Explanation of Cross Sections

A geologic cross section represents a side view of a vertical slice through part of the Earth. It is a geologist's interpretation of the subsurface geometry and thicknesses of different rock types. Sedimentary rock sequences typically vary gradually in thickness over distances of miles to tens or even hundreds of miles. Consequently, geologists can estimate the depth to each unit of a buried sedimentary rock sequence if the order and thicknesses of rock units are known from nearby surface exposures or drill holes. It is possible to construct cross sections through layered sequences even where the rocks are folded or broken by faults. Cross sections based on geologic maps are important tools used in exploration for oil and gas, mineral resources, and ground water.

The locations of the cross sections presented here are plotted on the Geologic Highway Map. These cross sections represent areas where rock units range from gently folded to highly faulted and tilted. The cross sections are stretched vertically by a factor of three, except for cross section G, which is stretched by a factor of two. This reveals more clearly the layered rock units, which would be very thin without vertical stretching, but it makes canyon walls and mountain slopes look steeper than they actually are.

Cross sections A and B show the undisturbed to gently folded character of Paleozoic and Mesozoic strata of the Colorado Plateau. Section A crosses the Grand Canyon in two places, and Section B crosses the young San Francisco volcanic field that was erupted on top of the flat-lying Paleozoic and Mesozoic strata.

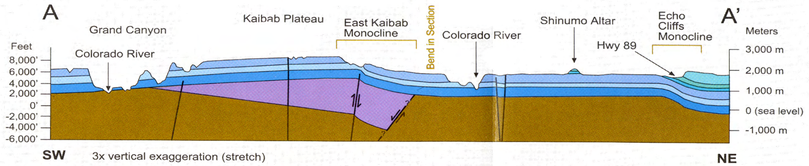
Cross sections D and E show the edge of the Colorado Plateau and the adjacent Transition Zone where Paleozoic strata of the Plateau have been partially or completely removed by erosion. Payson and Prescott rest on Proterozoic granitic rocks like those beneath the Paleozoic strata of the Colorado Plateau. Sedona rests on Paleozoic strata below those that form the dramatic cliffs around the town.

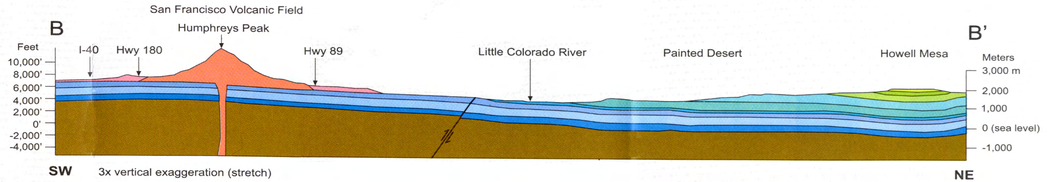
Cross sections C and G show areas of the Basin and Range Province in the Phoenix and Tucson areas where crustal extension (horizontal stretching of the Earth's crust) has broken and tilted the rocks. Extreme crustal extension formed *detachment faults,* which dip gently into the Earth. Rocks below a detachment fault are displaced up and out from beneath rocks above the fault and may move as much as ten miles up and several tens of miles horizontally.

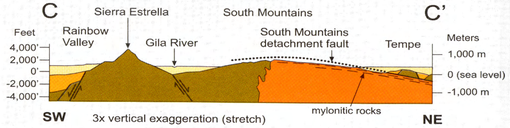
Cross section F shows an area that has been broken repeatedly by different kinds of faults. Thrust faults (shown with teeth on the geologic map) dip gently into the Earth like detachment faults. Unlike detachment faults, rocks above a thrust fault move up rather than down relative to rocks below the fault. Mesozoic thrust faulting in this area was followed by Cenozoic extension that further broke and tilted the rocks.

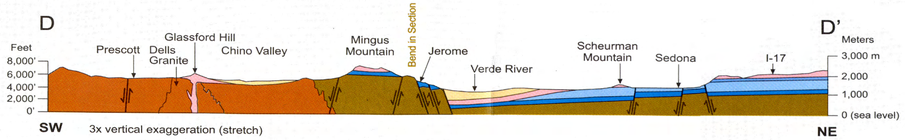
J.E. Spencer

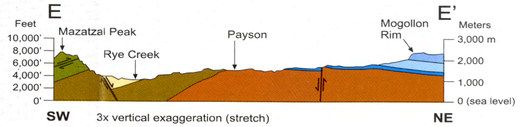
GEOLOGIC CROSS SECTIONS

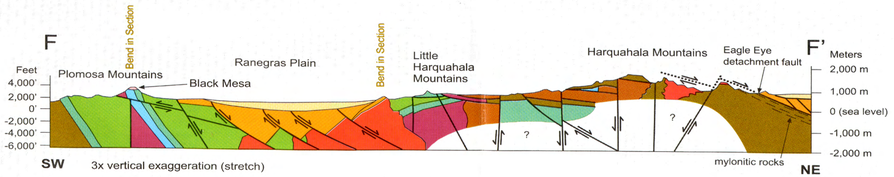


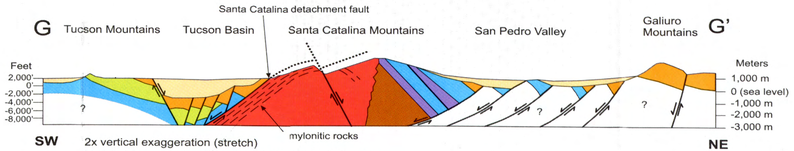




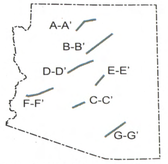








Modified from: Dickinson, 1992, AZGS Contributed Map 92-C



Locations of cross sections
(also shown on geologic map)

Kamilli, R. J. and Richard, S. M., editors, 1998, Geologic Highway Map of Arizona: Tucson, Arizona Geological Society and Arizona Geological Survey.

0 10 20 30 40 50 Miles

0 10 20 30 40 50 60 70 80 kilometers