Every snow often oil, microbes, and sediment get together and sink

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Marine oil snow sedimentation and flocculent accumulation

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Biological carbon pump

- Food web processes transfer organic matter to depth
- Remove carbon from surface ocean
- Global carbon export range from \(~4 - \geq 12\) GtC y\(^{-1}\)
Microbial exopolymers:

- Are released by phytoplankton, zooplankton and bacteria
- Proteins, lipids, carbohydrates
- Thought to protect, aid in attachment, from biofilms

Stocker et al. 2012 Science DOI: 10.1126/science.1208929 Marine Microbes See a Sea of Gradients
Tsujita, 1953; Phytoplankton & zooplankton in matrix

1–3 nm thickness & 100s to 1000s of nm in length

Santschi et al. 1998; Extracellular Polymeric Substances (EPS)

Thornton et al. 2016; Transparent Exoploymeric Particles (TEP)

Passow et al. 2012; Marine snow (> 0.5mm)
Deepwater Horizon Oil Spill

- began on April 20, 2010
- killed 11 people
- largest spill in US history
- total discharge at 4.9 million barrels
- 1.84 million US gallons of oil dispersant
• Marine snow + oil = marine oil snow (MOS)
• Oil-mineral aggregates (OMA)
**Marine Oil Snow Sedimentation and Flocculent Accumulation (MOSSFA):**

- marine snow formation,
- the incorporation of oil (marine oil snow or MOS)
- subsequent settling to the seafloor, i.e., MOSSFA

- this pathway accounted for up 5–31% of the total oil returning back to the sediments

MOSSFA report, 2012
Marine Oil Snow Sedimentation and Flocculent Accumulation (MOSSFA):
**Marine Oil Snow Sedimentation and Flocculent Accumulation (MOSSFA):**

**Why do we care?**

- bioaccumulation of hydrocarbons into the pelagic food web
- oil on the seafloor increases exposure by benthic organisms and economically important fish, as well as corals and their habitat

**Has this happened before?**

Recent reports indicate that MOS sedimentation occurred during the *Tsesis* and *Ixtoc-I* oil spills; reviews suggest other scenarios in which this may have occurred
Evaluate intersections between biology and chemistry in the water column in order to aid the development of response strategies.
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• What are the long-term effects on crustacean fisheries?
• The oil that settled on the ocean floor is it still a factor or has it become part of the “snow”?
• Curious about the interactivity of microbes, dispersants, oil and marine snow.
  • Oil and suspended particle interactions
• Oil-related generation of flocs/marine snow
• What is the role of marine snow as an oil transport mechanism?
• How does this (marine snow) influence NEBA-SIMA based decision making in future spills?