

DRIFT Modelling and Sensitivity Analysis of Pressure-liquefied Ammonia Releases

Rory Hetherington¹, Graham Tickle², Veronica Bowman³, Daniel Silk³, Simon Gant¹, Adrian Kelsey¹, Alison McGillivray¹, and Harvey Tucker⁴.

¹ Health and Safety Executive (HSE), Buxton, UK.

² GT Science and Software, Waverton, Cheshire, UK.

³ Defence Science and Technology Laboratory (DSTL), Porton Down, UK.

⁴ Health and Safety Executive (HSE), Bootle, UK.

Abstract: As part of the Jack Rabbit III (JRIII) project, the Modelers Working Group (MWG) has been coordinating an international model inter-comparison exercise, studying six previous pressure-liquefied ammonia release experiments from the Desert Tortoise (1983) and FLADIS (1993-4) trials. Coordinators of the exercise provided a complete description of baseline input parameters, plus suggestions of possible sensitivity tests, based on analysis of uncertainties in the Desert Tortoise and FLADIS trials. These included ranges of values for the rainout fraction, wind speed, Monin-Obukhov length, and relative humidity. HSE used a Gaussian process emulator to perform a global sensitivity analysis on DRIFT. Results are presented here to show how model inputs affect the predicted concentrations at different downwind distances in the dispersing plume. Sensitivity analysis shows that the predicted concentrations are strongly affected by the wind speed and atmospheric stability. The rainout fraction has a modest effect, and its importance gradually diminishes with distance downwind. Changing the relative humidity in the model between 5% and 60% RH has very little effect, despite the fact that DRIFT takes into account reactions between ammonia and atmospheric water vapor. The exercise has improved our understanding of the predictive capabilities of DRIFT for simulating pressure-liquefied ammonia releases.

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