Monitoring Active Hydrocarbon Seepage

Oily vs Gassy seepage

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Natural Hydrocarbon seeps are natural springs where liquid and gaseous hydrocarbons leak out of the ground.

Types of Natural Seepage

- Oily Seepage
- Gassy Seepage

Active
Intermittent
Inactive
Oily Coated Bubbles
Natural Seepage Process:
Hydrocarbons Transfer From Seafloor to the Atmosphere
Oil Slicks in the Water and Related Processes

Capillary-Short Gravity Waves = Gray Speckle Backscatter
Wavelength = ~0.7 - 10 cm

Surfactant Layer 0.1 µm

Suppression of Capillary Waves

Radar-Dark suppressed back scatter

Wind

Photolysis

Evaporation

Currents

Spreading

Floculation

Dissolution
Synthetic Aperture Radar Background For Oil Slicks and Surfactants Analysis
Texture Classifying Neural Network Algorithm

Remote Sensing Inventory

File size ~100 Mbyte

File size ~1 Mbyte
Oil Slicks Analysis

Oil Slick Origins (OSO)
The challenge of estimating the location of the active seeps, is that each SAR image provides a different location of the OSO generated by the same seep formation: requires repetitive coverage by satellite. Repeatable results confirm robust seepage.
1081 Seep Formations in the Gulf of Mexico.

Average = 1424 Individual Vents.
Maximum = 1925 Individual Vents.
Minimum = 1105 Individual Vents.
Mississippi Canyon Area
Green Canyon Area
Figure A.7. Slice at 6000ft depth on site MC709-EGM116. The elliptical shape corresponds to a relatively shallow salt body.
Seepage is directly influenced by salt body geometry, with recurrent satellite observations around fringe of salt body.
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Archive of CTD profiles and bottom water temperature measurements from NODC records for the Gulf of Mexico. A. locations of measurements; B. summary plot for the bottom measurement, truncated above 200 m. Compiled by N. Guinasso, Geochemical and Environmental Research Group, Texas A&M University.
Figure 1.10. Stability horizons for gas hydrate formed from (methane) (CH$_4$) (structure I) and mixtures of C$_2$H$_6$ (ethane) and C$_3$H$_8$ (propane) as calculated by M. Reagen, Lawrence Livermore Lab, University of California, Berkeley. Points show the expected temperature and pressure conditions for the gridded locations of the gas hydrate region (Figure 1.8).