An Oily Summerland Century Story

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Office of Spill Prevention and Response

Prevention First

Long Beach, California

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The Problem

Despite multiple abandonment efforts, persistent but intermittent beach oiling continues causing community concern.

The Solution

A scientific study to quantify the amount of oil emitted and to understand the intermittency and persistence of oil emissions at Summerland

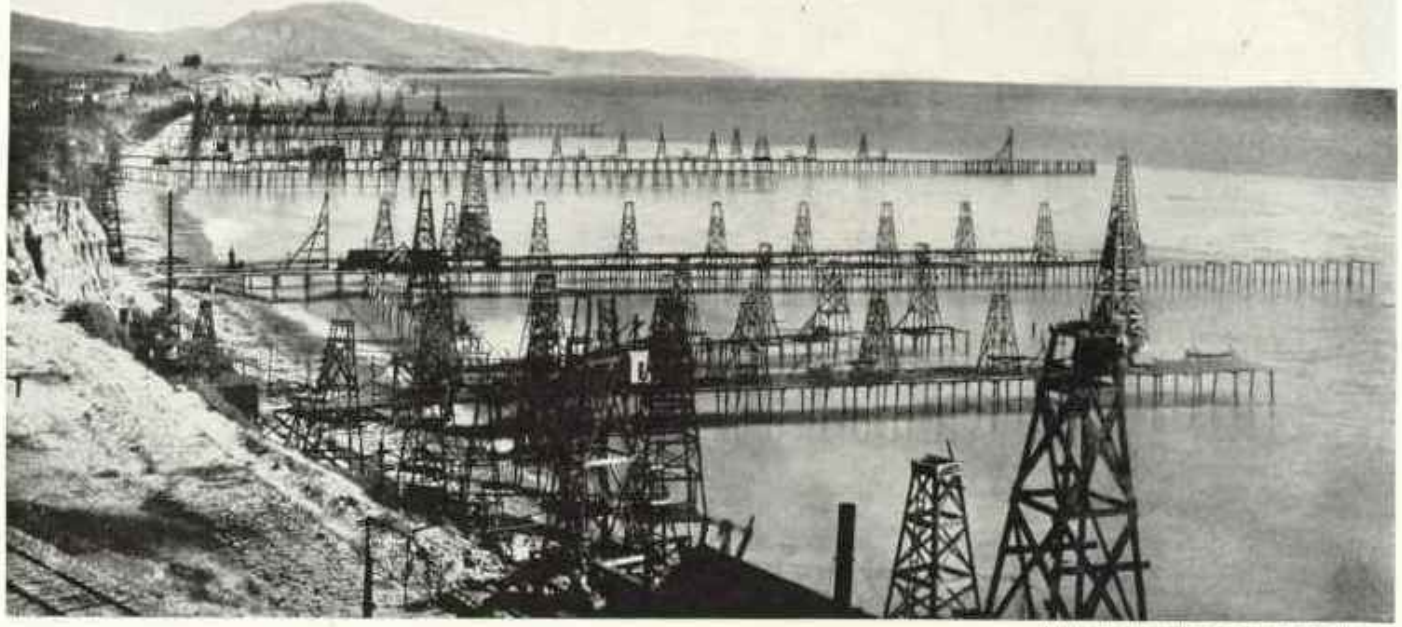
The Answer

There is a geologic reason why Summerland reports persistent oiling.

Root Cause - Historical and Geological

416 wells drilled 1895-1906

220 wells drilled nearshore and offshore



Photograph from U. S. Geological Survey

THE SUMMERLAND FIELD IN SANTA BARBARA COUNTY, CALIFORNIA

Where man's conquest of the subterranean treasure extends beyond the shore-line. These wells were drilled 300 feet below sea-level to reach the oil.

Abandonment Efforts

Historical- Rags & Telephone Poles

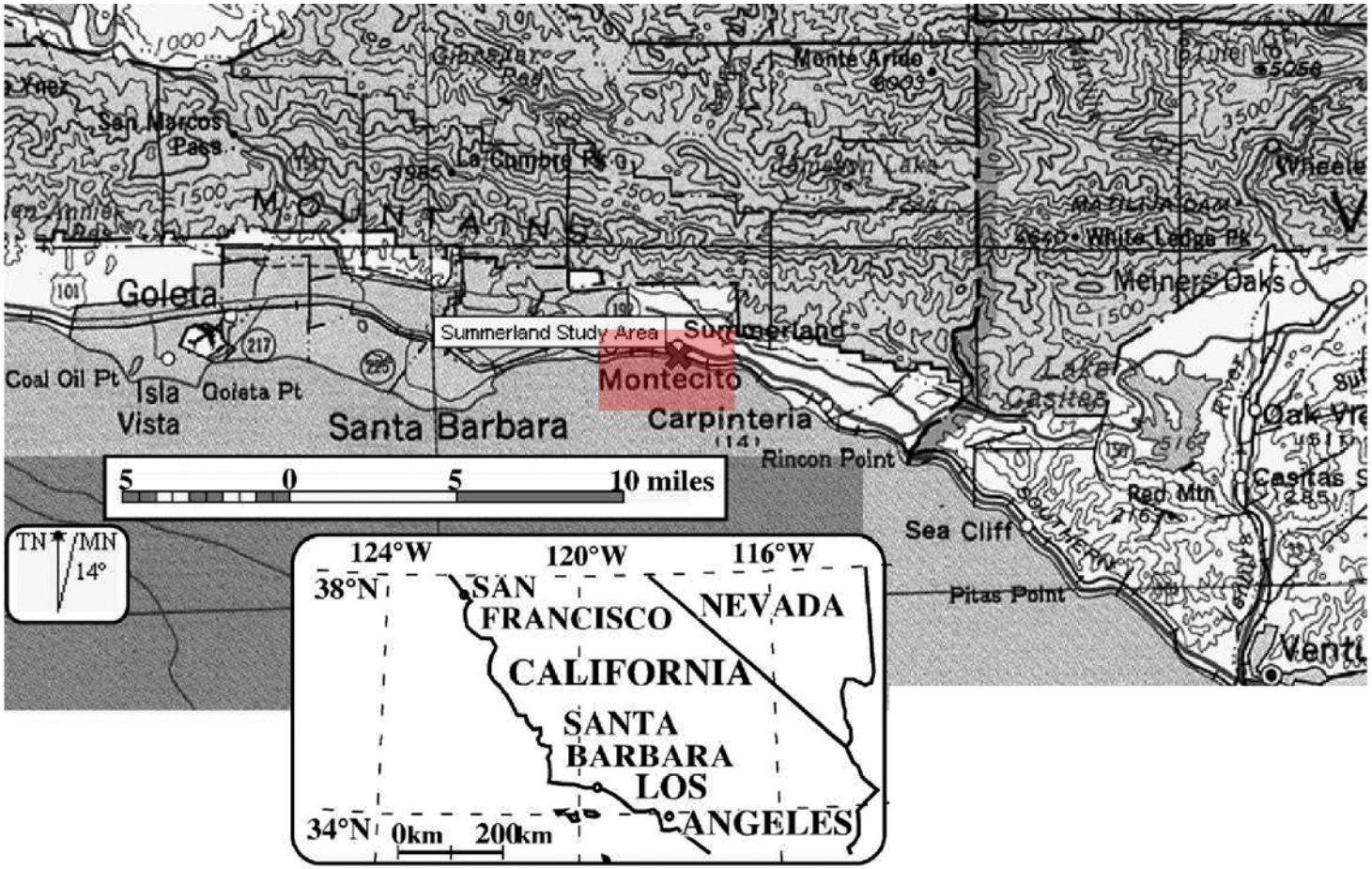
Modern - Reduced Oil Emissions Significantly

Approaches

- Aerial Surveys
- Underwater Surveys & Quantification
- Boat Surveys
- Beach Surveys & Quantification

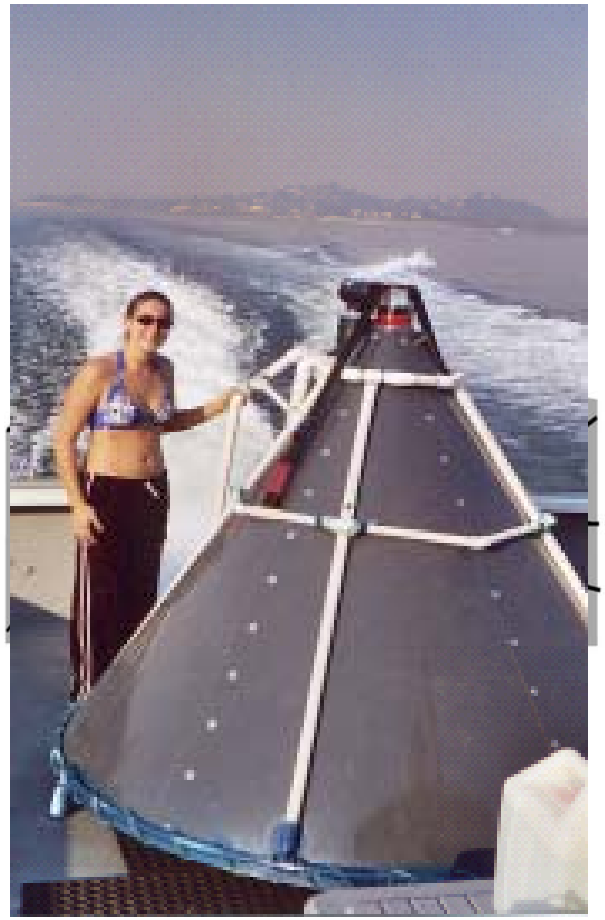
How Much Oil?

