Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Aerosolization of crude oil and dispersant slicks due to bubble bursting KAUSHIK SAMPATH, NIMA AFSHAR-MOHAJER, WON-SEOK HEO, JOSHUA GILBERT, DAVID AUSTIN, KIRSTEN KOEHLER, JOSEPH KATZ, Johns Hopkins Univ — Bubble bursting in oceanic whitecaps is a well-known mechanism of marine aerosol generation. When crude oil spills occur, these aerosols may be oil-laden, leading to public health concerns. The introduction of dispersants aimed at accelerating the breakup of slicks, which greatly reduce the oil-water interfacial tension, potentially alters the aerosol number and size distributions. To characterize these effects, controlled bubble plumes are injected into a vertical seawater column (ϕ0.6m, 1.8m high) with an oil-contaminated surface. The aerosol concentrations are measured in the micron (0.5-20m) and nano (10-370nm) size ranges. Tests are performed at the same air injection rate for varying bubble diameters (614, 263 and 89μm), slick thicknesses (50 and 500μm), and oil-water interfacial tensions. The latter are achieved by using crude oil, crude oil premixed with the dispersant Corexit 9500A at a ratio of 1:25, and pure dispersant. The results confirm that bubble bursting causes aerosolization of oil in the micron range, which increases with the introduction of dispersant. An order of magnitude increase in the concentration of nano-aerosols occurs for the largest bubbles, but not the smaller ones, and only for slicks containing pure dispersant or 500 μm thick crude oil-dispersant mixtures.

Kaushik Sampath
Johns Hopkins Univ

Date submitted: 28 Jul 2017 Electronic form version 1.4