Undersea quake evidence found off West Coast

David Perlman, San Francisco Chronicle, 10-8-11

The ocean floor off the coast of Northern California and southern Oregon reveals a record of massive earthquakes that have hit the region over the past 10,000 years - and there's a 1-in-3 chance that another could strike again within the next 50 years, scientists say.

Submarine landslides triggered by major quakes on land have sent layers of sediments onto the seabed, and by dating those sediments researchers led by Chris Goldfinger, a marine geologist at Oregon State University, have calculated that the temblors rupture the ground roughly every 240 years on what is called the Cascadia Subduction Zone.

That 600-mile zone runs approximately from the northern end of Vancouver Island in Canada along the coast of Oregon, and into California for 100 miles past Crescent City and Eureka to Cape Mendocino.

Goldfinger and his colleagues have found evidence in those sediment layers that 19 monster quakes with magnitudes of 9 or more have struck along the northern Cascadia zone within the past 10,000 years. Quakes that size would have been as violent as the undersea temblor off Japan that triggered the devastating tsunami there in March, and the great Sumatra quake and tsunami of 2004.

Goldfinger's sediment records show that 22 quakes have struck along the southern segment of the Cascadia zone during the same period. Their magnitudes were lower, Goldfinger found - between 8 and 8.3 - but even those were larger than San Francisco's 1906 Big One with its magnitude of 7.9.

The thin sediment layers, known as turbidites, show up in some 170 core samples that Goldfinger and his colleagues have collected by drilling into the ocean floor of the Cascadia zone.

Turbidites also mark the seafloor off the San Andreas fault, and core samples drilled by Goldfinger's team at more than 30 sites as far south as Monterey Bay revealed evidence of ancient onshore quakes there.

Their findings add information for the earthquake hazard teams that produce probability estimates of future quakes on the San Andreas and the Bay Area's many other faults, according to David Schwartz of the U.S. Geological Survey in Menlo Park.

Goldfinger heads the Active Tectonics and Sea Floor Mapping Laboratory at Oregon State, and most of his lab's studies have focused on the Cascadia Subduction Zone. That region beneath the Pacific Ocean is where a giant slab of Earth's crust called the Juan de Fuca Plate dives down beneath the North American plate, pushing up the Cascade mountains and causing dangerous upward-thrusting earthquakes.

The northern end of the 800-mile-long San Andreas fault runs into the sea near Cape Mendocino and turns west to become the Mendocino Transform Fault that marks the southern edge of the Cascadia zone.

Goldfinger's studies of turbidites and past earthquakes have been published in many recent scientific reports, and are more completely detailed now in a full-length report to the U.S. Geologic Survey.

Gary B. Griggs, an oceanographer and Director of the Institute of Marine Sciences at UC Santa Cruz, has

studied turbidite layers in the ocean off Oregon as evidence of Crater Lake's formation in Oregon some 7,700 years ago when a cluster of huge volcanoes now called Mt. Mazama erupted again and again.

Griggs, who has followed Goldfinger's work, said "his work is solid, and it has created a big picture of the seismic past along the Cascadia Subduction Zone."