Concentrations of placer minerals in Mississippian Antler Basin regressive sequences

Concentrations of placer minerals in Mississippian Antler Basin regressive sequences provides prospect leads to new Great Basin mineral deposits of eastern Nevada and northern Utah. X ray fluorescence analyses of samples collected from measured sections of the sequences show a strong correlation between concentrations of platinum, iron, thorium, titanium, zirconium, vanadium, and barium. These elements are typically associated with placer mineral deposits, including placer gold deposits.

Published conventional wisdom strongly suggest that the Antler Basin siliciclastics were deposited as deep-marine flysch turbidites. However, it is difficult to explain the assemblage of placer element concentrations in flysch turbidites. In contrast it is easy to explain the assemblage with regressive stratigraphic sequences.

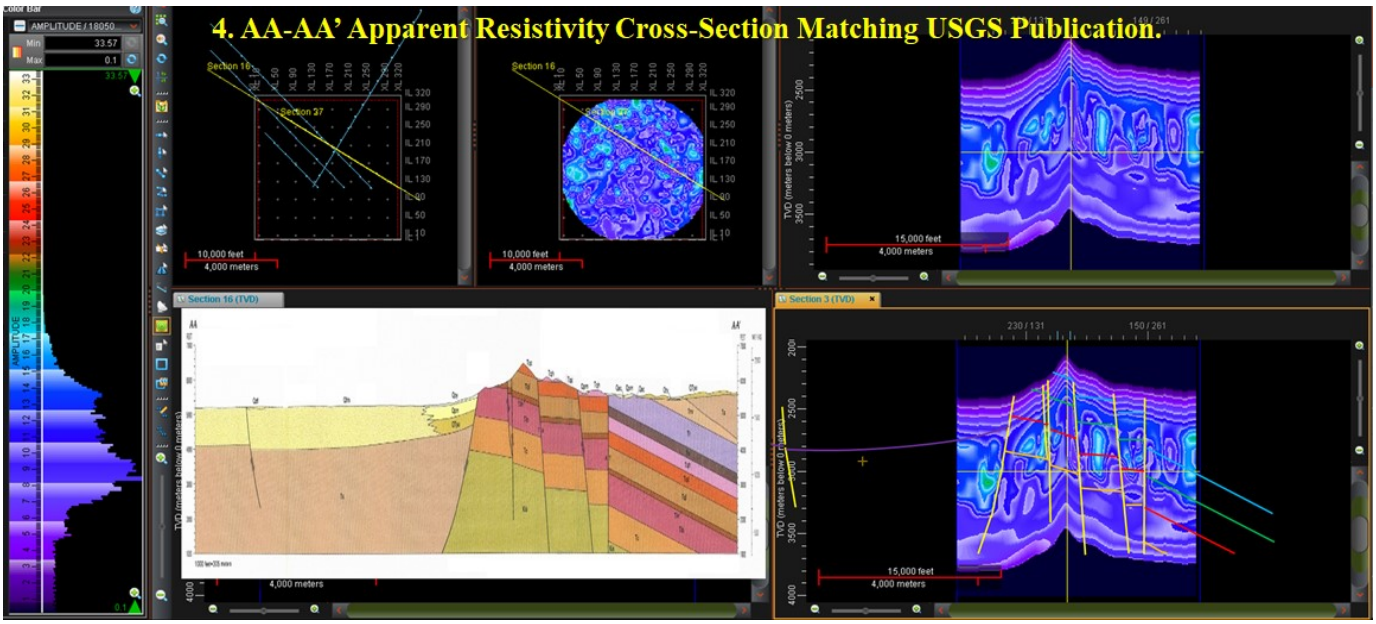
Stigmaria or lycopod roots, found in place at regressive sequence boundaries, provide the strongest evidence that non-marine regressive sequence streams deposited the Antler Basin siliciclastics. Assemblages of palynomorphs, that are typically associated with lacustrine deposits, in the overlying shales confirm that non-marine fluvial processes deposited the siliciclastics as regressive stratigraphic sequences. The largest Antler fluvial system extended from the Antler Mountains in central Nevada to the Uinta Mountains in eastern Utah

The richest Great Basin gold deposits coincide with the axis of the fluvial system, including the Carlin trend and Hamilton and Ruby mines on the west and the Mercur and Bigham mines on the east. Fluvial system streams flowing from the Mississippian Antler Mountains in the west could have concentrated commercial concentrations of placer gold along with the assemblage of other placer minerals, especially at transgressive sequence boundaries in the Antler Basin to the east.