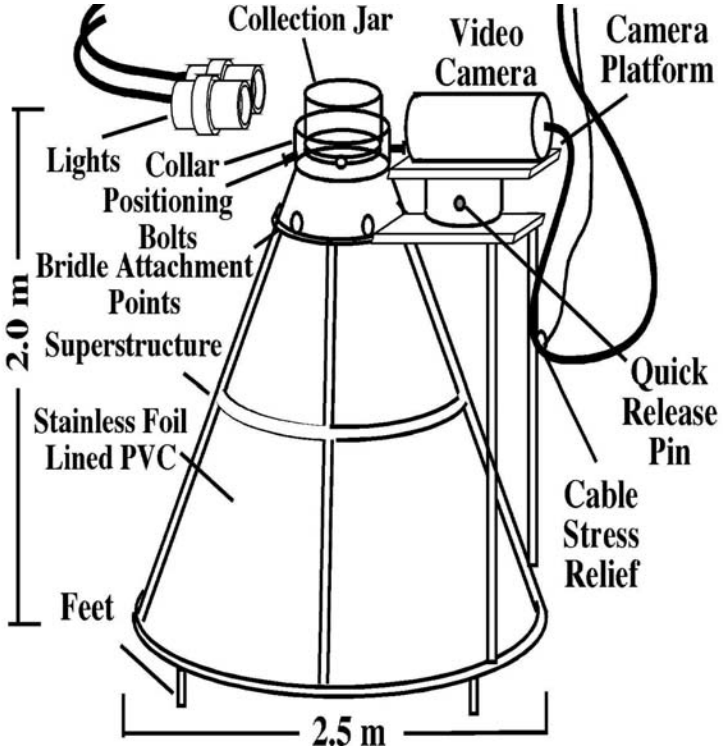
Summerland is a 15-45 minute drive east from Santa Barbara



Underwater Surveys & Quantification

Video-Monitored Seep Tents





Underwater Surveys & Quantification

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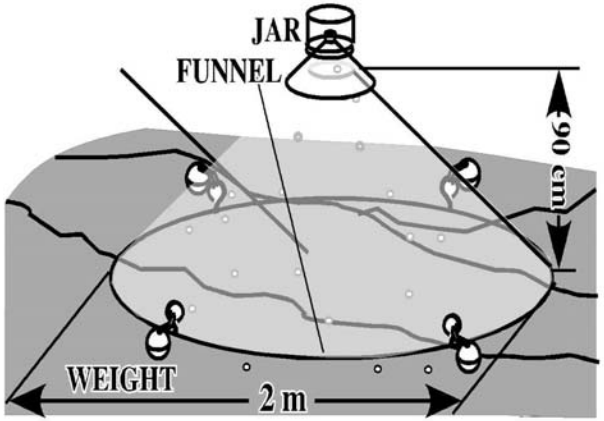

