Workshop Summary:
Newport-Inglewood Fault Zone Corehole Project
May 9, 2008
California State University at Long Beach

The Southern California Earthquake Center (SCEC) with California State University at Long Beach (CSULB) and Signal Hill Petroleum (SHP) coordinated a workshop on drilling into the Newport Inglewood Fault (NIF). At least 19 scientists participated in the workshop held on May 9, 2008, at CSULB Pyramid Conference Center. (Agenda is attached)

The NIF is the source for the 1933 Long Beach earthquake (March 10, 1933, 5:54 pm PST) that led to Field Act—legislation that initiated building codes for public schools. The NIF cuts through one of the most densely populated areas in southern California with an immense infrastructure including freeways, oil fields and the nearby ports of Long Beach and Los Angeles. Although the State has implemented building codes to strengthen the infrastructure, an earthquake on the NIF would have a critical impact on the welfare of California and the nation[1].

The 1933 earthquake had no known surface rupture. As described by several of the speakers and those in attendance, the NIF is a fault zone with a series of fault segments as it proceeds northwest from about Long Beach. However, the southeastern segment, which ruptured in 1933, is thought to be a more continuous segment though it may be zone that is 200 m wide.

A fundamental question for faults is what does it look like geologically at depth. Equally important is whether the fault properties at depth, e.g., frictional characteristics of the fault, can affect the dynamic behavior during an earthquake. There are few direct observations of faults at depth; the most notable are the Nojima fault (source of the 1995 Kobe earthquake) in Japan; the Chelongpu fault (source of the 1999 Chi Chi earthquake) in Taiwan and the San Andreas Fault (just north of Parkfield). The information from the cores that are taken is invaluable in advancing our understanding of what actually takes place during an earthquake.

An opportunity exists for coring the NIF near the northern end of the 1933 rupture. As part of its effort to understand the faults and the structure of the Long Beach oil field, SHP will undertake a 3D seismic survey of the region to map the near surface structure and the location(s) of the NIF. Of additional interest is that SHP has designed and purchased its own instrumentation for radio linked sensors to be used during the 3D seismic survey. The 3D survey and analysis the data are expected to be completed in about one year. Once the results of the 3D survey define the NIF in the area of the 3D survey, SHP has designs to drill a 3 km (10,000') hole that would penetrate the NIF at one or two depths. In the area (Figure 1) where the fault is to be penetrated, the drilling would change to coring so that intact cores of the fault and its surrounding environment could be brought to the surface for scientific studies.

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[1] USGS Professional Paper 1360, Evaluating Earthquake Hazards in the Los Angeles Region—An Earth-Science Perspective, 1985.

After the drilling and coring is complete, the drill hole itself would be instrumented to record ground motions at various depths. A key element in ground motion is the amount of amplification that occurs as the seismic waves emerge from bedrock into the softer sediments overlying the bedrock. This effect can alter the amplitude of the ground motion by factors of five or more. The plan is that the data from this seismic station would be automatically included in the southern California seismic network. It would also be transferred to a local seismic display at CSULB. One objective that was discussed was to use the data, both seismic and geological, as elements of an observatory at CSULB.

Jim Boles, UCSB, Judi Chester, Texas A&M, Jim Evans, Utah State University will coordinate a plan for sampling of drill cuttings, decisions about cores to be extracted and analysis of the cores. A steering committee for instrumentation will be determined, with the most likely chair to be Jamie Steidl, UCSB, with anticipated participation from others at SAFOD who have experience with instrumenting a deep hole as well as those familiar with the southern California seismic network. The plan is that the data would flow seamlessly into the Southern California Earthquake Data Center. In addition, there is a natural outreach element for education. Dan Francis, CSULB, would be taking the lead in this effort that would be coordinated with SCEC E&&O. The SCEC coordinator for the corehole project will be Ralph Archuleta, UCSB.

The workshop was recognized as the first in a series that would be necessary to fully implement the science that is being proposed.

