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FLUORSPAR DEPOSITS AND THE RIO GRANDE RIFT SYSTEM

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INTRODUCTION

Nearly 40 percent of the more than 200 fluorspar mines, prospects, and occurrences in New Mexico occur within or along the margins of the Rio Grande rift system. Numerous deposits occur within or marginal to the zone in Sierra, Luna and Grant counties, and there are several occurrences in Dona Ana and Socorro counties. There are a few occurrences in Bernalillo and Sandoval counties. The northern extension of the rift system into Colorado, and mineralized faults which extend further north into the Northgate fluorspar district in Colorado, constitute a trend along which numerous fluorspar mines and prospects are located. Several important fluorspar deposits occur at intervals along what some workers consider to be a southern extension of the Rio Grande rift system, a zone (Texas lineament) which extends southeasterly along the Rio Grande and the northeast side of the Coahuila tectonic belt from the vicinity of El Paso to the Sierra Madre Oriental in northern Coahuila and beyond. Thus, the question arises: What is the genetic relationship, if any, between the Rio Grande rift system *per se* and fluorspar deposits aligned along it?

FLUORSPAR DEPOSITS ASSOCIATED WITH CALDERAS

It is an interesting and perhaps significant fact that most of the fluorspar deposits located within the southeastern extension of the projected rift zone—between the Organ Mountains in Dona Ana County, New Mexico, and the Sierra Madre Occidental in northwestern Coahuila—are associated with calderas and silicic, alkali-rich intrusive igneous rocks (principally rhyolite). These include deposits at Encantado, El Jardin, Cuatro Palmas—Aguachile, and Pico Etereo in northwestern Coahuil a; Sierra Rica in northwestern Chihuahua; the Christmas, Chinati, Eagle, and Quitman Mountains in Brewster, Presidio, and Hudspeth counties, Texas; and around the margins of the Organ Mountains in Dona Ana County, New Mexico (Fig. 1). Several large replacement fluorspar deposits in the Sierra Madre Oriental in central Mexico are also associated with calderas (Riolita, Refugio). Future work probably will establish a relationship between fluorspar deposits and calderas in the rift zone north of Dona Ana County, New Mexico. The fact that most, if not all, of the calderas mentioned above are situated on or near intersections of major north-south structural trends and the Rio Grande rift zone (? Texas zone or lineament) may also be significant (McAnulty, 1970).

ORIGIN AND DISTRIBUTION OF FLUORSPAR DEPOSITS IN WESTERN UNITED STATES AND NORTHERN MEXICO

If fluorspar deposits of middle and late Tertiary age within and marginal to the Rio Grande rift zone are somehow related to the rift system *per se,* what controlled the widespread fluoritization outside the rift system in New Mexico, other western states, and in north-central Chihuahua? Occurrences in the Animas, Pyramid, Burro, Mogollon, and Zuni Mountains in New Mexico, and at several places between El Paso and Chihuahua City lie outside the rift system as generally projected.

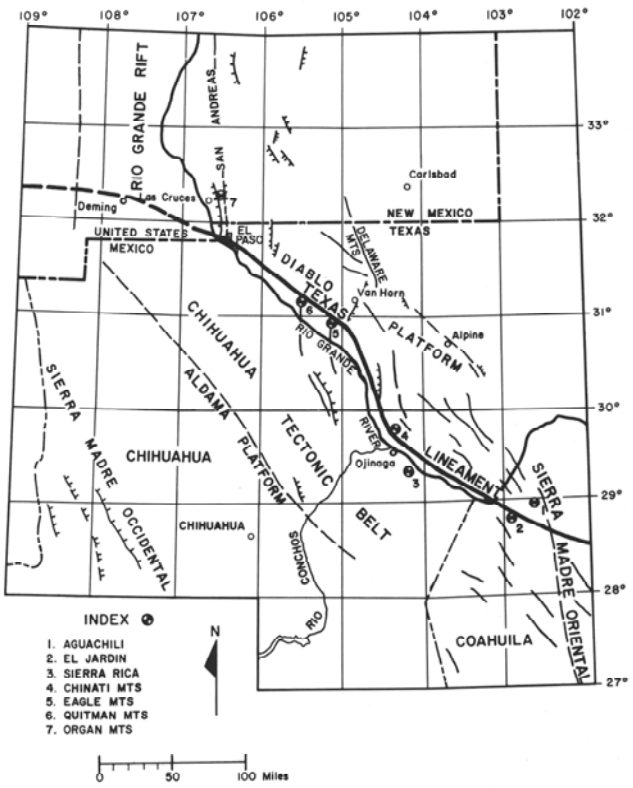

Figure 1. Caldera-related fluorspar deposits along the Rio Grande rift-Texas lineament zone.

