

## **Great Basin portion of the western American Cordillera**

Dr. Alan Chamberlain, Larry McMaster, H. Roice Nelson, Jr.

Nevada's Carlin trend, the earth's second richest gold trend, lies within the Great Basin portion of the Western American Cordillera. The thrust belt containing the earth's largest and richest mineral trends spans North and South America. However, due to the lack of a geological survey an unproven theory of Late Tertiary extension causing north-south structures has become engrained in the literature.

Conventional wisdom suggests that extensional tectonics about 10MYA caused the north-south structural grain. However, a comparison of detailed proprietary magnetic and gravity data indicates that compressional tectonics more than 30MYA formed the Great Basin ridge and valley geomorphology. Diamond Valley in Eureka County and Railroad Valley in Nye County Nevada provide two examples of valleys or synclines with gravity lows that contrast sharply with the gravity highs of the adjacent Grant and Diamond Ranges. The synclines formed a depocenter for subsequent 30MYA magnetic susceptible ignimbrite lava flows. The flows are thickest and give the highest magnetic measurements along the syncline axes. The flows thin toward the syncline flanks and result in lower magnetic readings. 350 oil wells in Railroad Valley and nine oil wells in Diamond Valley confirm the thickness of the lava flows.

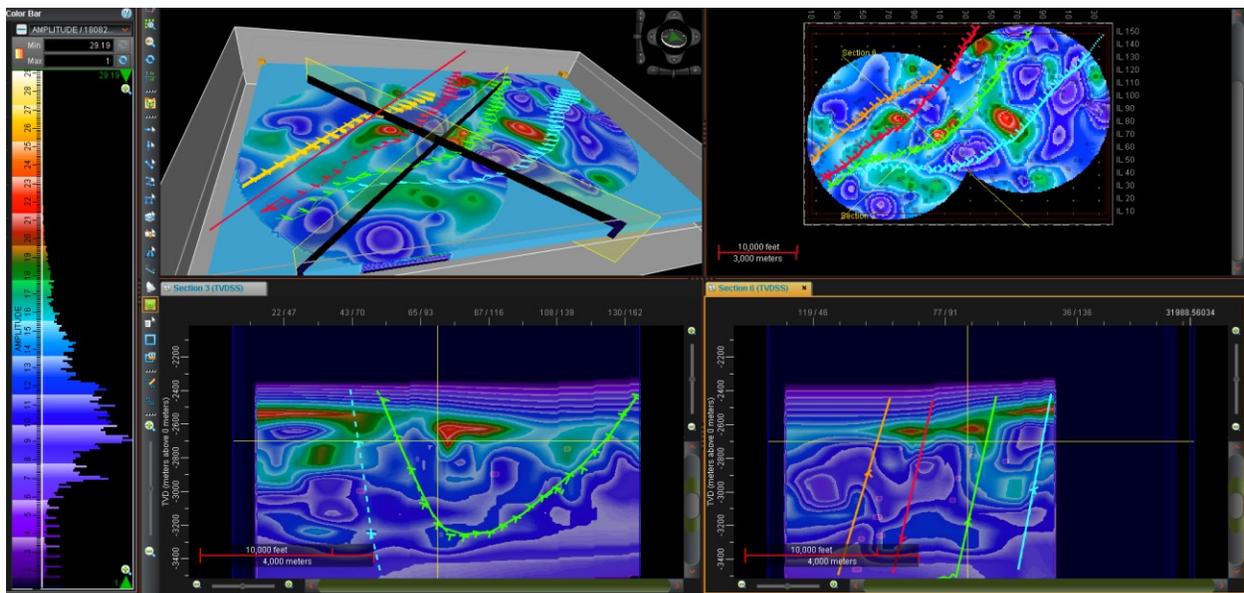
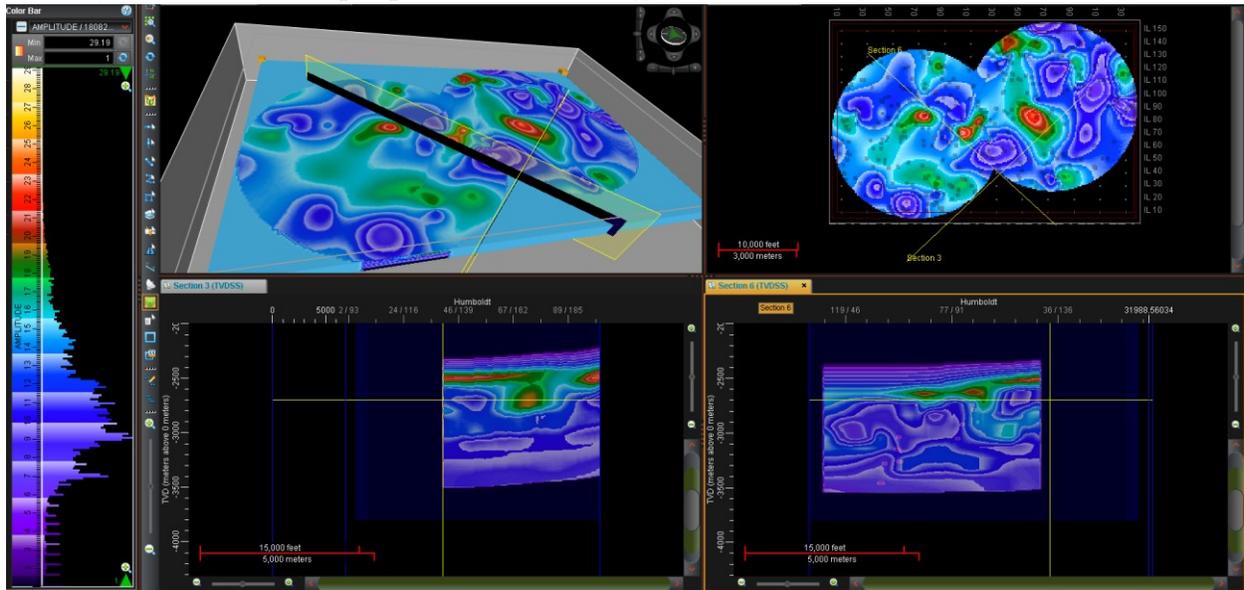
Balanced, restorable structural cross sections of the Piñon and Diamond Ranges show that the ridges or ranges are structural duplexes due to Late Cretaceous and/or Early Tertiary compression and are not horsts caused by Late Tertiary extension. Four oil wells in the Piñon Range and an oil well in the Diamond Range confirm the thrust duplex structural model of this part of the Cordillera thrust belt. The Fasken Oil and Ranch Piñon #5 Federal well in the Piñon Range cut repeated beds at least nine times. The abrupt change in velocity at about 16,000' in a vertical seismic profile shot in Cambrian carbonates at total depth 12,037' is the northern extension of the exposed Hoosac thrust fault fifty-one miles south in the Fish Creek Range where Cambrian is thrust over Permian rocks.