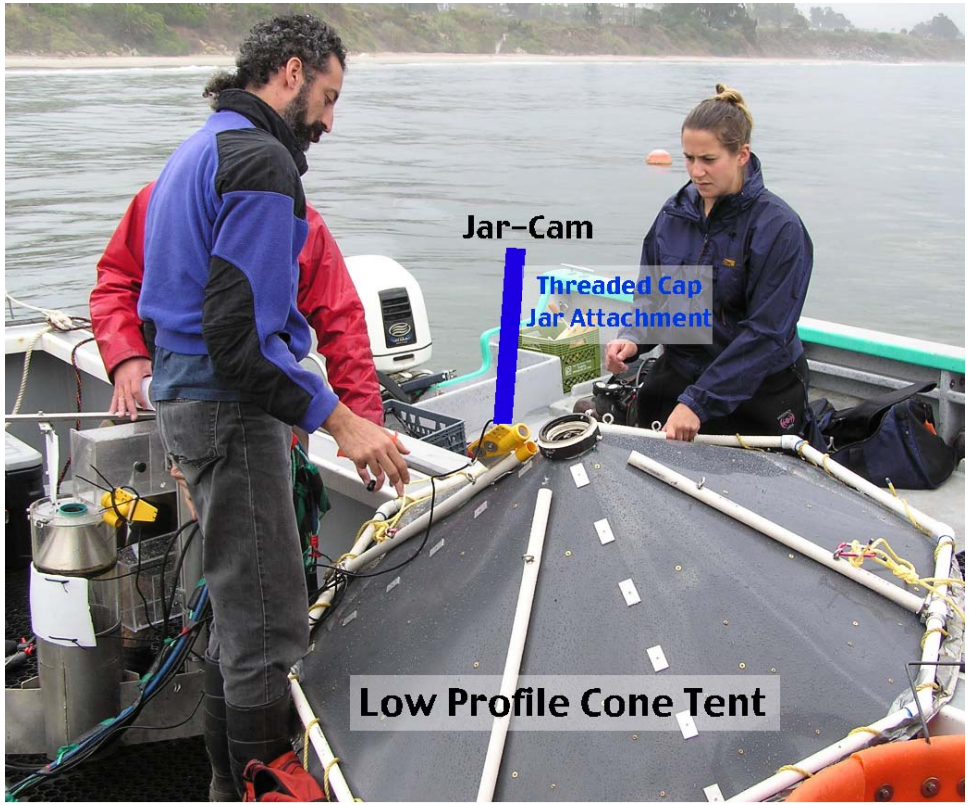

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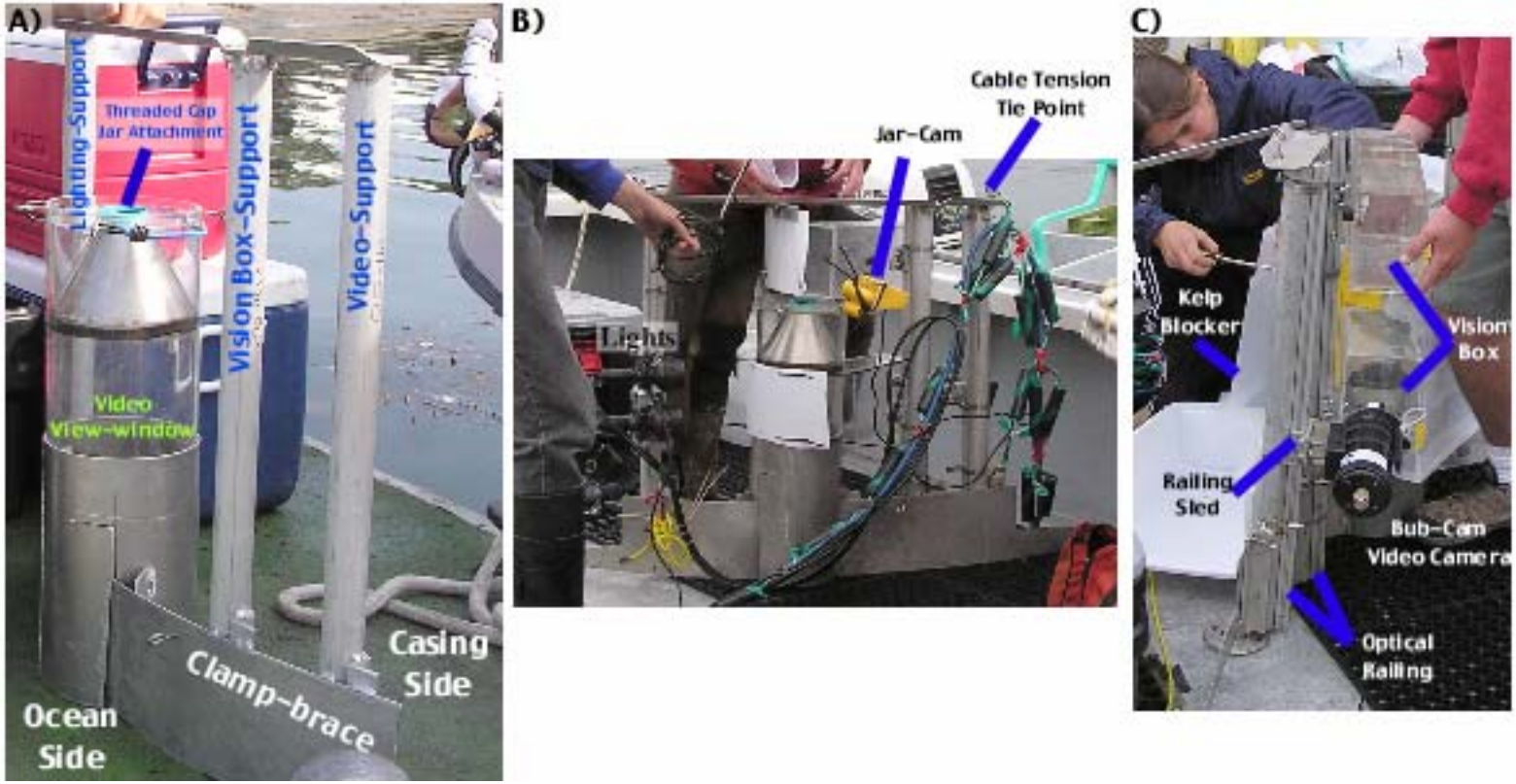
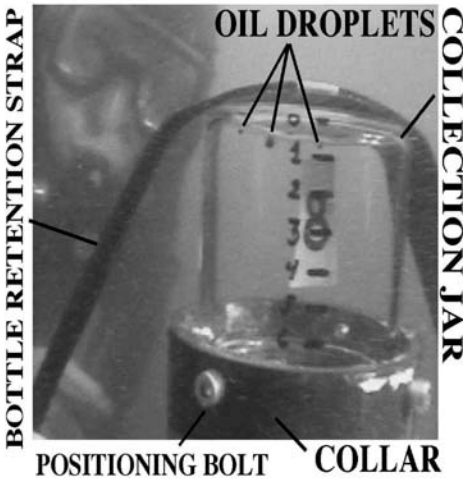
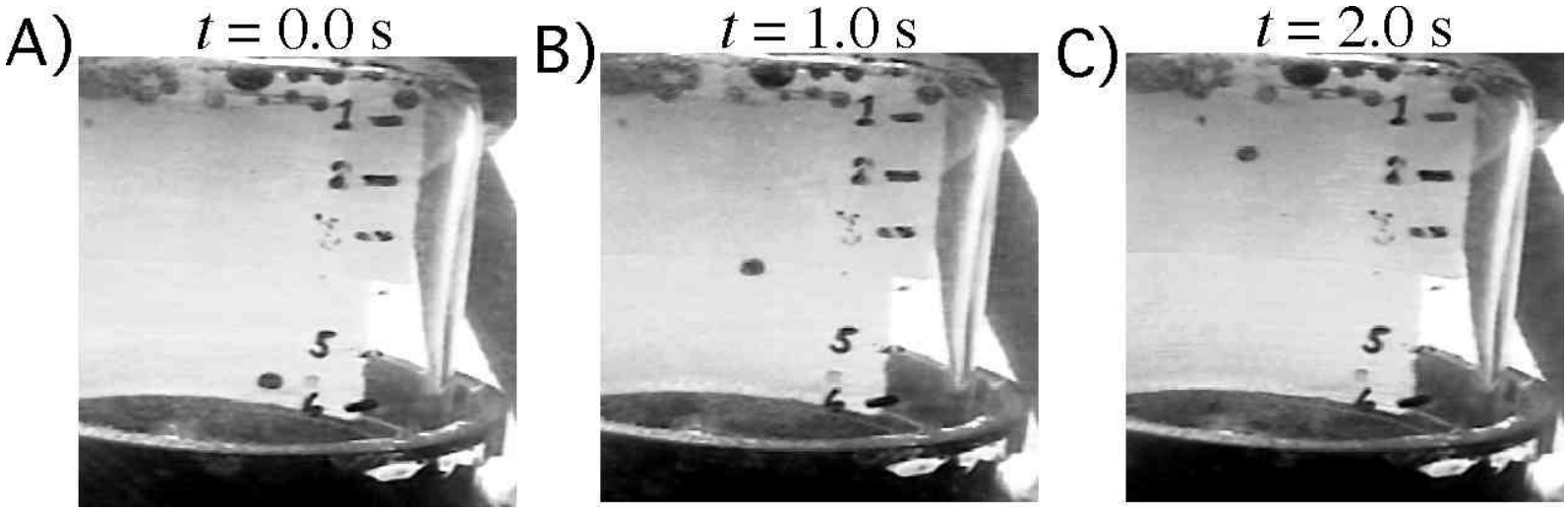


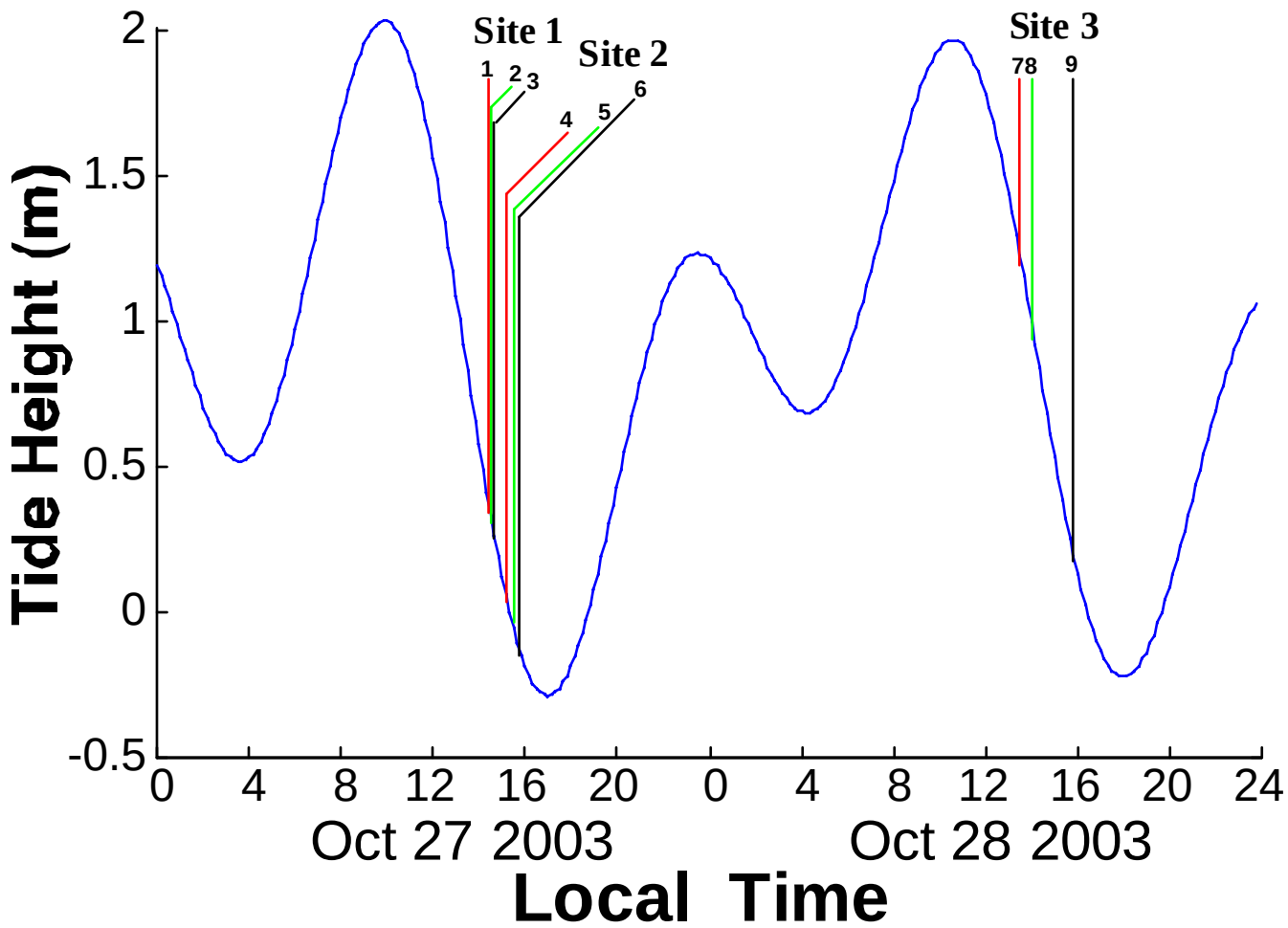
Command Center

Underwater Surveys & Quantification





Oct 27-28, 2003 Seabed Deployment



Oct 27-28, 2003 Sites 1-3 Emissions

Site 1 10/27/2003 **34° 25.0549'N, 119° 35.8777'W (NAD83)**

Site 2 10/27/2003 **34° 25.0687'N, 119° 35.9224'W (NAD83)**

Site 3 10/28/2003 **34° 25.0832'N, 119° 35.9640'W (NAD83)**

Site	Sample	Time deploy	Time (min)	Oil (ml)	Oil Flux (ml dy^{-1})	Gas (ml)	Gas Flux (L dy^{-1})	Gas/Oil ratio
1	1	14:35	5.15	0.0027	0.75	364.60	101.95	135,000
1	2	14:39	6.20	0.0027	0.63	407.70	94.69	151,000
1	3	14:46	5.00	0.0054	1.56	259.40	74.71	48,000
2	4	15:25	6.32	0.0027	0.62	318.50	72.57	117,000
2	5	15:36	4.08	0.0036	1.27	298.70	105.42	83,000
2	6	15:52	3.46	0.0032	1.33	265.30	110.41	82,900
3	7	13:34	31.3	0.4910	22.6	8.00	0.368	16.3
3	8	14:05	112.29	0.4310	5.53	1.50	0.019	3.48
3	9	15:56	26.60	2.3360	126.46	12.40	0.67	5.31

Mean Site Values	Oil Flux (**ml dy^{-1}**)	Gas Flux (**L dy^{-1}**)
Site 1	0.979±0.4	90.4±14
Site 2	1.072±0.4	96.2±20
Site 3	51.5±65.5	0.35±0.33

SCUBA Survey Dec 2004

Treadwell was active, S-3 was not. High profile tent was rapidly degraded by the surge.

