Association Round Table

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ABSTRACTS OF PAPERS

ASHER-BOLINDER, SIGRID, U.S. Geol. Survey, Denver, CO

Possible Mechanism for Lithium Accumulation in Miocene Popotosa Formation, South-Central New Mexico

The lower to middle Miocene Popotosa Formation records the history of sedimentation in the tectonically active closed Socorro basin before its disruption by late(?) Miocene rifting. The Ladron and Lemitar Mountains contain about 1,600 m of volcaniclastic alluvial-fan, alluvial-flat, and playa sediments intercalated with as many as 12 ash beds. Possible ash sources include the Datil-Mogollon volcanic field on the south, the Socorro caldera within the Socorro basin, and more distant calderas.

Ash samples collected from measured sections progressively farther north of Socorro caldera show increasing lithium content. Those taken 9 km north of the caldera averages 47 ppm; 17 km north, 355 ppm; and 27 km north, 2,640 ppm lithium. Still farther north, however, lithium content drops to 150 ppm.

Lithium enrichment of an individual ash within a section is generally inversely proportional to the potassium content of that ash. Yet the average potassium content of all ashes within a section remains nearly constant for all three sections, each farther north of the caldera.

Close to Socorro caldera, welded ash-flow tuffs show enrichment of potassium ascribed to postdepositional hydrothermal alteration. Such alteration could provide the mechanism for increased lithium enrichment away from the caldera.

Beds of unaltered volcanic ash have enormous surface area exposed to a variety of migrating fluids. Laboratory experiments suggest that 50% of total lithium can be leached from fresh volcanic glass by hot alkaline solutions through ionic exchange. Such (hydrothermal) solutions would increase in lithium as they travelled away from their heat source (Socorro caldera) until precipitation by cooling occurred. The same ash beds that may have been leached in the area of hydrothermal alteration have been altered farther away to dioctahedral smectites, clinoptilolite, feldspar, and silica under the less rigorous conditions of near-surface temperatures and pH's consistent with those of playa brines. Those smectites may now hold the precipitated lithium as interlayer cations.

BAKER, BRUCE, and DONALD L. WOLBERG, New Mexico Bur. Mines and Mineral Resources, Socorro, NM

Upper Cretaceous Stratigraphy and Paleontology, Lower Tres Hermanos Sandstone, Sevilleta Grant near La Joya, Socorro County, New Mexico

More than 1,300 ft (396 m) of Upper Cretaceous rocks overlie shales of the Upper Triassic Dockum Formation and are exposed on the Sevilleta Grant, near La Joya, Socorro County, New Mexico. The Upper Cretaceous sequence extends from the Dakota Sandstone to the Dilco Member of the Crevasse Canyon Formation and consists largely of shales and sandstones. The included Tres Hermanos Sandstone Member of the Mancos Shale includes sandstones, shales, and two coal beds.

The lowermost sandstone unit is a moderately sorted, calcareous sandstone which coarsens upward and with small- and medium-scale tangential, wedge and trough-shaped sets of cross-beds. The sandstone is about 11 ft (3.4 m) thick and contains fossil-rich lenses of poorly sorted, dark yellow-brown-weathering sands that are friable to moderately indurated and calcite cemented. Shale galls are present in the fossil-rich lenses and, together with wood fragments, abundant turtle bone fragments, some crocodile tooth and scute fragments, amid vertebrae and teeth, indicate a nearshore environment with a nearby source of freshwater. Selachian teeth and probable coprolites are richly varied and abundant. The following genera have been recognized: *Hybodus, Lonchidion, Squalicorax, Squatina, Brachaelurus, Scapanorhynchus, Odontaspis, Cretoxyrhina, Cretolamna, Plicatolamna, Paranomotodon, Ischyrhiza, Ptychotrygon, Rhombodus* as well as several as yet indeterminate genera. The dominant invertebrate genus is the oyster *Crassostrea soleniscus* although at least two genera of gastropods are present.

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Upper Cretaceous Stratigraphy and Paleontology, Sevilleta Grant near La Joya, Socorro County, New Mexico

More than 1,300 ft (396 m) of Upper Cretaceous rocks overlies shales of the Upper Triassic Dockum Formation and are exposed on the Sevilleta Grant, near La Joya, Socorro County, New Mexico. The Upper Cretaceous sequence extends from the Dakota Sandstone to the Dilco Member of the Crevasse Canyon Formation and consists largely of shales and sandstones. The included Tres Hermanos Sandstone has been raised to formational status by Hook and Cobban and includes the lowermost Atarque Member, overlain by the Carthage Member and the Fite Ranch Member, respectively. The Atarque and Fite Ranch Members consist of sandstones; the Carthage Member consists of shales and sandstones and contains two coal beds.

The Atarque Member is a moderately sorted, calcareous sandstone which coarsens upward with small- and medium-

sized tangential, wedge and trough sets of cross-beds. The Atarque Member is about 11 ft (3.4 m) thick and contains fossil-rich lenses of poorly sorted, dark yellow-brown-weathering sands that are friable to moderately indurated and calcite cemented. Shale galls are present in the fossil-rich lenses and, with wood fragments, abundant turtle bone fragments, some crocodile tooth and scute fragments, amid vertebrae and teeth indicate a nearshore environment with a nearby source of fresh water. Selachian teeth and probable coprolites are richly varied and abundant. The following genera have been recognized: *Hybodus, Lonchidion, Squalicorax, Squatina, Brachaelurus, Scapanorhynchus, Odontaspis, Cretoxyrhina, Cretolamna, Plicatolamna, Paranomotodon, Ischyrhiza, Ptychotrygon, Rhombodus,* as well as several as yet indeterminate genera. The dominant invertebrate genus is the oyster *Crassostrea* although at least two genera of gastropods are present.

