"Prediction of the oil droplet size distribution in blowouts and surface spills"

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Abstract:

The fate and transport of droplets in the water column are greatly affected by the droplet size distribution of oil. For a given oil, large droplets have larger buoyancy than smaller droplets, and thus rise to the water surface rapidly when submerged. In addition, the smaller the droplet size, the faster the oil dissolves into and/or biodegrades in the water column. Existing models for oil droplet formulation rely on the Weber number scaling for breakup, where the interfacial tension of oil-water is the only resisting force for breakup. However, there are situations where the viscosity of the oil plays an important role in resisting breakup, such as for high viscosity oils and/or when surfactants are applied reducing therefore the interfacial tension of oil-water. We developed the model VDROP (V is for viscosity) that encompasses existing works, and accounts for the role of oil viscosity in resisting breakup. The model was applied to various reactors (tanks) and jets and plumes. For the latter case, we address the droplet size distribution from the Deepwater Horizon spill (diameter 0.50 m and flow rate of 50,000 oil barrels per day).

About the speaker:

Dr. Michel Boufadel is the Director of the Center for Natural Resources Development and Protection, at NJIT. He is a Professor in Civil and Environmental Engineering, and Professional Engineer in New Jersey and Pennsylvania, and a Fellow in the American Society for Civil Engineers. Dr. Boufadel just served recently on two National Research Council (National Academies) committees on oil spills. Dr. Boufadel has conducted numerous projects on the transport and fate of oil spills in the environment, including work on the Exxon Valdez oil spill and the Deepwater Horizon spill (the BP spill). He has more than 90 refereed articles in publications such as NATURE geosciences, Environmental Science and Technology, and Environmental Fluid Mechanics.