

CGS Monthly Meeting Tuesday June 17, 2008

Tsunami Hazards in Southern California: Surf City Tsunami Ready?

Presented by:

Dr. Mark R. Legg
Legg Geophysical, Inc.

Abstract: The disastrous Indian Ocean earthquake and tsunami on December 26, 2004 has initiated a reassessment of tsunami hazards in the southern California region. Eastern Pacific sources like Alaska, South America and Cascadia represent the greater threat for distant tsunamis whereas western Pacific and Hawaiian tsunamis are attenuated by the irregular bathymetry of the California Continental Borderland. Pacific-wide tsunamis from great subduction zone earthquakes were damaging, mainly in southern California harbors, following the 1960 Chile (M9.5) and 1964 Alaska (M9.2) earthquakes. Historically, southern California also has suffered local tsunamis, particularly in the western Transverse Ranges area with significant events in 1812 (M7.5? Santa Barbara Channel) and 1927 (M7.3 offshore Point Arguello). These events resulted from thrust or reverse-slip earthquakes due to convergence in the western Transverse Ranges, although submarine landslides triggered by the earthquakes may also work as a tsunami source. For the Borderland south of the Channel Islands, many earth scientists, and in particular, seismologists considered the threat from local tsunamis insignificant because most faulting offshore southern California is strike-slip. Recognizing that strike-slip fault zones are often curved and comprise numerous en echelon step-overs, tsunami generation from realistic strike-slip faulting scenarios was modeled in a collaborative research project with the Tsunami Research Center at the University of Southern California. Tectonic seafloor uplift, at a restraining

MEETING INFO: 3RD TUESDAY OF EVERY MONTH (DARK IN JULY & AUGUST)

BIEDERMANN HALL AT SACRED HEART CHURCH

10800 Henderson Road Ventura, CA 93004

(See the MAP at the end of this Newsletter for directions.)

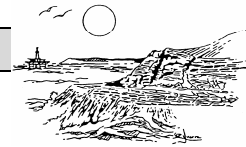
Reservation Deadline: 4:00 PM on THURSDAY before the meeting.

E-mail Reservations to: secretary@coastgeologicalsociety.org or visit the CGS website

*****Please specify your dinner choice: Tri-Tip, BBQ Chicken or Vegetarian Lasagna,**

Social Happy Hour - 6:00 p.m., Dinner - 7:00 p.m., Speaker - 8:00 p.m.

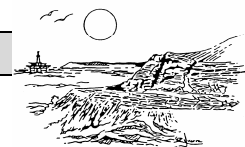
\$18 - With Reservation, \$25 - Without Reservation, \$ 10 - For Students and K-12 Teachers



bend or "pop-up" structure, provides an efficient mechanism to generate destructive local tsunamis; likewise, subsidence at divergent pull-apart basin structures initiate tsunamis. Large earthquakes on complex strike-slip fault systems may involve both types of structures. Maximum runup derived in our scenarios ranges from one to several meters, similar to runup observed from the 1994 Mindoro, Philippines, (M=7.1) earthquake. The runup pattern is highly variable, with local extremes along the coast. We only model the static displacement field for the strike-slip earthquake source; dynamic effects of moving large island or submerged banks laterally during strike-slip events remains to be examined. Depending on the size, recurrence of Southern California tsunamis from submarine strike-slip faults is estimated at a few hundred to few thousand years, similar to return periods estimated for large earthquakes on other active faults within the urban area. The combined probability from onshore and offshore hazards may be higher. Including the convergent fault sources in the western Transverse Ranges, and based on the historical record, local tsunamis strike the southern California region about once per century. Natural harbors and bays created by long term vertical motion associated with strike-slip structural irregularities are now sites of burgeoning population and major coastal infrastructure. Tsunami warning for distant sources is provided by the West Coast and Alaska Tsunami Warning Center; the only warning for a potentially destructive local tsunami is likely to be the earthquake—if situated at the coast, be prepared to move immediately inland or to higher ground.

Biography: Dr. Mark R. Legg, the President of Legg Geophysical, Inc. in Huntington Beach, CA has more than 30 years experience mapping offshore geology and faulting, studying the tectonic evolution of the California Continental Borderland (southern California offshore region), and evaluating earthquake and tsunami hazards. He received a B.S. in Space Sciences & Mechanical Engineering from the Florida Institute of Technology; an M.S. in Oceanography from UC San Diego (Scripps Inst. Oceanography); and a Ph.D. in Geological Sciences from UC Santa Barbara. He has conducted several research cruises to map faults in the southern California offshore region and participated in submersible dives to directly view seafloor faulting (DSV Alvin, DSV Turtle, and Delta Submersible). Dr. Legg is an expert on strike-slip faulting, especially offshore southern California, specializing in oblique fault movement where seafloor is uplifted or subsided and may generate local tsunamis. He received the Earthquake Engineering Research Institute NEHRP Professional Fellowship to study tsunami hazards to southern California cities with Professor Costas Synolakis and Dr. Jose Borrero at USC during 2002. Dr. Legg is a participating scientist with the Southern California Earthquake Center and has performed several thousand probabilistic seismic hazard assessments (PSHA) for commercial properties in California and the U.S. including offshore territories (Guam, Virgin Islands). Dr. Legg's expertise spans all aspects of earthquake and tsunami hazard including sources (fault geology and tectonics), seismic wave propagation and amplification, structural damage and potential losses.

RESERVATIONS: E-mail Secretary@coastgeologicalsociety.org or visit the CGS website by the Thursday before the meeting at 4 pm. Please include name and menu choice (Tri Tip, Chicken, or Vegetarian Lasagna) for each person attending. If you don't make a reservation, it's possible there will not be a meal available for you the day of the meeting.



