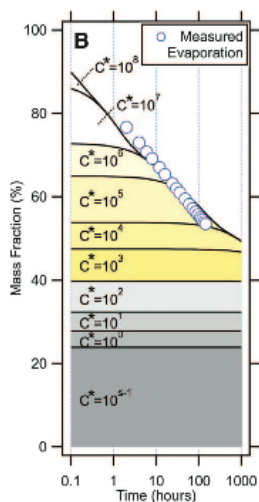
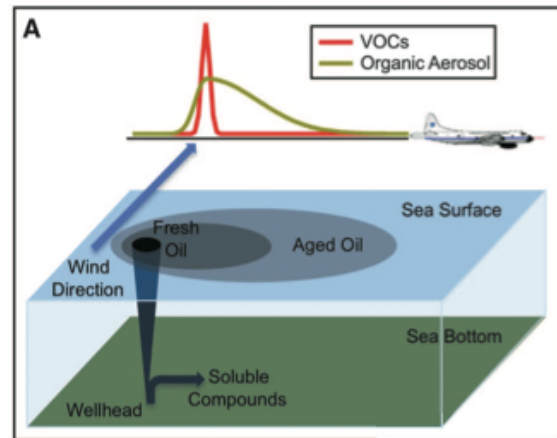


Organic Aerosol Formation Downwind from the Deepwater Horizon Oil Spill

Nicole O'Neill - ATOC 3500 - Term Paper - 14 April, 2011

- A WP-3D research aircraft made airborne measurements of the gaseous and aerosol composition of air over the Deepwater Horizon oil spill in the Gulf of Mexico.
 - The lightest chemicals in the oil evaporated within hours, as scientists expected them to do. What they didn't expect was that heavier compounds -- the ones with more carbon atoms per molecule -- in the oil took longer to evaporate, spread out much more widely and contributed most to the formation of air pollution particles.
 - A narrow plume of hydrocarbons was observed downwind that is attributed to the evaporation of fresh oil on the sea surface
 - a much wider plume with high concentrations of organic aerosol (>25 micrograms per m³) was attributed to the formation of secondary organic aerosol from unmeasured, less volatile hydrocarbons that were emitted from a wider area
- The oil leak rate was estimated to be 68,000 barrels per day, with much of that accumulating on the sea surface.

- Recent research has indicated that secondary organic aerosols (SOA) formation in polluted air is much more efficient than expected from the measured VOC's.
 - possibly as a result of formation from SVOC's or IVOC's
 - it was easy to measure since different parts of the oil slick were segregated depending on their volatility
- The evaporation of freshly surfaced oil was the dominant source of the VOC's measured



during a 2-hour period

- the OA was largely

formed from vapors released from the oil and the condensation of their atmospheric oxidation products onto existing particles

- Aromatics and C₈ and C₁₁ alkanes are known to be SOA precursors

- were measured at very high mixing ratios downwind

- assuming that the evaporation rate of a compound is proportional to its vapor pressure, then evaporation for C ≥ 10⁸ ug m⁻³ takes (C₈ hydrocarbons) <1 hour, for C = 10⁴ to 10⁷ ug m⁻³ (C₉ to C₁₈ Hydrocarbons) evaporation takes place from 1 to 1000 hours.

- The compounds responsible for SOA formation were most likely released on evaporation time scales of 10-100 hours, thus C₁₄ to C₁₆ Hydrocarbons.