Thrust fault restoration of fifty miles of eastward horizontal displacement best explains the massive thickness change and normal depositional gradient of Mississippian Antler oil and gas shale source rocks from more than 5,000 feet thick in Diamond Range to less than one thousand feet in oil wells in Newark valley less than ten miles to the east. Furthermore, detailed geological mapping supports the compressional structural model. For example, the southern half of the Diamond Range is composed of overturned Paleozoic rocks and the northern half is composed of folds and repeated beds.

It would be highly unlikely for the thrust belt that is so well exposed by the Colorado River in the Las Vegas area and confirmed in the Grace Arrow Canyon well twenty miles north of Las Vegas and the Hunt USA 1-25 well in southwestern Utah and in the Diamond and Piñon Ranges 320 miles to the north would not continue northward another fifty miles on structural strike to the Carlin Gold trend.

Lightning analysis provides a new way to understand regional faults and the framework for thrusts belts, as described above, and mineral trends like Nevada's Carlin trend. The following two images show two adjacent 12.5 square mile lightning analysis areas in perspective, as a combined horizontal slice, a strike cross-section, and a dip cross-section. The first image shows apparent resistivity cross-sections, and the second image adds an interpretation. The area is just south of the Sleeper Gold Mine in Humboldt County, Nevada. There are down to the basement growth faults, and intrusions which came up these

faults. The reds are high apparent resistivity, which is anticipated to be the rhyolite intrusions. These intrusions are believed to be the source of the gold and silver. This same type of lightning analysis can be done anywhere, and cover a prospect, a trend, a county, or even a state.



South\_Sleeper\_Animation.png