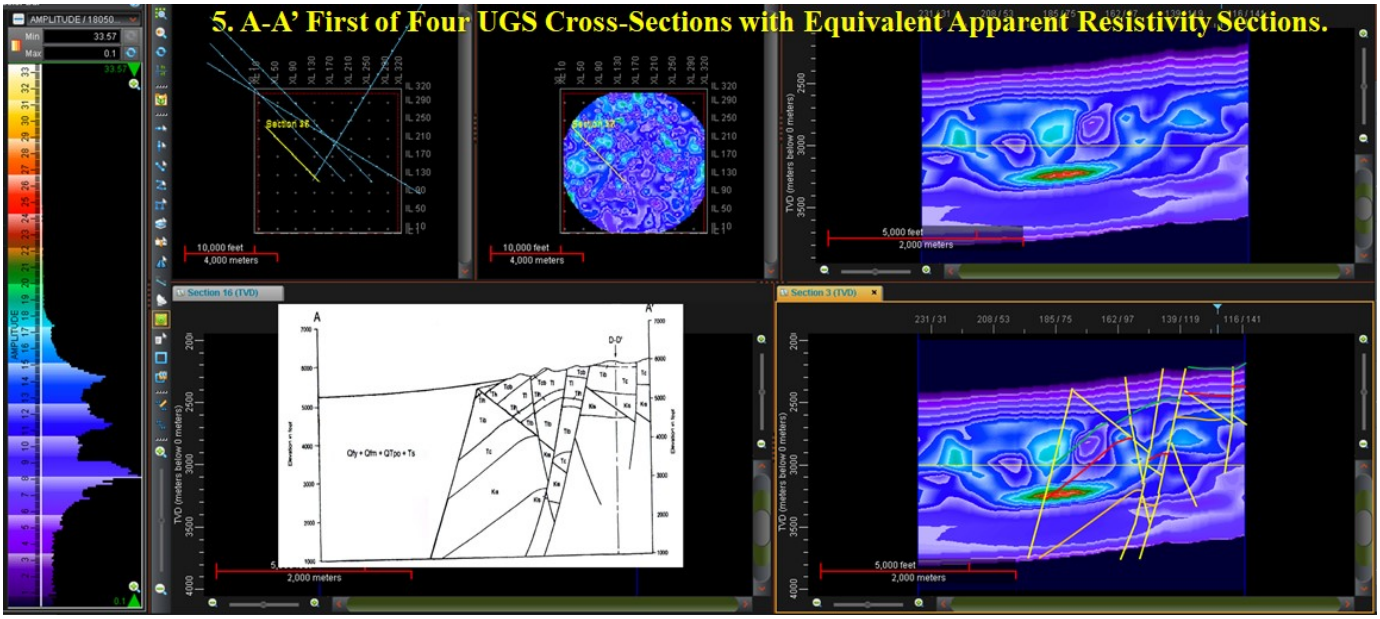
Outcrop relationships and well data from Las Vegas to the Piñon Range strongly suggest that a deep (15,000' or more) test in the Carlin Gold Trend, or at Hamilton, Ruby, Mercur or Bingham would likely encounter subthrust Antler Basin siliciclastics in this part of the western America Cordillera thrust belt. Intrusives and hydrothermal fluids could have redistributed gold concentrations from subthrust Mississippian fluvial rocks to shallow hanging wall deposits near the surface along faults or other conduits. A correct understanding of the Great Basin plumbing system and the depositional environments of the Antler foreland basin could lead to discovery of new deposits.

