Subduction of the Nazca Plate under the South American Plate generates more large earthquakes than any other fault margin on Earth. A new study indicates that significant movement along this margin takes place as aseismic sliding.

earthquake struck the town of Nazca in 1996, but no quakes have struck the ridge directly. The new GPS data confirm that the sections of the fault beneath Pisco and Nazca remain locked between earthquakes. The region between them — onshore from the ridge — is sliding aseismically.

"It seems counterintuitive that a ridge should be aseismic," Farber says, because subducting ridges and seamounts often generate more earthquakes than plate boundaries with less topography. One possibility is that the ridge may contain serpentine, a relatively soft group of rocks that are thought to promote stable slip, Perfettini says. But really, Farber says, "we don't know why the Nazca Ridge behaves this way. It's still something of a mystery."

The Nazca Ridge isn't the only question mark along the western coast of South America. Even though the Nazca-South American plate interaction generates more large earthquakes than any other plate boundary, Perfettini says, comparatively little research has been done along its 7,000-kilometer-long margin. Conducting additional post-seismic studies would be dependent on another large quake, he says. "Of course, we don't wish for an earthquake to strike a populated area," Farber adds. "But if we get another opportunity to set up this kind of study, we will certainly take it."

Mary Caperton Morton

Tracey Ford

OUT OF THE BLUE: ANCIENT PIGMENT FOUND IN MEDIEVAL CHURCH

A religious and geological mystery has been uncovered in a medieval Spanish church. Like something out of a Dan Brown novel, the mystery involves a mural altarpiece, the Roman Empire and a pigment called Egyptian blue.

While preparing to restore a mural altarpiece in the Romanesque Church of Sant Pere in Terrassa, Spain, scientists were surprised to find Egyptian blue, otherwise known as calcium copper silicate, a pigment last commonly used in Roman times, and seen only rarely on works more recent than the 5th century. The Church of Sant Pere was completed in the 12th century.

To identify the pigments on the mural, which depicts Jesus, Peter and the evangelists, Anna Lluveras of the University of Barcelona in Spain and her colleagues analyzed samples of various colors from the mural with an array of microscopy, spectroscopy and X-ray diffraction techniques. They found many of the pigments they expected, such as red earth, yellow ochre, lime (calcium hydroxide) for white and coal for black, as the team reported in Archaeometry. These pigments were cheap and easy to make, and are common in Romanesque mural paintings in Catalonia, they wrote.

What the scientists didn't expect to find was Egyptian blue. No use of Egyptian blue has ever been documented in Romanesque art, Lluveras and colleagues reported. Unlike the other raw materials used in the mural, Egyptian blue is a synthetic pigment, and, according to Paul Nicholson, a professor of archaeology at Cardiff University in Wales who was not involved in the new study, its production is relatively complex. "Sand, natron and copper filings are ground up and mixed together," he says. "The mixture is then made into balls, presumably with a gum binder and roasted together in a sealed container" at 900 to 1000 degrees Celsius for several hours.

The pigment was widely used in Pharaonic Egypt starting around 3000 B.C., and was still used until the end of the Roman Empire in A.D. 476, says Michael Tite, a physicist at the University of Oxford in England who consulted for the new study. "The fall of the Roman Empire saw the end of a sophisticated style of living involving large houses decorated with mosaics and frescoes, and as a result the demands for pigments ended," Tite says.

Egyptian blue pigment was used throughout antiquity, including likely at the palace at Knossos on Crete, as seen here (although this particular mural was likely reconstructed by Sir Arthur Evans in the early 1900s).

The team suggests a few possibilities as to the source of the pigment. The church was built on the site of the Roman city of Egara, and a painter could have retrieved the pigment from remains of the Roman settlement, which are well-preserved in the area. There, pigment would have been in ball or powder form. Also possible, though less likely, the team reported, is that new Egyptian blue was manufactured in medieval times, or more recently added during an undocumented restoration. This is considered less likely, as no records exist of Egyptian blue production during medieval times.

Tite says that this sort of finding is fairly infrequent. "There are probably no more than some five reported uses of rare pigments such as Egyptian blue for the period after the 4th and 5th century A.D.," he says. Whether this latest puzzle leads to a bestselling mystery novel, we'll have to wait and see.

Bernard Langer