Two other minor emission sites, S-4 and S-5, further offshore from T-10 were identified.

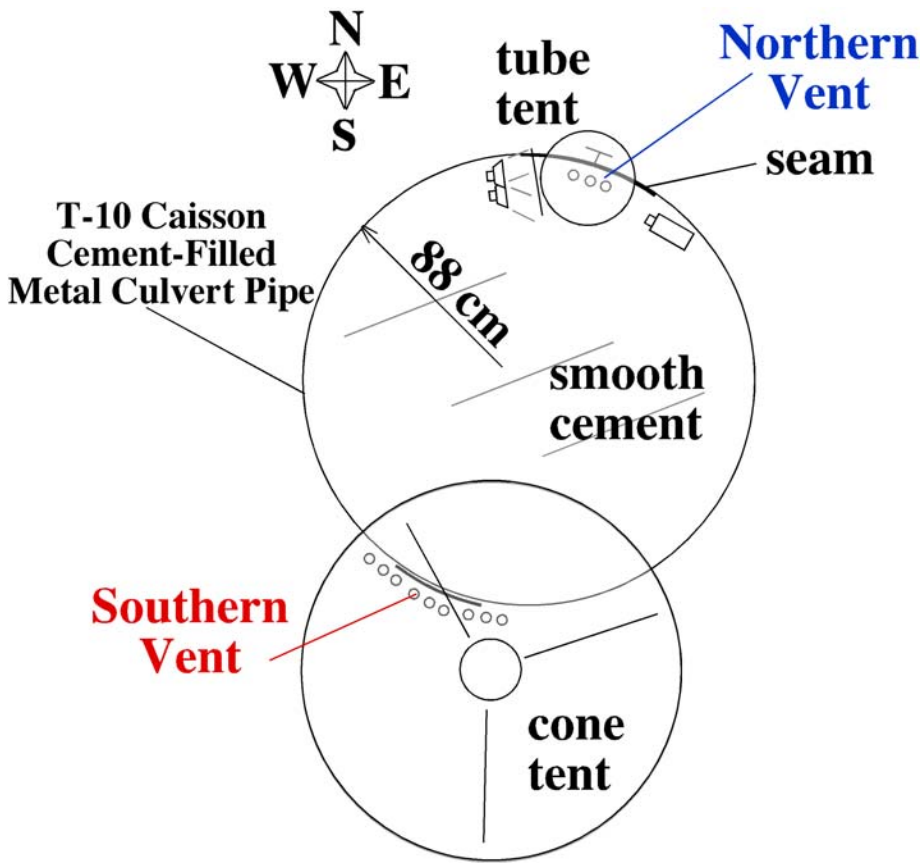
SCUBA Survey July 19-20 2005

Treadwell T-10 was active, S-3 was inactive. Tube and Cone Tents were deployed.

