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First-Order Basin-Range Extensional Architecture, Southern Nevada Region

In 1875 a block-fault rift model for this and other parts of the Basin-Range was published by G. K. Gilbert. Carpenter and Carpenter (1988) were first to use reflection seismic data, gravity modeling and subsurface well data in concert with field mapping in researching the extensional (& contractional) architecture of the crust in this region. C&C's research validated the Gilbertian block-fault rift model. Extension is accommodated by steep (50-60 degrees of dip) range bounding normal faults, with regional crustal extension of 15% to 25%. C&C's (1988 to present) research also led to vibrant debate because it refutes Wernicke et al.'s view of the area (1984 to present). Wernicke views the range bounding normal faults (a.k.a. "detachments") as having very shallow dip, as shallow as 3-11 degrees. In his view, the magnitude of regional crustal extension is extreme, exceeding 115%.

Beginning in 1993 published research by independent third party referees (i.e., USGS, Anders et al., and Hintze) provided the quintessential form of rigorous and objective peer review support for C&C in this vibrant debate. USGS scientists adopted the same approach as C&C, using geophysical and well bore data to corroborate C&C's steep Gilbertian block-fault geometry.

Wholly and singularly critical to Wernicke's et al.'s model is interpretation of klippen in the ranges as remnants of extensional allochthons above purportedly rooted detachments. C&C (1988 to present) suggest Wernicke misinterpreted remnants of rootless gravity slides for parts of his rooted upper plate extensional allochthons. This would explain why the purported detachments are not observed by C&C (1988 to present) or the USGS (1993 to present) on reflection seismic data, nor are they encountered where there is key subsurface control. The gravity slide origin of these features is supported by new mapping and analyses, and is consistent with the fact that several klippen lie directly upon Cenozoic basin-fill sediments.