Eastern California Shear Zone puzzles seismologists

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Residents and seismologists in Northern California focus on the San Andreas Fault, but a Penn State researcher thinks more questions should be asked about the Eastern California Shear Zone, a fault that ends or dissipates without a clear connection.

"We want to know how it formed, why it formed," said Kevin P. Furlong, professor of geosciences. "We know the San Andreas boundary is getting longer as the Mendocino Triple Junction point moves northward. Right now we believe that the Eastern California Shear Zone is growing along with the San Andreas."

The Eastern California Shear Zone runs roughly parallel to the San Andreas Fault from the Gulf of California and is a wide area in western Nevada. The problem is that so far, no one has identified the northern end of the zone.

Basic plate tectonics requires that the large plates that make up the Earth's crust move over or under each other, slide above or below each other, or meet end-to-end to form large mountainous plateaus. In the California-Nevada area, most of the plate boundaries behave nicely. The Pacific plate slides northward while the North American Plate slides southward. The Juan de Fuca plate in the north slides beneath the North American plate and all three of these plates meet at a point near Mendocino, Calif., called the Mendocino Triple Junction. For the most part, seismologists understand how these three plates move.

However, the Eastern California Shear Zone, sometimes called Walker Lane, does not act properly. No obvious connection of the northern end of the zone with another plate boundary exits.

"This would not be a problem if the slip were not significant, but the slip is significant," Furlong told attendees at the 117th annual meeting of the Geological Society of America Oct. 17 in Salt Lake City. "The total displacement has been 50 kilometers and we know it has been going on for 5 to 6 million years."

The movement on the Eastern California Shear Zone -- 10 to 12 millimeters per year -- makes up 25 percent of the total movement of the North American Plate. The western side of the shear zone is moving northward, but at a different rate than the San Andreas area. In the middle of these two areas are the Sierra Nevada mountains that do not participate in the slipping except to move along with the piece of plate on which they reside.

"We have this intermediate piece of land from the eastern side of the San Andreas to the Eastern California Shear Zone -- including the Sierra Nevadas -- that is confusing," said Furlong. "We know this shear zone is an active earthquake area because there was a magnitude 8 earthquake there in the 1800s."

The Penn State researcher noted that there currently is not a model for this type of transition. "We are trying to identify the questions," said Furlong. "There may be evidence to explain this transition, but we have not found it yet. We have not been looking for the right type of data."

There are other areas on Earth, such as in Central Asia near Tibet, where fault zones simply end without explanation.

"While the concept of a major fault terminating without an obvious end

is not uncommon, we do not understand how this happens," said Furlong. "We need to quantify the questions, so we can find the answers."

Source: Pennsylvania State University