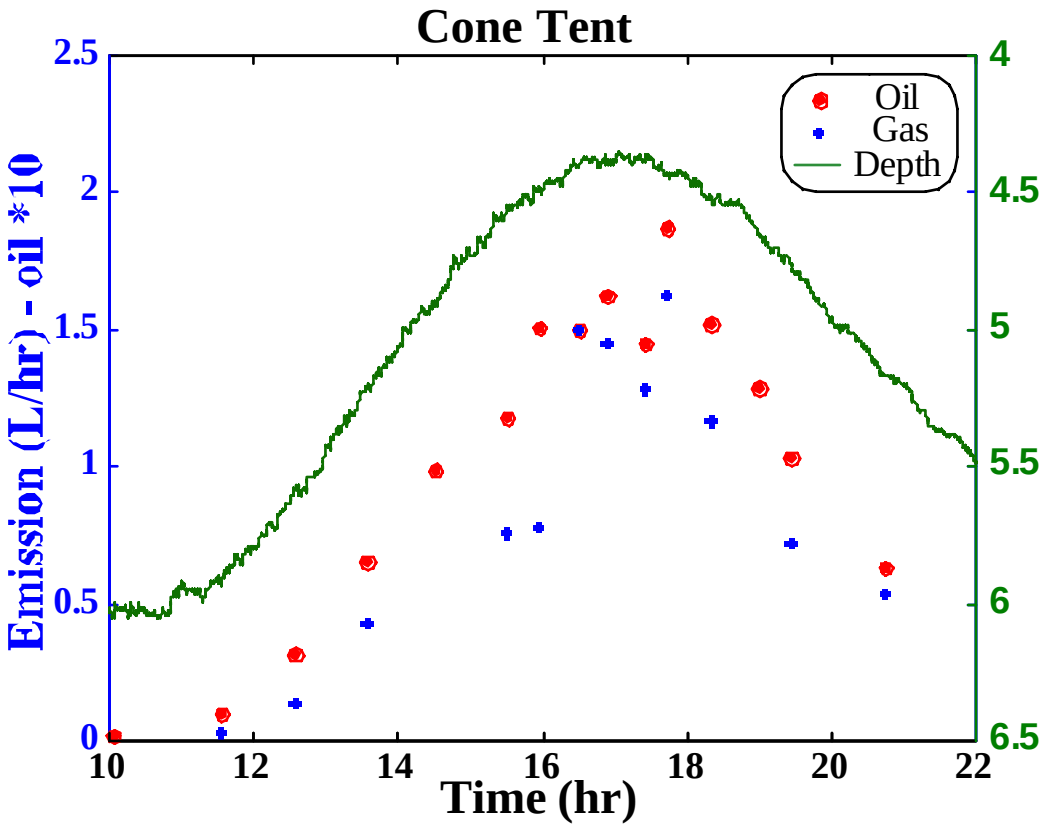
Emission for July 2005

Figure Here

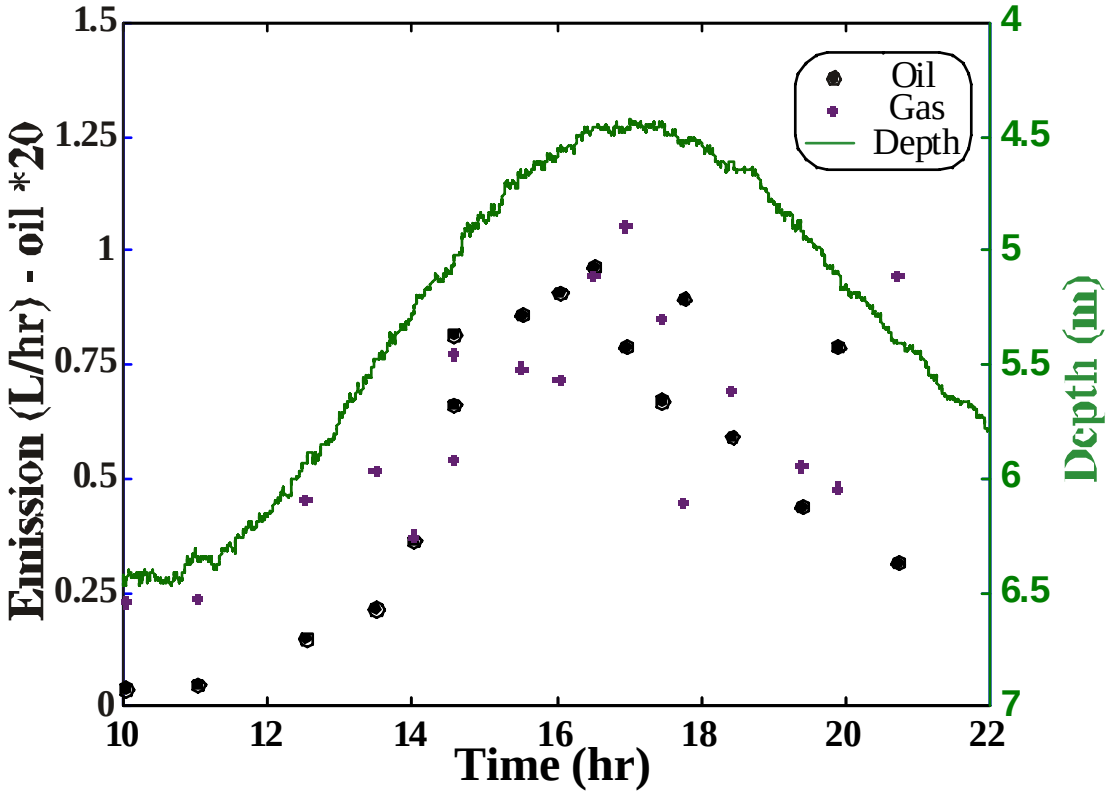
Oct 27, 2005 Seabed Deployment



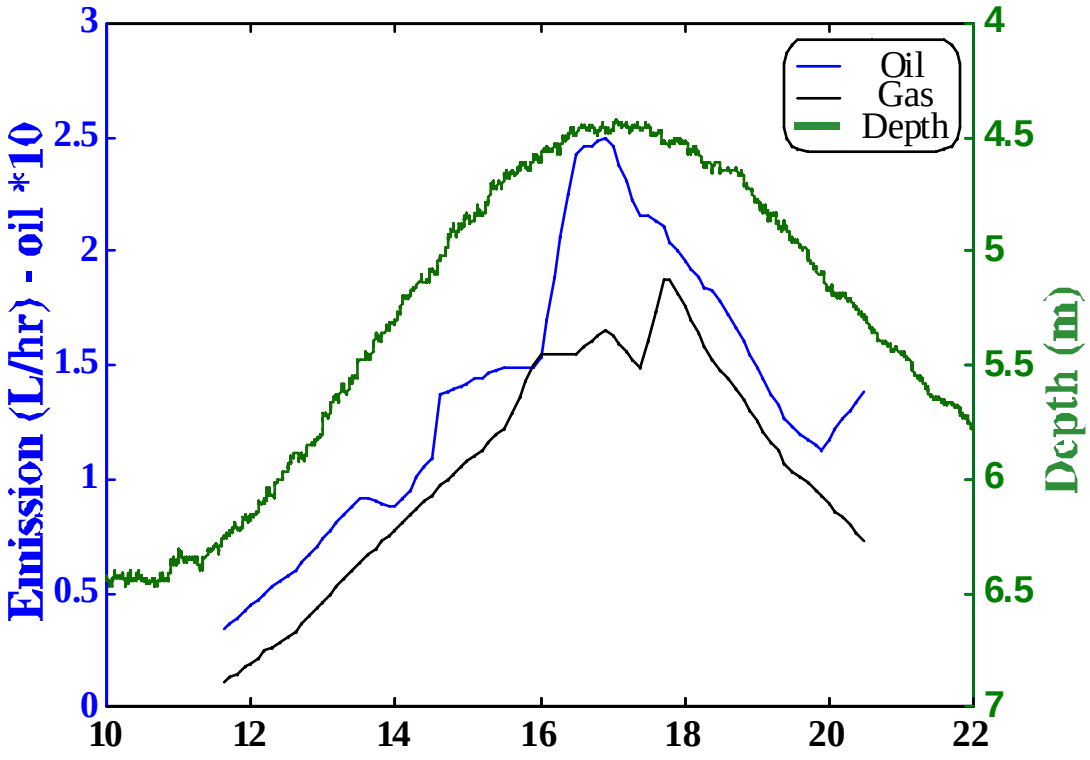
Cone Tent


Cone Tent
Oil
Gas
Depth
Emission (L/hr) - oil *10
Time (hr)
2.5
2
1.5
1
0.5
0
4
4.5
5
5.5
6
6.5
10
12
14
16
18
20
22

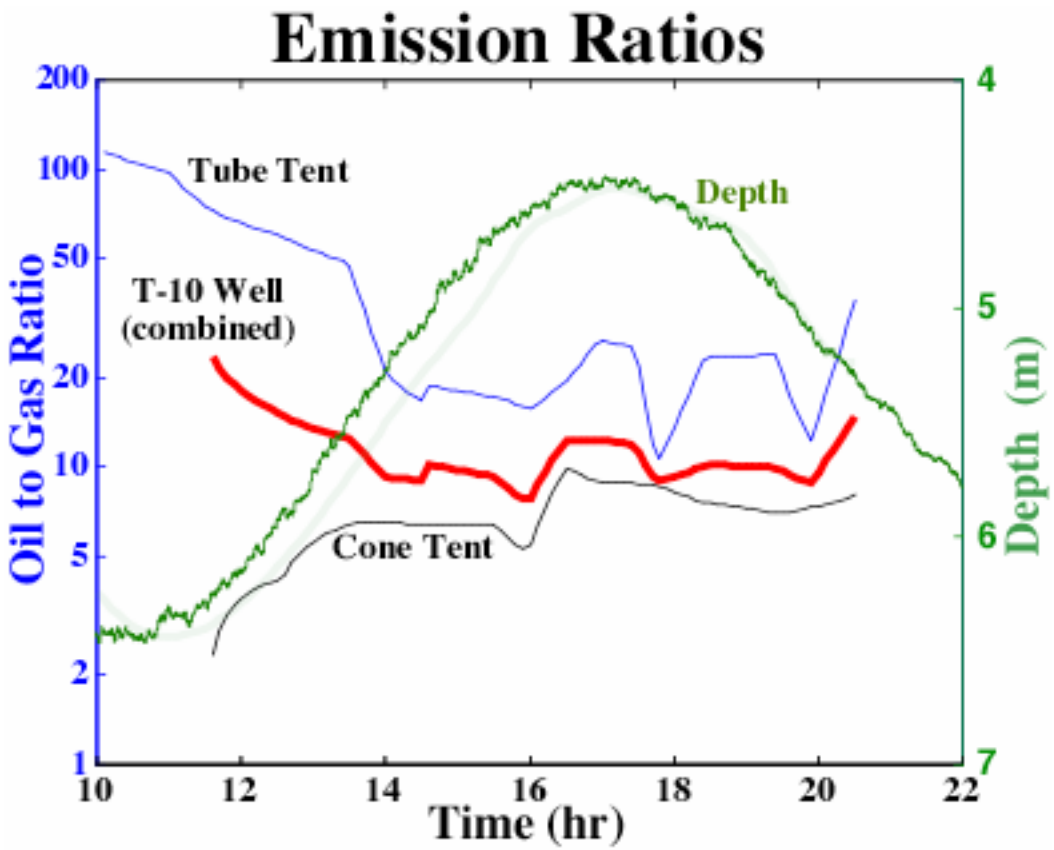
Tube Tent


Oil
Gas
Depth
Emission (L/hr) - oil *20
Depth (m)
Time (hr)
1.5
1.25
1
0.75
0.5
0.25
0
4
4.5
5
5.5
6
6.5
7
10
12
14
16
18
20
22