Gravity measurements give an estimate of how deep a basin is, and where there are thrust blocks. Magnetic measurements also are helpful in determining the depth of basement. However, to extrapolate out from deep well tests and to map subsurface structure, reflection seismology has been the key geophysical tool. There is a new geophysical tool, lightning analysis, which allows regional mapping of faulting and provides a new way to map and understand the Great Basin plumbing system.

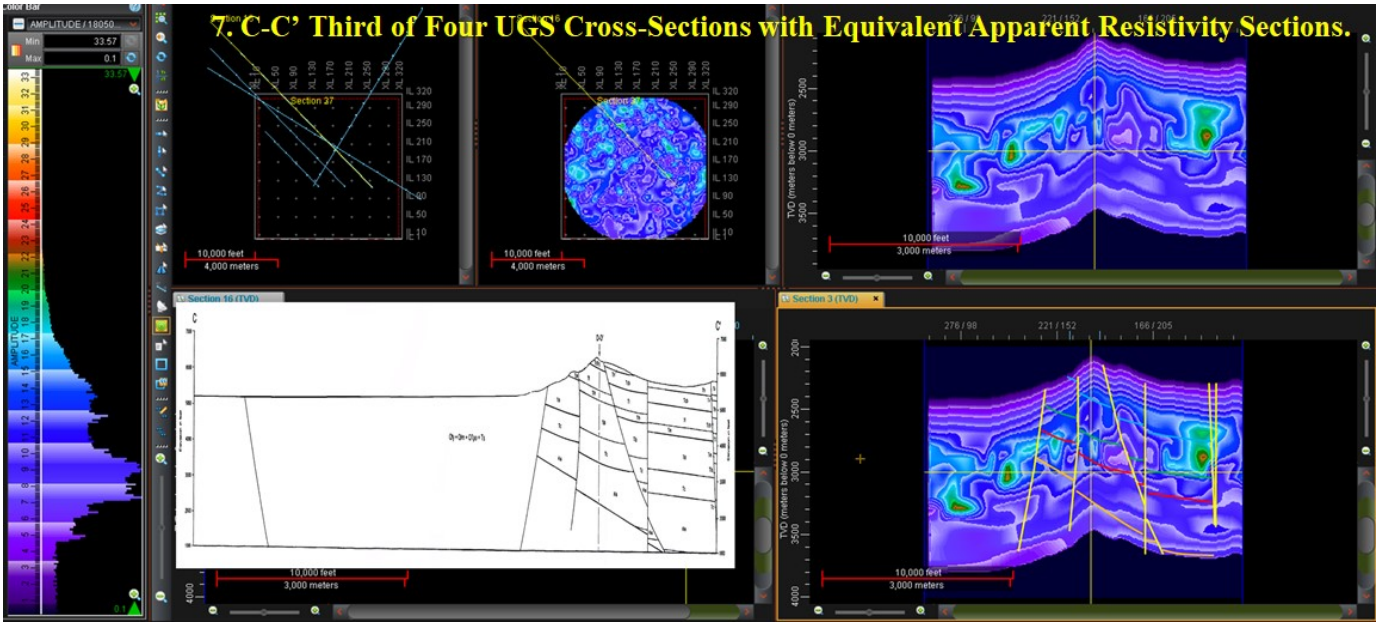
To illustrate the power of this technology, the following screen captures show lightning derived apparent resistivity sections, correlated with geologic cross-sections created by the USGS and the UGS at Newcastle, Utah in the Great Basin. For each geologic cross-section, there is a map showing the cross-section location, a depth slice, a raw data cross-section, and a cross-section with the geologic cross-section interpretation overlain.

