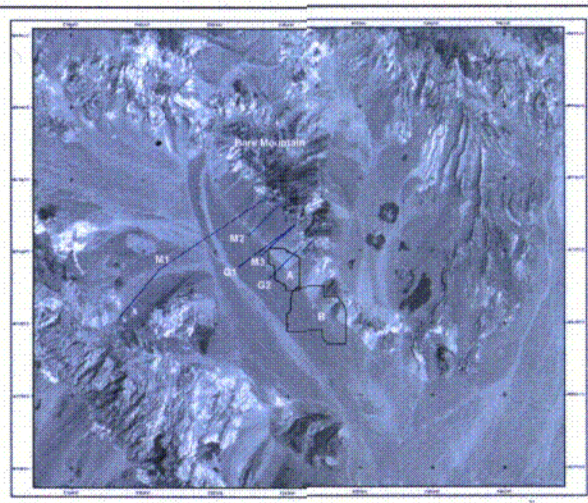
ABSTRACT

Recent geological and geophysical mapping in southeastern Nevada reveal an active strike-slip or transfer fault (named the Carrara fault) within the northwestern arm of the Amargosa Desert in southwestern Nevada. The fault is recognized from the northwesterly alignment of surficial features in Quaternary alluvium, including possible fault scarps, push-up ridges, truncated alluvial fans, and fault-parallel folds. Detailed geophysical surveys also show a pattern of anomalies indicative of both dextral strike-slip and down-to-the-southwest dip-slip faulting that is consistent with the surficial features. Total offset is presently unknown, but preliminary values based on a 2.5 mgal. anomaly across the fault and offset magnetic anomalies suggest a minimum of 300 m vertical and 3 km horizontal displacement. Best geophysical definition of its subsurface configuration is in an 8 km2 area of the Amargosa Desert, where the Carrara fault truncates two north-south curvilinear magnetic anomalies. These curvilinear anomalies appear to be edges of a faulted block of magnetic buried Miocene silicic tuffs or porphyry flows associated with a pull-apart basin along a releasing bend in the fault. In a regional context, the Carrara fault separates regions dominated by active extensional faulting (to the northeast) from regions with both extensional and strike-slip faulting (to the southwest). The fault also separates regions with little evidence for strike-slip related vertical-axis rotations, based on paleomagnetic observations from areas with large (> 30 degrees) vertical-axis rotations. Based on these observations, we hypothesize that the Carrara fault forms the boundary in southwestern Nevada between the Walker Lane and Basin and Range tectonic provinces.



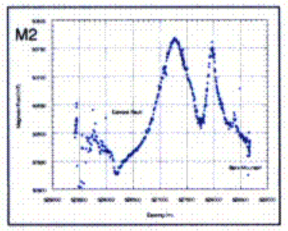
Setting

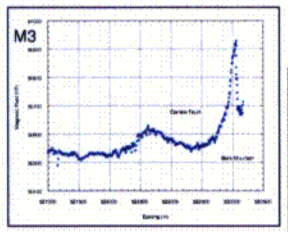
Geology of the Yucca Mountain region consists of highlands of Miocene volcanic and Precambrian to Paleozoic metasedimentary and sedimentary rocks juxtaposed against Quatemary alluival basins. The density and magnetic contrasts of the these rocks makes them ideal for gravity and magnetic investigations.

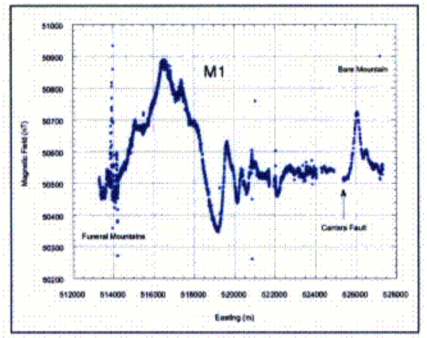


Geophysical Surveys

We surveyed the Amargosa Desert just west of Bare Mountan, Nevada. Gravity surveys (G1 & G2) and ground magnetic surveys (M1, M2, M3, & Area B), imaged the northwest-trending Carrara fault system. Area A is the location of high-resolution topographic surveys which shows fault-related surficial features.

