Session 020: The Deep Gulf of Mexico: Knowns and Unknowns After the Deepwater Horizon Spill
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The deep ocean is the largest habitat in the Gulf of Mexico affected by the Deepwater Horizon spill. Intense research for the last eight years has contributed to a much better understanding of the dynamics of this habitat influencing the fate of oil residues from the oil spill. Given the increasing motivation toward deep-water exploration, a recompilation of findings and gaps is needed between deep water pelagic and benthic habitats including the interplay among physical, chemical, and biological processes. This session shares results from the water column, sediments, and biota over a wide range of environments, with the goal of developing a conceptual model to generate an overall “big picture” of deep ocean dynamics from the water column to the seafloor.

Session Highlights
• Not all of the sedimentary pulse contained oil residue
• Evidence of redistribution of MOSSFA sediment SE of DWH wellhead (downslope)
• MOSSFA due to EPS production greatly outpacing remineralization
• No effect of corexit in experiments @ 150 bar for live or dead oil; use of corexit at depth likely not effective
• Methane concentrations above 10,000 nM in northern gulf near seeps, inertial frequency of plumes is 26.1 days
• Chlorinated hydrocarbon dumping in MC808 lease block, potential contamination of benthos
• 2 m of Pleistocene aged terrigenous material widespread throughout north central and north east Gulf of Mexico, potential revision of meltwater pulse history in the Holocene/late Pleistocene needed.
• Benthic foraminifera based marine biotic index calibrated for the entire Gulf of Mexico, can be used as management decision support tool
• Coral impact models suggest 66 sites were impacted by the Deepwater horizon.
• Long-term and broader sampling of meiofauna and macrofauna produced a much larger (2x) benthic footprint of impact from the Deepwater horizon
• Lateral transport of contaminated sediments likely as resuspension of material of the seafloor varies with sites on the seafloor.
• Deposition of MOSSFA material on the seafloor likely not to be uniform but highly patchy due to near bottom currents and seafloor morphology.
• New technology and methods presented include sediment resuspension flume (USM); rising droplet path module (TUHH); in-situ methane consumption measurements (UNC-chapel hill); foraminifera marine biotic index (USF/Eckerd); coral impact model (Temple); and sedimentary chemical markers of MOSSFA (USF)
• Real time reporting of oil and ambient environmental parameters would greatly aid response efforts
• Proper scaling and timeframe of field collections greatly impact the outcome of injury assessment

Gaps or challenges
• Frequency of sediment resuspension events unknown, this would provide baseline information to support impact assessments, sediment inventories, and geohazard mitigation in the future.

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• Collection of ambient seawater and oil parameters regularly at rigs would greatly support response and modeling efforts during a future spill.
• Auto-identification application for benthic foraminifera and creation of handbooks for each region of the gulf would make marine biotic indices more accessible for managers
• Regular spacing/gridded sampling is needed for future injury and monitoring efforts, reduces bias.
• Geochemistry characterization of oil-residues and other organics (e.g., Chlorinated hydrocarbons) as the new baseline of the GoM seafloor
• Spatial extent and fate of transformation products in deep-sea sediments.
• Long-term effect of oil-residues to benthic communities.
• Coordinated, hypothesis-driven, long-term, time series research projects in the deep gulf benthos are needed and would greatly support majority of injury assessment unknowns in the future.
• Several distinct sites are needed for this to study water column and deep-water sediment transport/current field