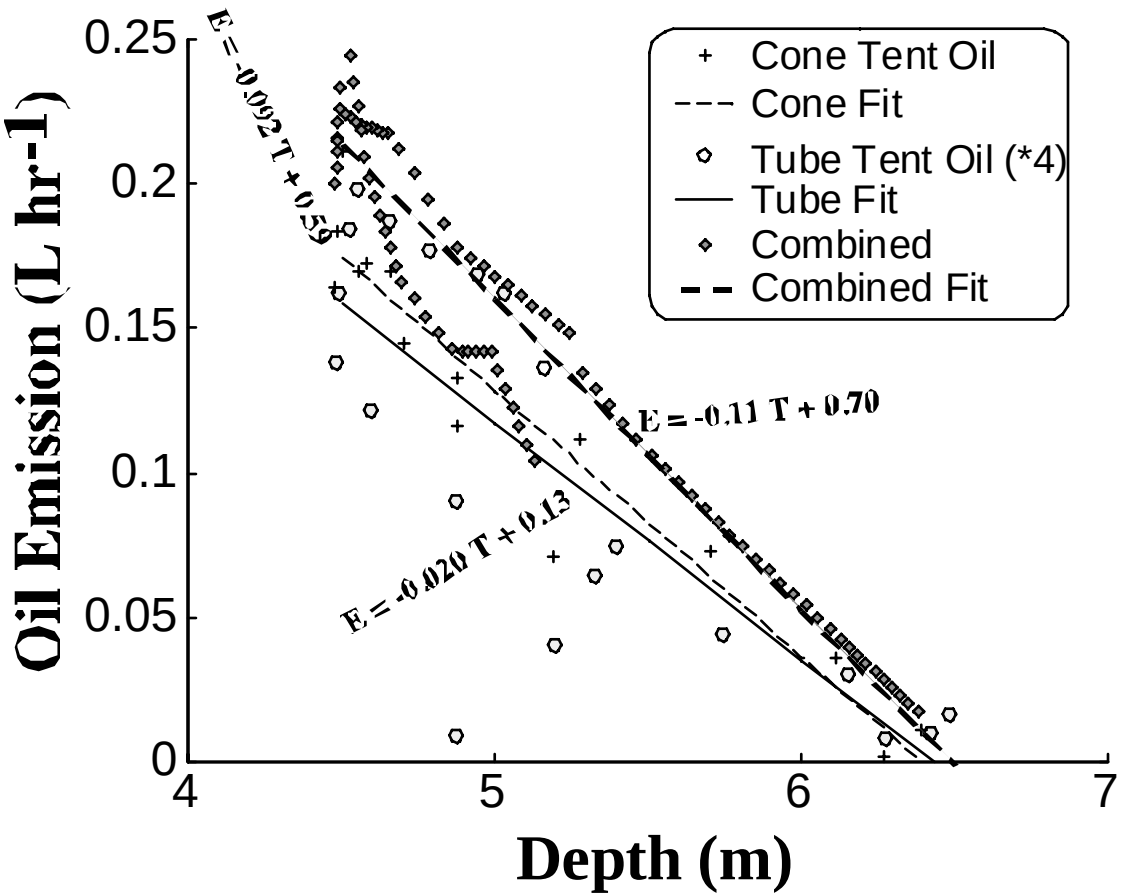
T10 (combined) Emission

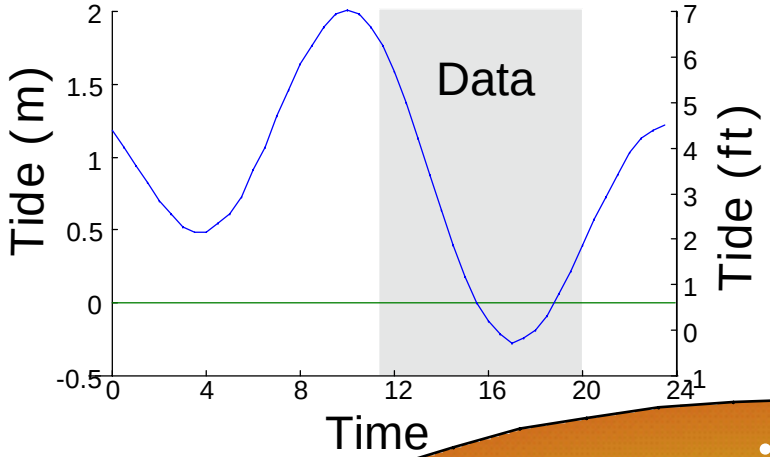


Oil to Gas Ratios



Curve Fit to Data



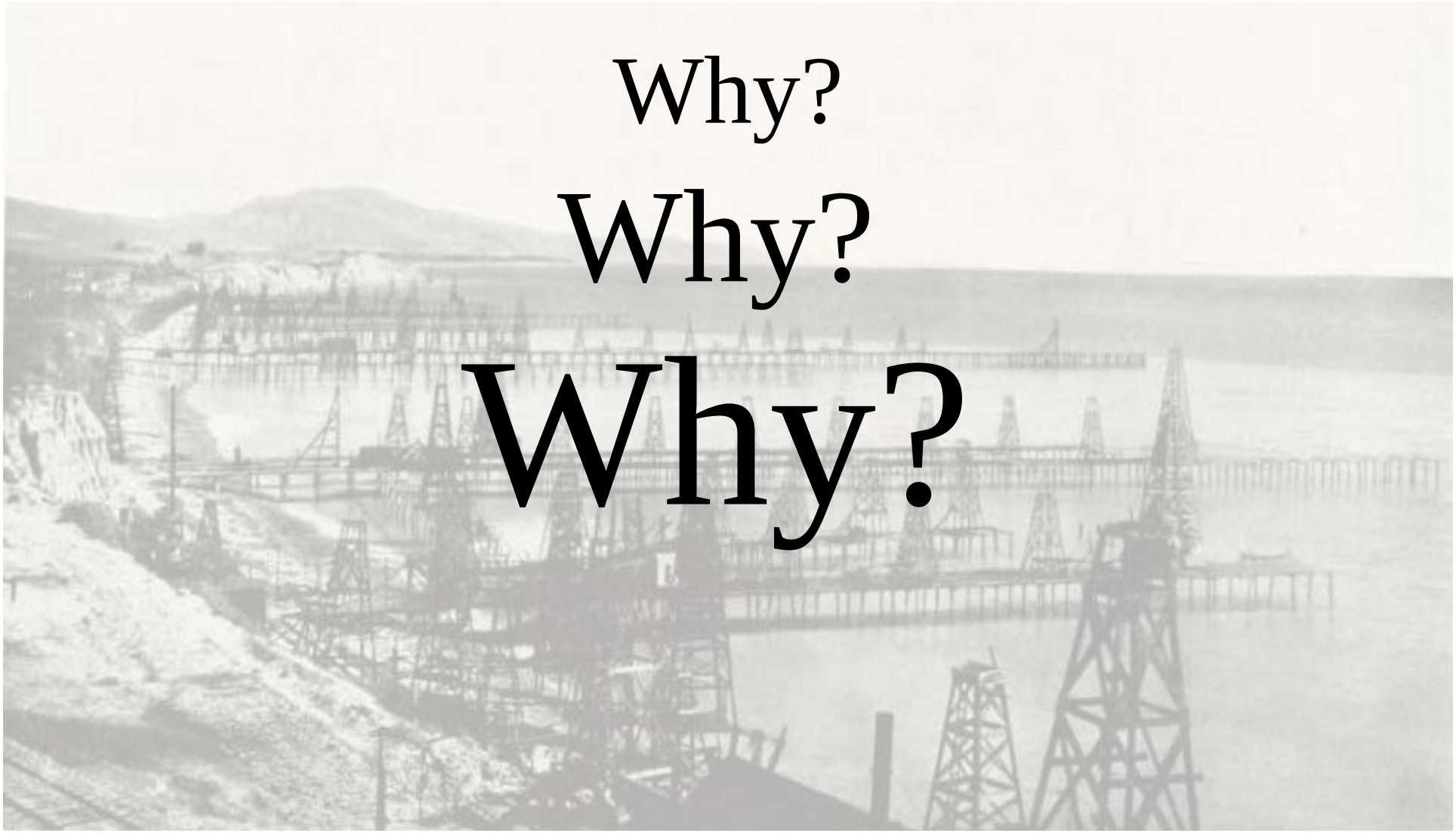


using fit -

Bottom Line:

2.62 liters oil day^{-1}

from T-10 Well

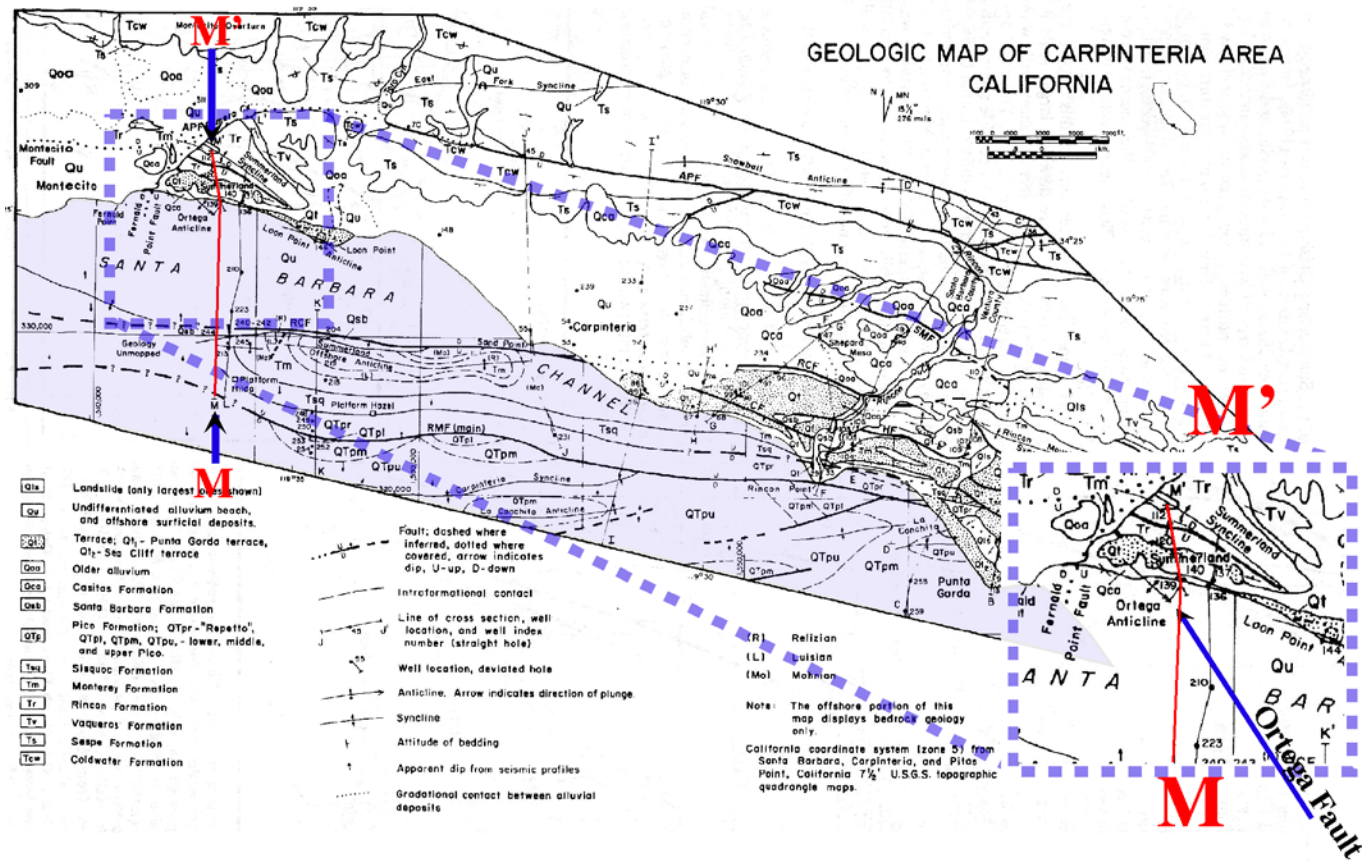


Why?

