

BP Oil Spill and Air Chemistry

Crude oil contains various hydrocarbons

NOAA and CIRES here at CU went to the oil spill in an aircraft that was equipped with instruments to measure the air quality.

1/3 of the oil dissolved into the water column (methane completely, benzene and ethane almost completely)

Showed significant fraction of the oil evaporated quickly

14% by mass of the oil was lost to the atmosphere within a few hours of surfacing and an additional 10% within the next 24-48 hours. 20-30% of the oil has evaporated.

Organic aerosols are formed from the oil vapors. Marine boundary layer is trapping the pollutants.

The light, highly volatile compounds of the oil evaporate quickly and form particles in that close region.

The heavier compounds evaporate slowly and spread out to a much larger area. These are the major concern that the team has detected. These organic compounds are not being measured in most air-quality monitoring programs

These heavy compounds are also what are contributing to air pollution in urban environments. The oil was not thick sludge oil but similar to what we put in our tanks → form the same organic aerosols.

From the same study they could calculate that at least 32,600 to 47,700 barrels of liquid gases and oil poured out of the breached reservoir, less than what was previously thought. (This does not measure what is still trapped in the ocean though. Could be higher.)

A barrel of oil today costs \$111.30

\$3,628,380 - \$5,309,010 worth of oil was breached

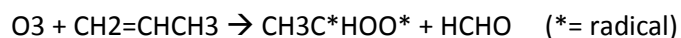
Chemistry

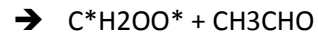
VOCs are hydrocarbons, and oxygenated hydrocarbons. There are over 1000 different VOCs that are produced naturally from vegetation.

Oxidation of VOCs often leads to formation of oxygenated or nitrated products with vapor pressures lower than those of the starting reactants, and form particles (aerosols).

The 3 main players that VOCs are effected by and depleted by are NO₃, OH, and O₃.

VOCs reacting with ozone in the troposphere lead to the formation of aerosols in photochemical smog.





The formations of these radicals are agents in tropospheric O₃ production.

Consequences

Will now help us improve our understanding of air quality and how to improve it.

Aerosols formed from the VOCs are linked to asthma, cardiovascular disease, and even premature death.

Clean Up

Can help clean up the water using skimmers and dispersants, but this won't help clean the aerosols out of the air.