MARK YOUR CALENDAR:

• Upcoming CGS meetings:

July / August 2008: **No Meetings Scheduled**

September 16, 2008: **Dr. Richard Behl, CSULB:** "Using Active Tectonics to Extend the Amazing Santa Barbara Basin Record a Million Years Further Back in Time"

UPCOMING EVENTS:

- Geology and Mining History Field Trips Co-Sponsored by Bureau of Land Management and Buena Vista Museum of Natural History:

Visit website at www.blm.gov/ca/st/en/fo/bakersfield/Programs/geology/fieldtrips.html or call Dr. Greg Wilkerson at 661-391-6081 or at gwilkerson@blm.gov.

Aug. 2, 2008: San Joaquin Valley: Westside Stratigraphy

The geology of Wheeler Ridge, White Wolf Fault, Maricopa and McKittrick Brea Pits, Oil Mining (diatomite), Lake View Gusher, Elk Hills Naval Petroleum Reserve and South Belridge oil field are discussed. Includes a display of core at the California Well Sample Repository, California State University, Bakersfield.

Sept. 13, 2008: Ventura-Ojai-Santa Paula-Lake Piru

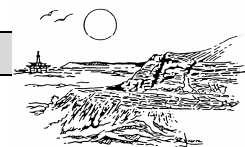
This trip includes stops at the Olivas Odobe, Ventura Historical Society Museum, Ventura Avenue Oil Field, Ojai Valley, Union Oil Museum (Santa Paula), Bardsdale and Blue Point on Lake Piru. We learn about the history of oil development in Ventura County, the oil mines of Sulfur Mountain, the effects of the St Francis Dam disaster and the ecology of Lake Piru.

Oct. 13-15, 2007: Mother Lode III: Northern Mines

This 3-day field conference looks at the structure, stratigraphy and geologic history of the Northern Mines of the Mother Lode in Sierra and Plumas Counties. Friday's trip in Grass Valley where we see the North Star Power house and Empire Mine. Saturday we journey to Edward's Crossing, Malikoff Diggings, Forest Hill, Downieville, and the Kentucky Mine. We end Saturday in Quincy. Sunday's trip will be from Quincy to the Walker Basin. We will go through Taylorsville, see the Englesmine and other mines of the Walker Basin. The program ends in Portola.

Nov. 1, 2008: San Andreas Fault: Ft. Tejon to Pallet Creek

This segment of the San Andreas fault takes us to several sag ponds and offset streams. Stops are made at Ft. Tejon, Quail Lake, Devil's Punchbowl and Wrightwood. Carbon 14 radiometric dating and its application to understanding the frequency of earthquakes along the San Andreas Fault is considered at the Pallet Creek paleoseismic site. Examples of the interaction between ecosystems and fault systems are discussed

**Jan. 26, 2009 : Santa Maria-Carrizo Plain-Cuyama Valley**

This trip starts in Santa Maria and investigates the ecology of the Santa Margarita Lake region including the Rinconada and La Panza mining districts. The tour continues on Highway 58 to the Carrizo Plains for a look at the San Andreas Fault.

- The Statewide Golden Bear Gem & Mineral Show: 69th Annual Show of the California Federation of Mineralogical Societies. Dates & Times: Fri., June 27 - Sun., June 29, 2008 (10 AM - 5 PM each day) Admission: \$5 adults, \$4 Seniors (60+), \$3 students, Kids under 12 free with paid adult. Location: Seaside Park, Ventura County Fairgrounds, 10 W. Harbor Blvd, Ventura. Contact Person: Bural LaRue, Show Chair, (909) 874-5664, bplarue@earthlink.net or www.cfmsinc.org. Features: over 100 gem, mineral, rock, fossil & jewelry exhibits, including exhibits entered into statewide competition; 50 dealers; demonstrations of jewelry making; informative speakers; door prizes & silent auctions; kids activities; and the official State Gemstone, State Fossil, State Rock, and State Mineral on display. This is informally known as "the Super Bowl" of California gem shows!
- The 2009 Pacific Section AAPG Convention will be hosted by the Coast Geological Society May 3 - 7, 2009 at the Ventura Marriott. Tom Hopps will serve as the Convention Chairman and Gene Fritsche will be the Technical Chairman.
- Upcoming Events at the California Oil Museum: See www.oilmuseum.net

CGS MEMBERSHIP: CGS membership is through Pacific Section AAPG. Be sure to select **Coast Geological Society** as your local affiliated society. To join CGS, please go to: www.psaapg.org/member.html

CGS OFFICERS DIRECTORY:

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NOTICES

1. *No-Cost* Employment Announcements (Help Wanted & Job Wanted) are available on our website! Also, business card ads and employment ads available in the newsletter! Contact secretary@coastgeologicalsociety.org
2. If you forward the email notice to another party, cc: secretary@coastgeologicalsociety.org in the email, we will put your party on the monthly notification list. There is no cost to receive CGS email notifications.
3. Buy your raffle tickets! Money generated goes toward scholarships, field trips, etc., to promote the advancement of Geosciences. Check the CGS supported activities on our website (3 Tickets for \$1).
4. Always needed: **Sponsors for our meetings!** Sponsors get a beautiful colored banner hung at the meeting, and the opportunity to distribute their literature and introduce their businesses, as well as the satisfaction of having supported a great organization! Sponsorships are \$300 per meeting and may be shared between two individual sources. Contact vicepresident@coastgeologicalsociety.org for info.



MEETING PLACE: MAP AND DRIVING DIRECTIONS

Meetings are held at the Sacred Heart Church, Biedermann Hall, 10800 Henderson Road, Ventura, CA 93004.

The location is off Hwy 126 at the Wells Road/Route 118 Exit. Click on the map below for a more detailed view and directions.