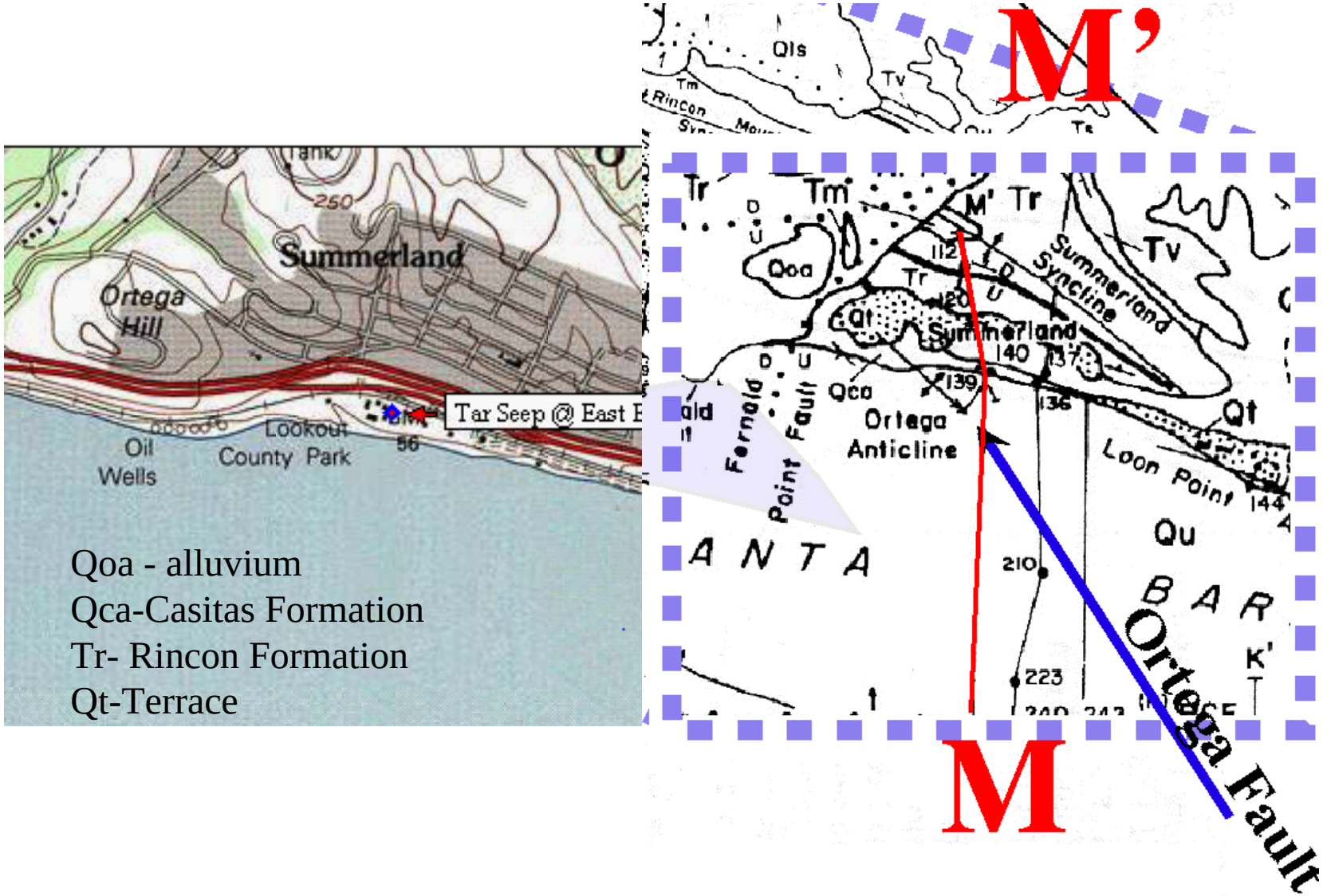
Why?

Why?