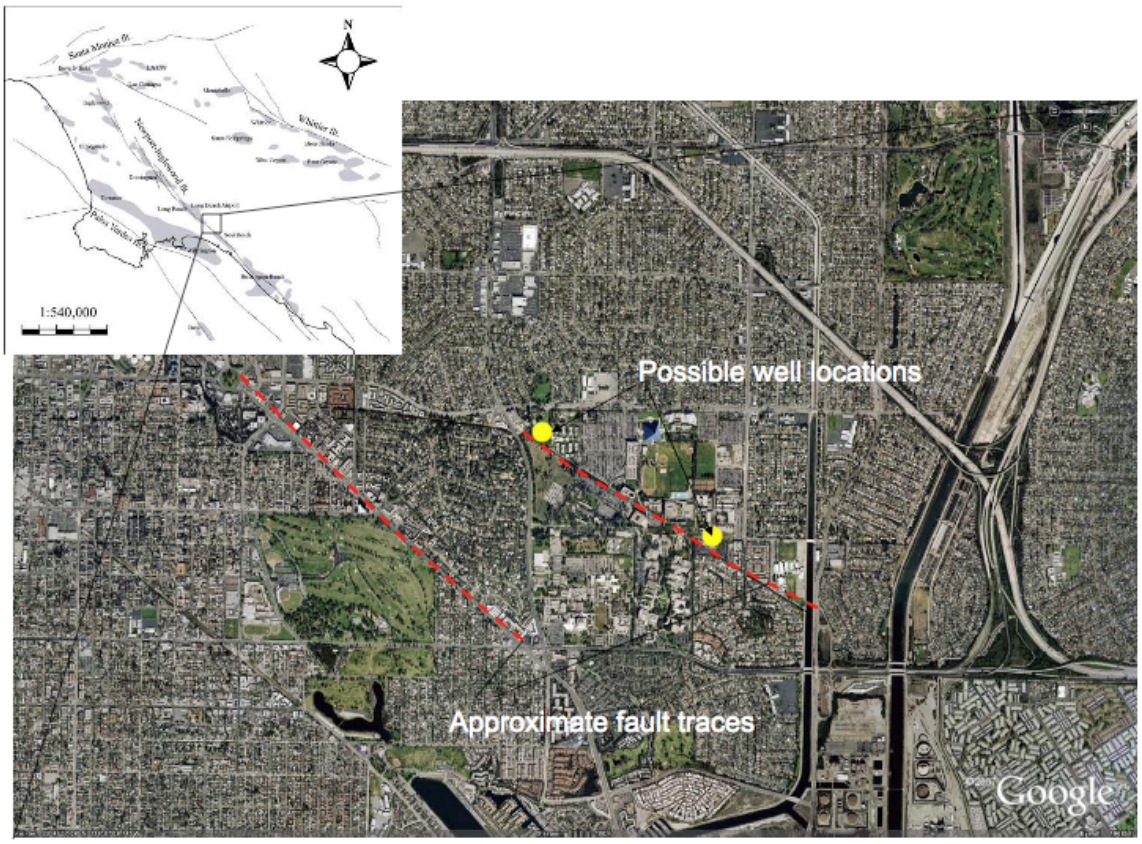


Figure 1: Google map showing approximate fault traces of the Newport Inglewood Fault and possible drilling locations. The possible drilling locations are ENTIRELY schematic to indicate that the corehole will be likely be in this section of the fault. The exact location will depend on the results of the 3D seismic survey.

**Newport-Inglewood Fault Zone Corehole Project**
Scientific Objectives
Agenda for Friday, May 9th, 2008
9:00 AM CSU Long Beach, California
Place: CSULB Pyramid Annex Conference Center

1. 9:00-9:30 Introduction and welcoming comments (Rick Behl representing CSULB, Hilario Camacho representing SHP, SCEC Ralph Archuleta)
2. 9:30-10:30 Newport Inglewood fault zone (NIFZ)
    a. General overview of structural trends in Los Angeles Basin
    b. Structure of NIFZ (Hilario?)
        i. Well data
        ii. 2D seismic
    c. Seismic activity associated with the NIFZ
    d. Fluid flow and temperature anomalies associated with the NIFZ (Hilario)
3. 10:30-11:30 Corehole (Hilario Camacho)
    a. Location
        i. Long Beach 3D
        ii. Wellbore design, drilling plan
    b. Drilling
        i. Logistics
            1. Surface impact
            2. Permits
        ii. Drilling time
        iii. Cost
            1. drilling
            2. petrophysical logging
            3. coring
            4. instrumentation
    c. Monitoring and management of instrumentation and related facilities.
4. 11:30-12:30 SAFOD overview (Steve Hickman)
    a. Petrological Analysis (Jim Evans)
    b. Fault zone properties (Judi Chester)

    LUNCH 12:30-1:30
5. 1:30-2:30 Core-studies (Jim Boles, Hilario Camacho, Judi Chester, Jim Evans)
    a. Coring plan
    b. Core description and storage
    c. Core accessibility and management
    d. Diagenetic/petrophysical/structural studies
        i. Mineralogic
        ii. Isotopic
        iii. fabric
    e. Modeling of fault zone
        i. Fluid/heat flow
        ii. Geophysical properties
6. 2:30-3:00 Instrumentation of borehole (Jamie SteidlSCEC)
7. 3:00-4:00 Discussion

Maps of the campus. http://daf.csulb.edu/maps/
Pyramid Campus Annex is in the northern section, in row 2, on the border of D and E

Workshop Participants:

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