

Submarine Oil Seeps off the Southern Santa Maria Basin

As part of the MMS Environmental Studies Program, MMS has partnered with the U.S. Geological Survey and the County of Santa Barbara to determine the location, activity, and destination of oil from natural seeps in the western Santa Barbara Channel/southern Santa Maria Basin. The Coal Oil Point seeps are well known and the subject of several current and past investigations. However, much less is known about other areas of the Channel and offshore coast. This study will provide direct information about natural oil seeps near Point Conception. The study will determine precise locations of the most active seeps and estimate the amount of oil being released from these seeps. It will also estimate the volume of oil deposited along the coastline adjacent to these seeps and attempt to determine the origin of this oil. The study will begin to establish a joint State/Federal library of oil fingerprints to assist in oil spill response.



Oil collected from natural seeps will be fingerprinted using a protocol, developed by scientists at the U.S. Geological Survey, that relies on biomarkers and carbon isotopes to distinguish among different weathered oils. This protocol has been effective in differentiating among different Monterey Formation source oils in the Monterey Bay region (Kvenvolden et al, 2000). Because both the natural seep oil and the oil produced

at depth by the offshore platforms in the Channel predominately come from the Monterey Formation, is it critical to be able to distinguish between these oils. This protocol will be used to determine which from which seep the oil came. Oil from offshore oil and gas platforms in the western Channel and Santa Maria Basin will also be fingerprinted. In particular, oil from platforms producing near active seep areas will be fingerprinted to ensure that the difference between seeping oil and produced oils in the same area is documented.

The location of the seeps will be determined through several investigative methods. The study makes use of data collected on the seafloor and in the water column. Information sources such as local fisherman data, biological surveys and overflights will be also used to refine potential seep sites. Once identified, divers or boat-deployed robots will collect samples directly from the seeps for fingerprinting. Current meters may be deployed at bottom locations of seeps to facilitate tracking of oil seep sources.

This study will greatly increase our understanding about the tarballs found along the mainland shoreline. The volume of oil being deposited on characteristic beaches will be estimated and the chemical composition of the tar determined. This information will be used to assess where some of the more active seeps typically deposit their oil. At the same time, tar from non-natural sources landing on the beaches can be identified.



USGS scientists initiated an effort at four locations north of Point Conception that has been expanded by the County of Santa Barbara to include 10 beach locations throughout the county. Geology students from UC Santa Barbara will sample beaches on a monthly basis and send their data/samples to USGS. The monitoring consists of marking random band transects, collecting and weighing tar and tarballs found within these transects, and randomly selecting tarballs for chemical analysis.



The USGS has conducted two offshore field surveys as a part of this study to date. The first cruise collected “sniffer” data—information about gas released in the water column. This released gas is located precisely with GPS navigational systems. It is believed that most oil seeps produce measurable quantities of gas and that this information can be used to locate active oil seeps. The second cruise targeted the Point Conception area and collected data about the seafloor to help refine structures which may support areas of active seepage.

The Quality Review Board (QRB) for this study is Dr. Bruce Luyendyk, a professor of Geology at UC Santa Barbara; Bill Castle, geochemist with the California Office of Spill Prevention and Response; and Dr. Cortis Cooper, oceanographer with Chevron U.S.A., Inc. MMS establishes QRB’s for its studies to provide MMS with an independent review of the scientific design and results of the study.

The study is beginning its final year. This year field surveys will target specific larger offshore seeps to determine the volume emitted and to collect oil for fingerprinting. A final report is anticipated October 2003. If you have questions about this study or want more information, please contact Mary Elaine Dunaway at (805) 389-7848.

Kvenvolden, K.A; Rosenbauer, R.J; Hostettler, F.D; Lorenson, T.D. Application of Organic Geochemistry to Coastal Tar Residues from Central California. International Geology Review. Vol. 42. 2000. P.1-14.

(captions: Tar “whip” discovered offshore Point Conception on the first cruise.)

Scientist evaluating tarballs on the beach.

Lighthouse at Point Conception