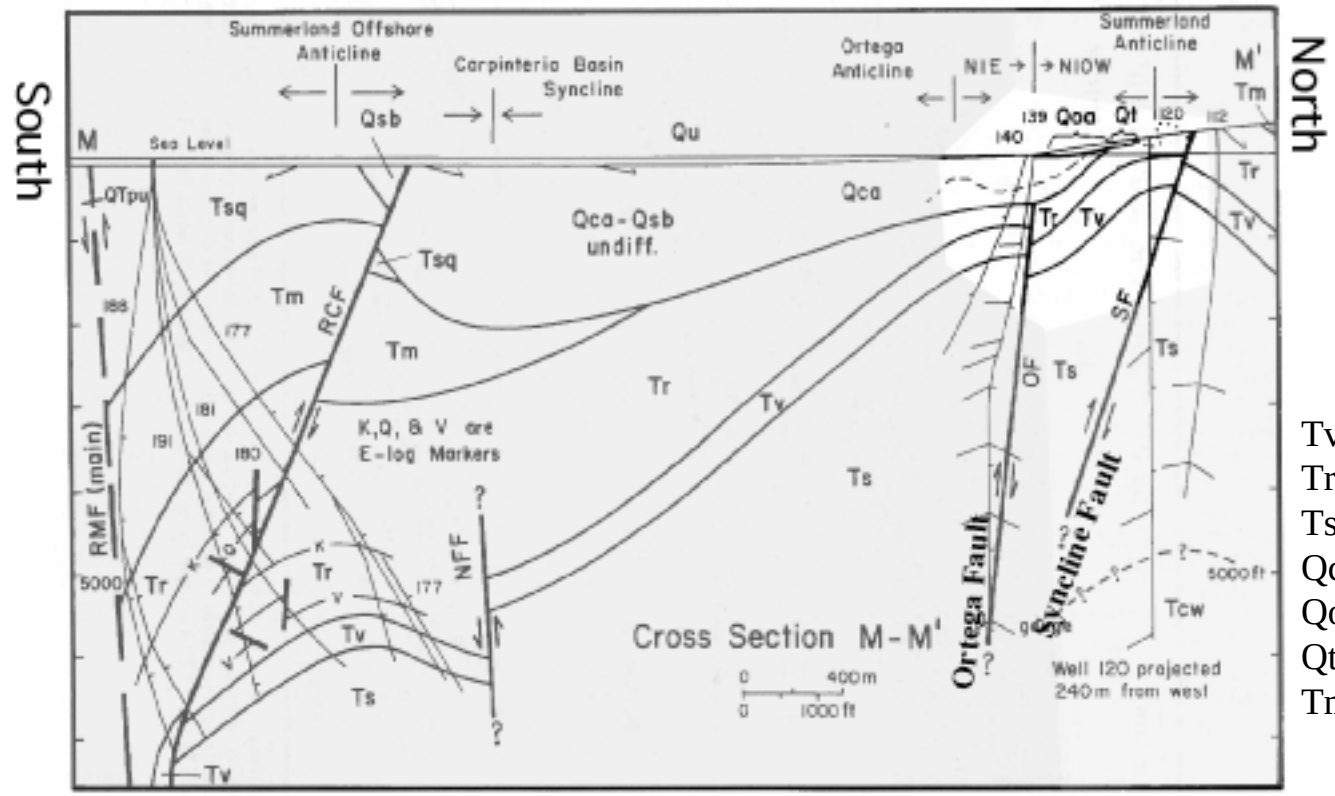
Carpinteria Basin Geologic Structure



Summerland Area Geologic Structure

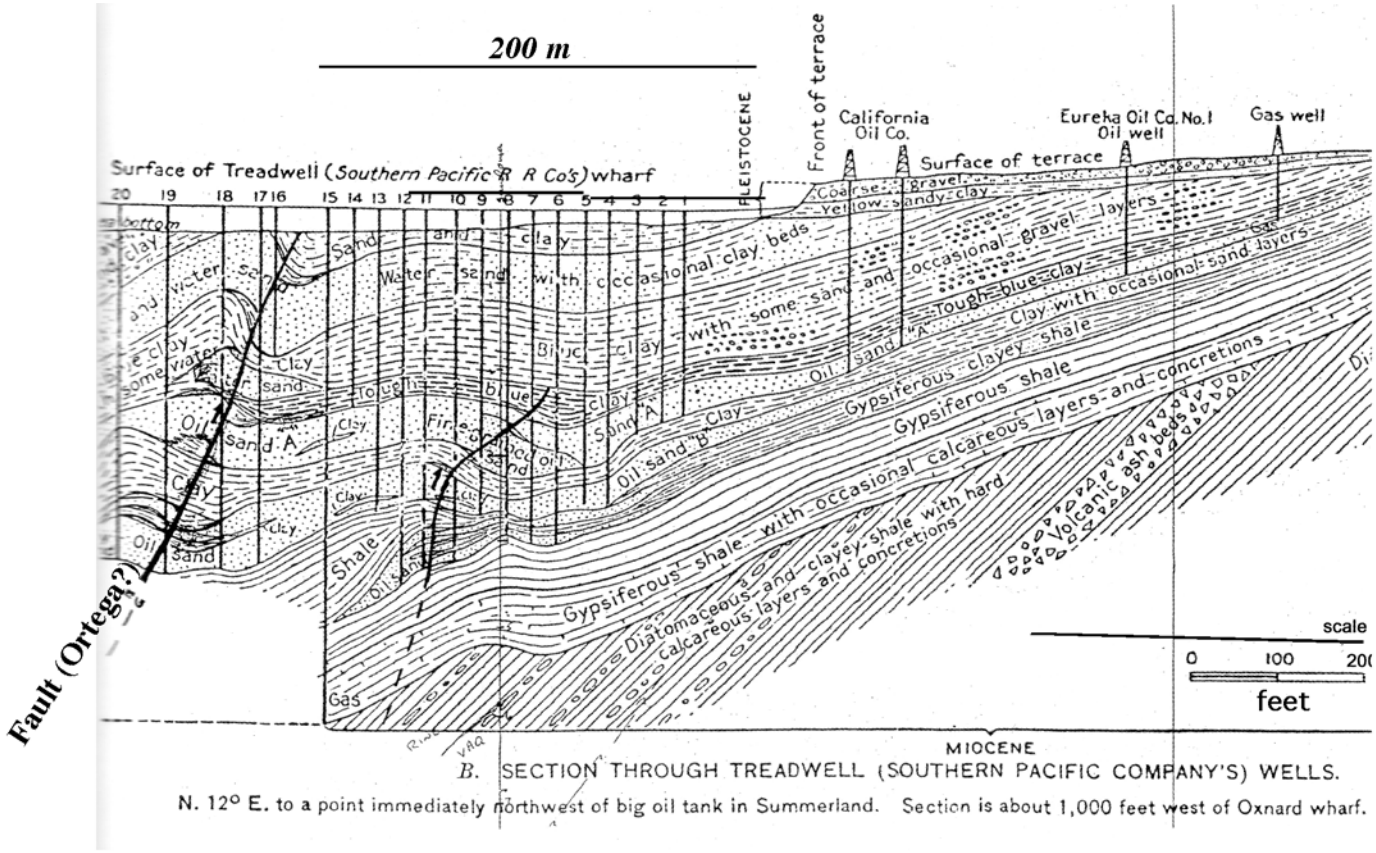


North-South Summerland Cross-section MM’



Tv - Vaqueros Formation
Tr - Rincon Formation
Ts - Sespe Formation
Qca - Casitas Formation
Qoa- Alluvium
Qt - Terrace
Tm - Monterey Formation

Treadwell Pier Cross-section

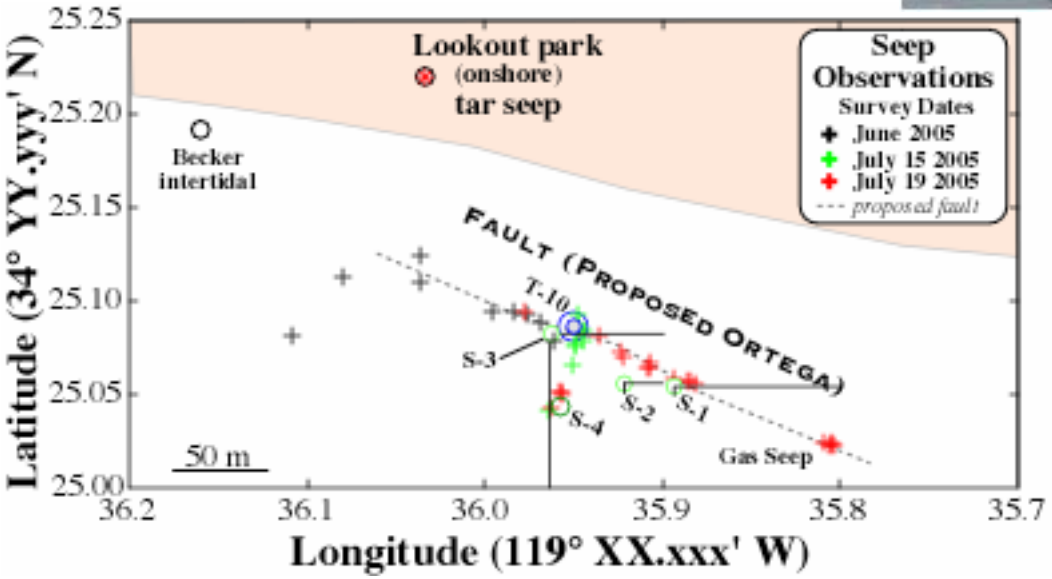


B. SECTION THROUGH TREADWELL (SOUTHERN PACIFIC COMPANY'S) WELLS.

N. 12° E. to a point immediately northwest of big oil tank in Summerland. Section is about 1,000 feet west of Oxnard wharf.

from Grosbard (2002)

Boat Surveys



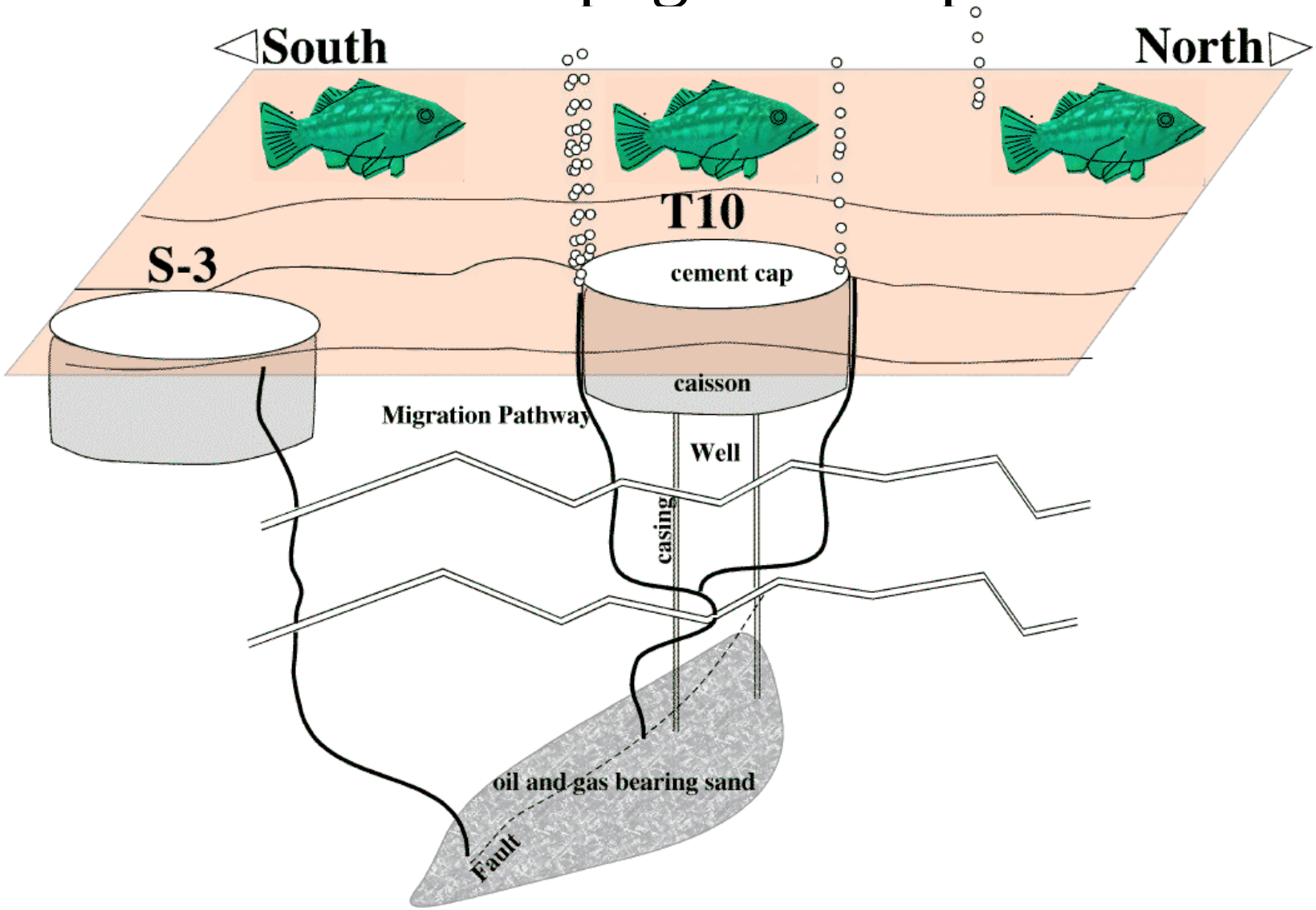
Bottom Line:

Geologic Evidence and Sea Surface Seep

Trends show Treadwell T-10 was drilled into a fault

We propose the fault is the Ortega Fault

Summerland Seepage Conceptual Model



Conclusions

- First quantification of submarine oil emission rates from an abandoned oil well
- Total T-10 oil emission Oct 18, 2005 was 2.6 liters per day
- S-3 Site, was active when T-10 was not, at other times, T-10 was active. Likely due to tapping the same faulted reservoir along the Treadwell Pier
- Although T-10 was the dominant oil emission source, sea surface surveys showed a trend of natural oil and gas seepage offshore Summerland
- The oil to gas ratios at S-3 and T-10 both surveys was approximately 1 to 10. Very oily bubbles (black bubbles) were mostly gas

Conclusions

- Geologic data indicates a fault passes through the Treadwell Pier
- Seep trend indicates a fault offshore Summerland - Proposed as the Ortega Fault
- The Proposed Ortega Fault passes through T-10 and likely other wells on the Treadwell Pier

Conclusions

The failures of multiple T-10 abandonments is due to geological factors, which indicate that future abandonment(s) to decrease oil emissions will be of short-lived success.

Moreover, seepage likely would increase from other conduits - natural seepage or human created, such as Site S-3.