



September 2022

LOS ANGELES BASIN GEOLOGICAL SOCIETY

September 22nd (Thursday) – 11:30 AM

Live, IN-PERSON meeting

NOTE NEW VENUE ON NEXT PAGE

Mark Legg

Legg Geophysical

**Potential for Large Complex Multi-Fault Earthquakes Offshore
Southern California**

M. Legg¹, C. Sorlien², C. Nicholson³, M. Kamerling⁴, and G. Kuhn⁵

Abstract

The recent 2010 M7.0 El Mayor-Cucapah and 2016 M7.8 Kaikoura events emphasized that some large ($M > 7$) earthquakes can be quite complex. Similar interacting high- and low-angle fault geometry exists on the major fault systems in the offshore Borderland region of southern California owing to structures developed during the middle Tertiary initiation and evolution of the Pacific-North America plate boundary. Oblique-rifting of the Western Transverse Ranges and Outer Borderland crustal blocks from the North America continental margin created the Inner Borderland Rift with major low-angle oblique normal faults (detachments) that may have reactivated former subduction thrust faults. New high-angle strike-slip faults were created in the rifted margin to accommodate the northwest translation of captured microplates and overriding continental crust. Offshore southern California, the Coastal fault zone includes complex 3-D fault geometry with widespread low-angle faults in the middle to lower crust that may link more steeply dipping, highly segmented shallow crustal fault

zones to produce large complex rupture sequences. This system of segmented shallow crustal fault zones follows the initial breakaway for the rifted Western Transverse Ranges and Outer Borderland crustal blocks. Low-angle faults that persist to seismogenic depths may be locked, allowing elastic strain energy to accumulate between large earthquakes. Moderate earthquakes, 1933 Long Beach (M6.3) may rupture individual segments, but paleoseismic data indicate the potential for infrequent large rupture events, which may include secondary faults along the coast. Although low slip rates reduce the probability of such events, fault proximity to major cities, harbors and associated infrastructure may produce significant risk for severe losses from large potential, complex multi-fault earthquakes.

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Legg M, Sorlien C, Nicholson C, Kamerling M, Kuhn G. Potential for large complex multi-fault earthquakes offshore southern California. *Proceedings of the 11th National Conference in Earthquake Engineering*, Earthquake Engineering Research Institute, Los Angeles, CA. 2018.

Biographical

President, Legg Geophysical, Huntington Beach, CA 92647-4472.

Dr. Legg conducts high-resolution multichannel seismic reflection surveys to map the shallow coastal and offshore geology for neotectonic investigations and to characterize offshore alluvial basins for suitability of subsurface intakes at desalination plants. He consults with major petroleum exploration companies to re-interpret 3-D seismic data volumes using synthetic seismograms from well logs to correlate the seismic stratigraphy and locate bypassed oil or gas deposits. He processes multichannel seismic reflection data for shallow geotechnical investigations, mapping coastal and inland aquifers, and offshore deep hydrocarbon exploration. He is actively investigating historical and pre-historical earthquake activity along the coast and offshore of southern California, including potential for liquefaction and locally-generated tsunami. He has assisted the cities of Malibu, Buena Park, and Coachella in preparing Seismic Safety Elements. He assessed earthquake hazards (PML evaluations) to over 500 major building sites throughout California, the Pacific Northwest and Alaska, the Rocky Mountain seismic belt, the New Madrid seismic area, and offshore areas including Guam and the U.S. Virgin Islands to assist financial institutions estimate lending risks.

When:

Thursday, Sept. 22, 2022
11:30-1:00

Meeting Agenda

Lunch Served: 11:30 AM to 11:50 PM
Announcements: 11:50 AM to 12:00 PM
Guest Speaker: 12:00 PM to 12:45 PM
Questions/Close: 12:45 PM to 1:00 PM

NEW VENUE:

Signal Hill Petroleum located at 2633 Cherry Ave, Signal Hill, CA (562-595-6440, Brady Barto, ext. 5233). They are two doors north of E. Willow St. on the west side of Cherry. Drive to the rear of the parking lot on the north side of the building and look for the sign directing you to the conference room

Cost (Note temporary price reduction):

Lunch and Speaker: \$25.00 with reservations
\$35.00 without reservations
Retired: \$20.00
Student: \$5.00

PAYMENTS IN CASH OR CHECK ONLY

Meeting Reservations:

Reservations are required by noon, Monday, 19 Sept. at www.labgs.net
Then click the gray "Meetings" tab at the top of the page and use the "Make Reservation" button near the middle of the page. Or contact **Joseph Landeros** at 626-497-1710 or email him at landerosjd@gmail.com

Reservations must be made by:
12:00 noon Monday Sept. 22nd
to receive reservations at discounted price.
(This will be strictly adhered to)

As always, walk-ins are welcome!

OUR WEB SITE ADDRESS:
www.labgs.org

Announcements

NEW VENUE:

LABGS is pleased to announce that Signal Hill Petroleum has offered the use of their conference room facilities for our meetings (SHP's needs prevail). We are also pleased to say that they are paying for our Italian lunch on the 22nd to start us off. Thank you Brady Barto of Signal Hill Petroleum.

Owing to the fact that LABGS lost approximately \$700 at our last two in-person meetings at The Grand, we are collecting a reduced payment for this meeting to help us recover from this shortfall. Based on our experience this month, we will determine next month's pricing.

ELECTIONS:

We need to elect or appoint a new President before the January 2023 meeting. Please send any nominations to Scott Prior (contact listed below). Someone needs to step up to the plate if you want to keep your society going. **The October meeting will be Scott's last one as President.**

President: This officer updates the monthly newsletter using the previous month's newsletter as a guide. Speaker information is supplied by the program chair (VP). The President forwards the newsletter to the Secretary for distribution to members. The president brings the projector to the live meetings and introduces the speaker. Zoom meetings are currently set up by the Financial Secretary who also makes the bookings for in-person meetings. This is a pretty easy job requiring about an hour of time each month. There are only 8 live meetings per year. The current President has been in

this position for three years and would like to step aside for a time. The hand-off would take place at our September meeting.

LABGS Board Contact Information:

President: Scott Prior

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VP & Programs: Chris Smart

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**Do you know if your PSAAPG/LABGS
membership is current?**

*If you don't know, please check via
the PSAAPG website:*

<http://www.psaapg.info/cloud/miscellaneous/dues.php>

***Please inform a LABGS Board member
if you have a pertinent announcement.***