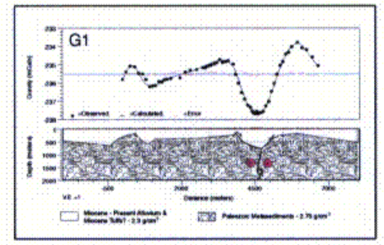


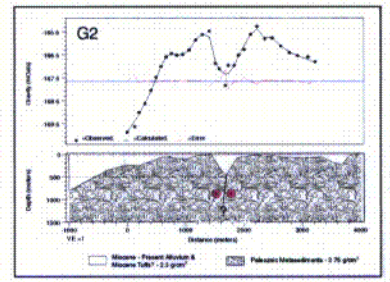


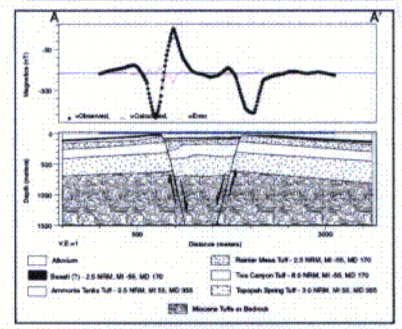


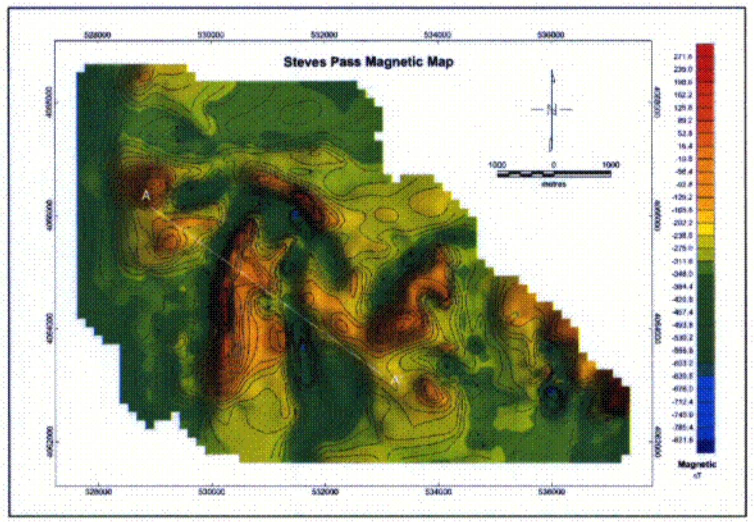
Gravity and Magnetic Profiles

Magnetic anomalies along line M1 show several faults in the northwest central Amargosa Desert and along the eastern front of the Funeral Mountains. Magnetic anomalies along lines M2 and M3 reveal detailed structure of the the Carrara fault. Gravity anomalies (lines G1 and G2) suggest a narrow graben within the Carrara fault zone between G1 and G2. Forward gravity models of these two gravity profiles indicates up to 700 m of vertical displacement with the Carrara graben.