Based on data available, it appears that fluorspar deposits in western United States and Mexico are middle to late Tertiary in age (30 to 20 m.y.). In western United States and northern Mexico, fluorspar deposits closely coincide with basin-range faulting, occurring both within the structural zones and nearby subsidiary structures (Wort, 1974, p. 50). Using a modified map by Peters (1958, p. 64) showing the distribution of hydrothermal fluorspar deposits in western United States, Lamarre (1974) showed that most of the deposits are clustered along two linear trends—one (the most obvious) passing through western Montana, Wyoming, central Colorado, New Mexico (the Rio Grande rift, at least in part); and another, not so well-defined, passing through eastern Idaho, western Utah, eastern Nevada, southern California, and western Arizona (Fig. 2).

In 1933 Lindgren noted the progressive increase in fluorite abundance eastward from the Pacific Coast to the eastern

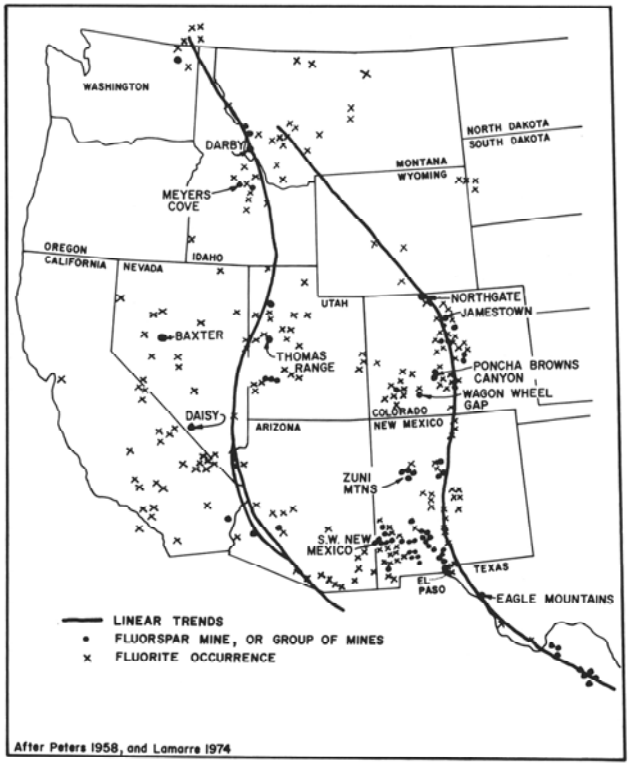

Figure 2. Fluorite-bearing deposits in the western United States.

Rocky Mountain front and suggested a genetic relationship with alkali-rich igneous rocks in the eastern portion of the Cordillera, a concept in keeping with progression of orogenic movement from west to east. The association of fluorspar with igneous rocks containing high contents of K_20 and NaO has been well established. Lipman and others (1972) pointed out that middle to late Tertiary volcanic provinces of calc-alkali composition become more alkalic eastward in the North and South American Cordilleran belt. All of this suggests that the origin and distribution of fluorspar deposits in western United States and northern Mexico may be related to plate tectonics and subduction.

Lamarre (1974) proposed an interesting subduction model (summary in this guidebook) which attempts to explain: (1) the common association of fluorite with jasperoid deposits and quartz-rich alkalic rocks, (2) the paucity of metals in fluorspar deposits, (3) the source of water in fluorine-bearing hydrothermal fluids, (4) the source of fluorspar, and (5) the distribution of fluorspar deposits in western United States.

QUESTIONS

I have no answers, but I do have several questions, such as:

1. Is the so-called southeastern extension of the Rio Grande rift system truly part of the Rio Grande rift, or a segment of the Texas lineament or Texas zone?
2. Does the Rio Grande rift end in the Las Cruces-El Paso vicinity in the area of the Texas lineament or possibly in the Chihuahua tectonic belt south of El Paso?
3. Is there a genetic relationship between fluorspar deposits and the Rio Grande rift, or is the alignment of deposits in the rift zone purely coincidental?
4. Are the calderas and other hot spots located along the Rio Grande rift-Texas lineament trend, with which fluorspar deposits are associated, related to the Rio Grande rift system, or are they related to an older tectonic zone and intersections of younger north-south structural features?
5. Or, does Lamarre's subduction zone hypothesis coupled with basin and range faulting offer the best explanation for the origin and distribution of fluorspar deposits in western United States?

COMMENTS

In my present state of ignorance, I believe, without proof, that the Rio Grande rift system terminates in the Las Cruces-El Paso vicinity. Furthermore, I believe that the Rio Grande rift had little or nothing to do with formation and localization of fluorspar deposits within and along the rift zone. It is my opinion that the calderas mentioned above are located at intersections of north-south structural features and the Texas lineament. I also believe that the origin and distribution of fluorspar deposits in western United States are closely related to plate subduction and basin and range faulting.

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