

**Short abstract. 18th International Conference on  
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**Abstract title: Jack Rabbit II 2015 chlorine release experiments: simulations of the trials using Drift and Phast and comparisons against preliminary experimental data**

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*Preferred way of presentation (oral or poster):* Oral

*Preferred topic (choose number from list below and delete the list of topic numbers):*

## **Topic numbers**

Sessions will be organized within the following topics:

1. Model evaluation and quality assurance – model validation, model intercomparisons, model uncertainties and model sensitivities.

## **Abstract text**

This paper presents simulations of the 2015 Jack Rabbit II experiments using two different integral dispersion models: Drift 3.7.2 and Phast 7.11. It compares the simulation predictions against a preliminary set of experimental data recorded during the trials. The experiments involved five trials with releases that ranged from 4.5 to 8.3 metric tons of chlorine, with dispersion measurements up to a distance of 11 km from the source. In all five trials, the chlorine was released downwards from the underside of a pressure vessel through a six inch (0.152 m) diameter orifice, 1 m above a concrete pad. An array of Conex shipping containers was located around the release point to represent a mock urban environment. The experiments were conducted at the U.S. Army Dugway Proving Ground in Utah, USA. These experiments were managed by the Chemical Security Analysis Center (CSAC), which is part of the U.S. Department of Homeland Security.

The UK's Health and Safety Executive (HSE) contributed to the Jack Rabbit II Modelling Working Group (MWG) by providing dispersion model predictions prior to the 2015 trials, to

help select appropriate locations for concentration sensors. After the trials, HSE conducted further simulations to compare the model predictions against the experimental data. The developers of the dispersion models worked with HSE to help configure the models and provide feedback on the predictions. In this paper, the comparisons made against the experimental data consider both concentration and toxic load. Sensitivity tests were also carried out to help assess the impact of uncertainties in the models, including the discharge conditions, liquid rainout and atmospheric conditions.

Further Jack Rabbit II trials were also conducted in 2016, where chlorine was released using different discharge angles. These experiments were carried out without a mock urban grid, allowing the cloud to disperse across open unobstructed terrain. HSE intends to present similar work on these trials in the future.

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## **Motivation**

The Health and Safety Executive (HSE) is the UK's primary regulator for implementing the Seveso Directives. HSE is committed to ensuring that dispersion modelling carried out for both Safety Report assessments and for land-use planning purposes is fit for purpose. The Jack Rabbit II programme was an excellent opportunity for HSE to work with other modellers, and to compare commonly used integral models Drift and Phast against large-scale releases of pressurised liquid chlorine carried out in the USA. This is an international collaboration that brings together practitioners, developers and experimentalists. Our paper will share our preliminary results and experiences with the wider modelling community. The aim is to promote both the Jack Rabbit II programme and a better understanding of large-scale chlorine releases, which will aid common methodologies for such scenarios.