Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Modelling Oil Droplet Breakup in a Turbulent Jet RACHEL PHILIP, IAN HEWITT, PETER HOWELL, University of Oxford — In a deep-sea oil spill, a broken pipe near the seabed can result in the release of a turbulent oil jet into the surrounding ocean. The jet's shearing motion will typically cause the oil to break up into smaller droplets, which are then more readily dispersed and decomposed by sea microbes. In order to understand this natural clean-up process, we develop analytical and numerical models for the drop size distribution at different locations in the jet. This involves examining and unifying disparate scales, from the macroscopic jet to the microscopic droplets. We first examine the turbulent jet and we can use its self-similarity to simplify our models. We then turn to the droplet scale, considering the rate at which drops are deformed and broken up. Droplet deformation is precipitated by the jet's turbulent mixing and shearing and thus depends on the macroscopic jet models. We combine these large and small scale models to determine the droplet size distribution, as it varies with jet location. By varying the initial conditions and parameters in these models, we obtain insights into the factors affecting this droplet breakup process and how it may be optimised.

Rachel Philip
University of Oxford

Date submitted: 30 Jul 2017 Electronic form version 1.4