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Geomagnetic Polarity Stratigraphy of Type Tesuque Formation, Santa Fe Group, in Espanola Valley, New Mexico

Sampling of the several type sections of the Tesuque Formation, lower Santa Fe Group, exposed near Espanola, New Mexico, has yielded a composite magnetic-polarity stratigraphy in which the 760-ft (230 m), fine-grained, tuffaceous middle (Skull Ridge) Member is characterized by a long, uninterrupted interval of reversed polarity; approximately 900 ft (275 m) of the coarser grained upper (Pojoaque) member is characterized by rocks predominantly of normal polarity. Laboratory results from AF demagnetization in fields up to 200 oe, and from the acquisition and removal of IRM (often of multiple specimens cut from single samples), indicate that the magnetic signals in these rocks, probably borne by detrital magnetite, are a record of the geomagnetic field at or near the time of deposition. The stratigraphic utility of the results is confirmed by replication in geographically separate, lithostratigraphically equivalent sections in different fault blocks. Within the context of the medial to late Miocene time span long acknowledged for this part of the Santa Fe Group, this composite polarity stratigraphy appears to correlate best with the standard Tertiary polarity time scale as follows: fossiliferous Nambe Member: early Epoch 16; Skull Ridge Member: late Epoch 16 and early Epoch 15; Pojoaque Member: mid-Epoch 15 and younger. These results indicate an age for at least the Pojoaque Member significantly younger (by about 3 to 4 m.y.) than fission-track ages recently reported for ash beds in the type Pojoaque section.

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Effect of Oil Prices and "Windfall Profit" Taxes on Life or Death of an Oil Field—a Case History

The dramatic effect of price increases and subsequent taxing of profits is obvious for small oil operators who are attempting to produce marginal oil and gas properties. The Red Mountain oil field and associated leases in the San Juan basin of New Mexico are a prime example of the recent "yo-yo effect" of oil and gas pricing and subsequent taxing.

An analysis of the profitability of these operations, and its subsequent effect on oil field employment and purchases of equipment, are a clear, if small, example of the impact recent government policies have had throughout the oil industry.

Increases in the price of oil and gas made operations temporarily economic, and inspired additional drilling. This activity actually resulted in discoveries of new oil and gas sands and increased oil and gas reserves. However, the effect of a positive price has been partly or totally cancelled by taxing through the "windfall profit" tax. "Windfall profit" taxes have had a negative effect by shutting down additional exploration, cancelling planned waterflood projects, and generally hindering profitable operations.

This microstudy can be multiplied by hundreds and perhaps thousands of similar examples throughout the United States, with the effect of shutting in millions of barrels of oil, which would otherwise have been discovered and recovered. This is a prime example of illogical and arbitrary taxing procedures and policies.

The ramifications are felt not only by the oil and gas operators but also by suppliers, oil field workers, and their families. The economics of the area, and thus the state and the nation as a whole are adversely affected.

To compound this problem, we pay over $40 per barrel for imports to make up for the oil we have in these areas but do not recover. This $40 per barrel would have been paid to Americans, in America, and would have bought American products and paid American labor. This in turn would have increased the American labor force and the American inventory, and would have used American goods to find and increase American reserves.

Instead this money is diverted to foreign lands where it buys foreign goods and services. When, and if, it is reinvested in America it may be used to buy political influence, or buy control of American lands and industry. This microexample shows the economic insanity of such a program.

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Geochronologic Studies near WIPP Site, Southeastern New Mexico: Summary and Interpretation

The WIPP site is currently being investigated for pilot storage of defense-generated radioactive waste. A critical facet of the overall study is the question as to whether the rocks have remained closed systems with respect to their bulk chemistry and isotopic composition since formation in the Late Permian as opposed to later episodic or continuous recrystallization. Early attempts at K-Ar dating of sylvites mixed with other salts yielded inconclusive results, primarily because sylvite is not well suited for K-Ar study owing to loss of radiogenic ^{40}Ar. Rb-Sr study of sylvites yields a 214 ± 15-m.y.B.P. isochron indicating closed system conditions to Rb and Sr since latest Permian or earliest Triassic. Pre-200-m.y.B.P. K-Ar dates have also been determined for pure langbeinites and polyhalites. When mixed with sylvite, age lowering results. The Rb-Sr systematics of aeolian clay minerals known to have interacted with the evaporite brine yield a poorly defined isochron of 390 ± 75 m.y.B.P., but the apparent date indicates that the clay mineral-brine interactions were not so severe as completely to rehomogenize Sr isotopes despite the clay-mineral alteration. A 34 ± 1.5-m.y.B.P. lamprophyre dike intrudes the evaporite sequence 16 km north of the WIPP site. Contact effects, including recrystallization of polyhalite, are restricted to within 10 m of the dike. Finally, polyhalite inclusions in one rubble chimney yield a pre-200-m.y.B.P. age indicating no major recrystallization effects due to this disturbance of the evaporite sequence. Collectively, the geochronologic studies argue for