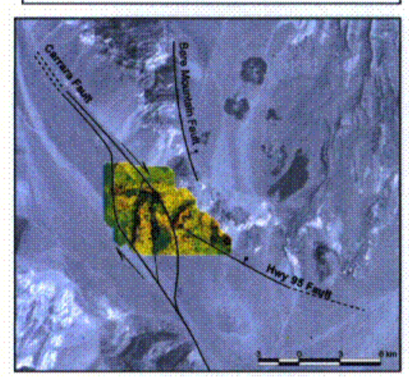


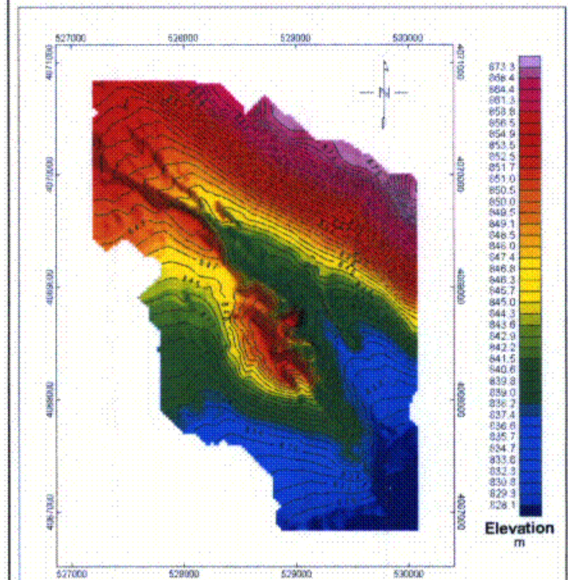




Magnetic Map

Magnetic map of Amargosa Desert just west of Steve's Pass (Area B). The map shows offset across two curvilinear normal faults within a pull-apart basin developed along a releasing bend in the Carrara fault (shown in the image to the right). Based on forward modeling of magnetic profile line A-A' (right), tuffs with the pill-apart are displaced approximately 70 m. The relationship of the Carrara fault with the proposed fault along highway 95 (Hwy. 95) is unknown.

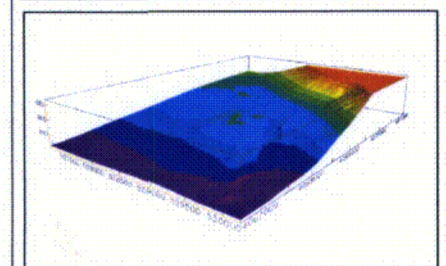


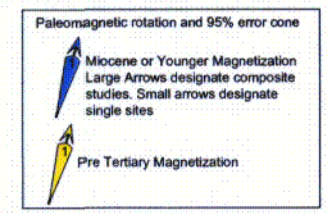


Rayet, Nevada Topography
DGPS - Orthometric Height
NAD 83/NAVD 88

Topography

Differential GPS was used to map the topographic features related to the Carrara fault (Area A). Resolution of the topography is about 10 cm. The map shows two fault-parallel folds that formed where the Carrara fault bends back toward the northwest. Paleozoic to Precambrian metamorphic rocks are exposed in the core of the larger fold. The image below shows a 3D representation of the topographic data looking from the southeast toward the northwest.

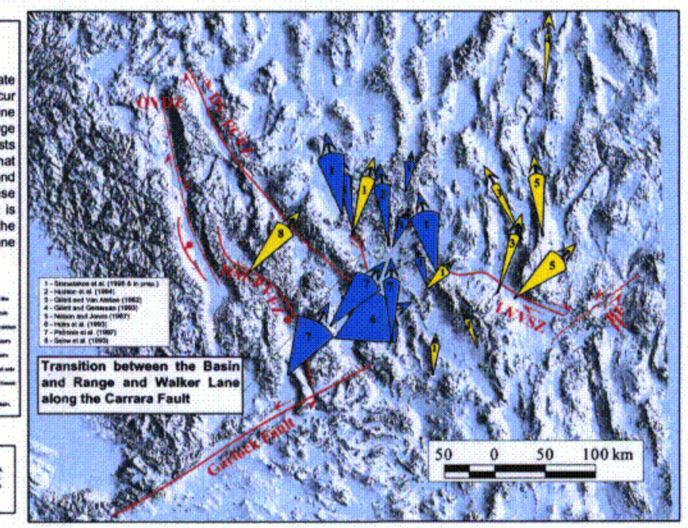




Paleomagnetic Results

Results of regional paleomagnetic studies indicate that large vertical-axis rotations (> 30 degrees) occur west of Bare Mountain, and that rotations in Miocene tuffs east of Bare Mountain are caused by large throw gradients along normal faults. This suggests that a boundary exists west of Bare Mountain that separates areas of large vertical-axis rotations and areas of east-west extension. Based on these observations, we suggest that the Carrara fault is the boundary between these zones and is the boundary fault, which separates the Walker Lane and Basin and Range tectonic provinces.

References



Transition between the Basin and Range and Walker Lane along the Carrara Fault

ACKNOWLEDGEMENTS

Gravity & magnetic data were modeled using GM-SYS by Northwest Geophysical Associates, Inc. and contour maps created in OASIS montaj by Geosoft, Inc. Work supported by the U.S. NRC (Contract NRC 02-97-009). This work is an independent product of the CNWRA and does not necessarily reflect the views or regulatory position of the NRC.

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