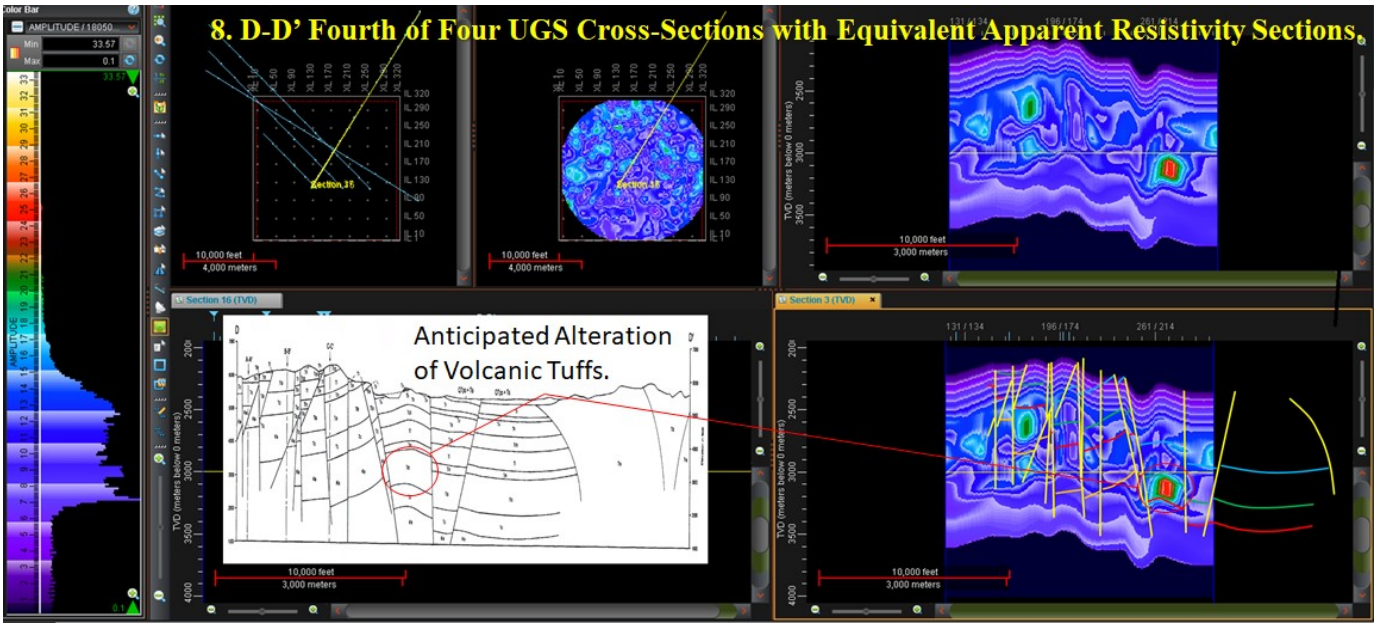


4. AA-AA' Apparent Resistivity Cross-Section Matching USGS Publication.

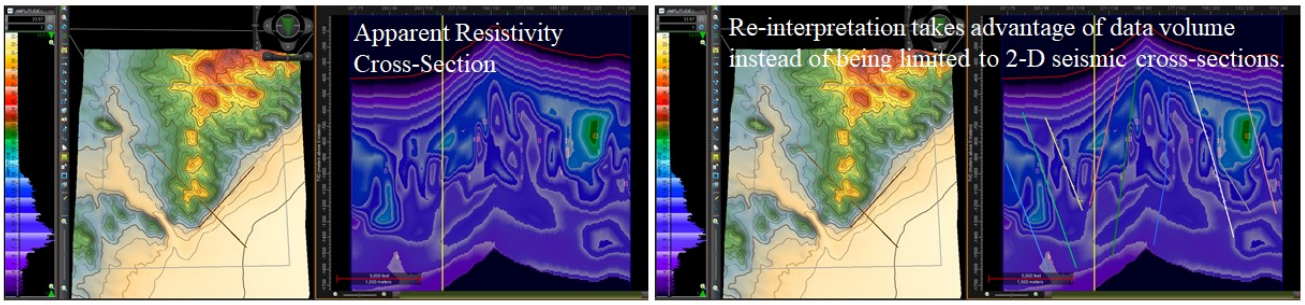


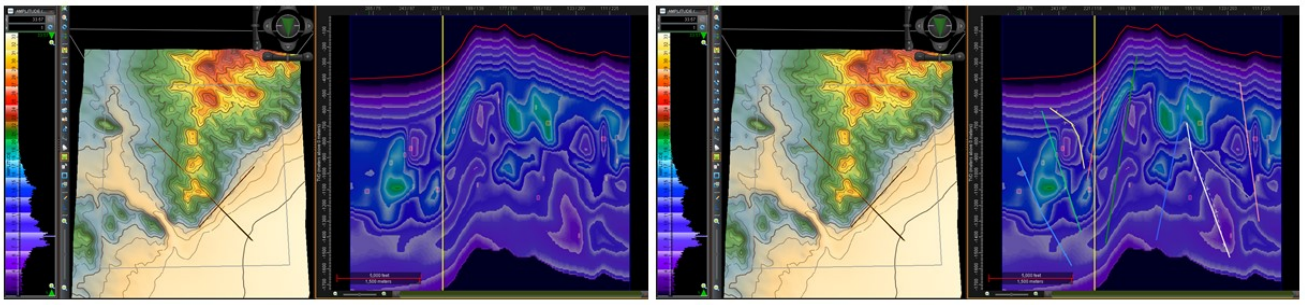
5. A-A' First of Four UGS Cross-Sections with Equivalent Apparent Resistivity Sections.

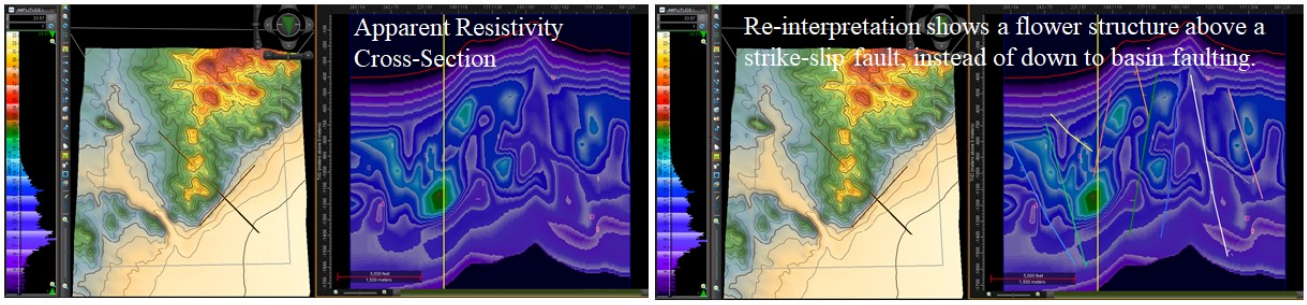


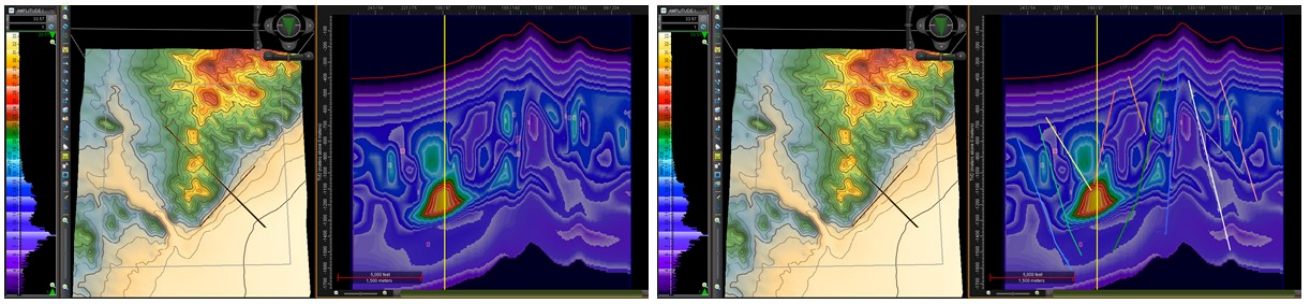


Reinterpretation of the lightning derived apparent resistivity sections shows there is not a down to the basin growth fault in the area of the geothermal anomalies. Rather a deep strike-slip fault, which is the source of the geothermal energy. This is shown on the following 4 dip cross-sections:









There is an opportunity to apply these new lightning analysis technologies to do regional analysis, and specifically to identify subthrust siliciclastic, and thus better define depositional environments, and the Great Basin plumbing system.

Newcastle_Animation.png