FAULTS RESPONSIBLE FOR COALINGA, CALIF., EARTHQUAKES LOCATED

Scientists of the U.S. Geological Survey have identified the faults responsible for the magnitude 6.5 earthquake of May 2, 1983, and numerous aftershocks at Coalinga, Calif.

USGS scientists said that the May 2 earthquake occurred on the Anticline Ridge fault, a steeply dipping reverse fault that lies along the southwest flank of Anticline Ridge, 4 miles northeast of Coalinga. The earthquake thrust rocks east of the fault up and over rocks on the other side.

A second fault, the Nunez fault northwest of Coalinga has been the source of most of the earthquakes occurring since June 11. Activity on more than one fault in a sequence of earthquakes is not uncommon and is frequently characteristic of reverse faults, such as at Coalinga.

The identification of activity on the Anticline Ridge fault was made by the examination of elevation changes produced by the earthquake and analysis of seismic reflection records from the area. USGS geophysicist Mark Zoback, Menlo Park, Calif., said, "The May 2 earthquake elevated Anticline Ridge about 16 inches and lowered the area around Coalinga about 8 inches.

"The earthquake rupture moved upward along the fault from a depth of six to seven miles, but did not reach the surface, apparently stopping at a depth of one to two miles. Because the rupture did not reach the surface, there were none of the usual cracks and fissures that are clear surface expressions of the fault, and which would have helped in our earlier attempts to identify the type and location of the fault," Zoback said.

The pattern of surface deformation demonstrates that movement on the Anticline Ridge fault caused the May 2 earthquake, rather than movement on the Coast Range Thrust fault as had been thought earlier.

Zoback also noted that the warping of the ground surface caused by the earthquake is similar to the folding of Anticline Ridge and Pleasant Valley in recent geologic time. "The Coalinga earthquakes seem to be part of the continuing geologic processes responsible for folding and uplifting strata along the western edge of San Joaquin Valley."

The magnitude 5.9 aftershock on July 22, as well as the other significant aftershocks of June 11, July 9 and July 25, appears to be associated with the Nunez fault, 7 miles northwest of Coalinga. "The Nunez fault ruptured in the magnitude 5.2 aftershock of June 11," said USGS geophysicist William Ellsworth, Menlo Park, Calif. "More than 20 inches of surface displacement occurred on the mile-long fault rupture. Succeeding aftershocks have increased the total offset by another three inches.

Although a large number of aftershocks have shaken the Coalinga area, the activity continues to decline. "Aftershock activity for an earthquake of this size should continue for a number of years, but the rate of activity should decline with time," Ellsworth said. "By comparison, several aftershocks are felt each year in the San Fernando region 12 years after the devastating earthquake of February 9, 1971, which had a magnitude of 6.3, like the Coalinga earthquake.

"Both the large number of aftershocks and the relatively small difference in magnitudes between the May 2 earthquake (M 6.5) and that of July 22 (M 5.9), point to the Nunez fault as playing a significant part in the strain release process at Coalinga," Ellsworth said. "While the relationship between the Anticline Ridge fault, the Nunez fault, and the many thousands of aftershocks is not completely clear, studies of ground deformation, seismicity, crustal structure and geology that are now underway will help refine our understanding of the earthquake potential and risk in the western San Joaquin Valley."