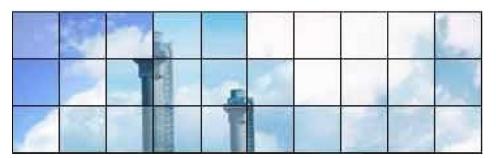# ADMLC

Atmospheric Dispersion Modelling Liaison Committee   www.admlc.com

Webinar: Dense gas dispersion modelling in complex terrain, with a focus on carbon dioxide pipelines

14:00-17:00 GMT Tuesday 7 March 2023

The Net Zero agenda is currently driving a rapid growth internationally in Carbon Capture and Storage (CCS) projects. In the UK, work is progressing on two Government-sponsored hydrogen and CCS clusters, HyNet and the East Coast Cluster, which are due to become operational in the mid- to late-2020s. In the USA, the recent Inflation Reduction Act heavily incentivises CCS, which is seen as being critical infrastructure to meet the country's climate targets. Other CCS projects are ongoing across Europe and Canada.

These projects will involve transporting very significant volumes of captured carbon dioxide using cross-country pipelines. The recent CO_2 pipeline rupture incident near Satartia, Mississippi, USA[1], highlighted the fact that the atmospheric dispersion behaviour of dense CO_2 clouds from pipeline releases can be influenced by terrain. In this incident, the cloud ran downhill from the release location and engulfed the village of Satartia, which was approximately a mile away.

It would be useful to address two longstanding scientific issues in relation to the current growth in CCS projects. Firstly, there is a need to develop models that can simulate dense-gas dispersion in complex terrain (hills, slopes) and produce results quickly, i.e., within seconds or minutes of computer runtime. Secondly, there is a need to obtain reliable data from large-scale field trials involving dense-gas dispersion in complex terrain to validate these new models. These two gaps in scientific capabilities and data have been recognised for many years and are pertinent to other hazards and threats, notably relating to toxic industrial chemicals such as chlorine and ammonia. The forecast rapid growth in CCS projects and the Satartia incident have brought these issues into sharp focus.

Various agencies worldwide are aware of these issues and are currently working to address them. In the USA, the pipelines regulator, PHMSA, have recently commissioned work at Texas A&M university to develop a new fast-running dispersion model[2]. The ongoing Jack Rabbit III ammonia project may involve new dense-gas dispersion experiments with terrain[3]. Discussions have also taken place with an

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[1] https://www.phmsa.dot.gov/news/phmsa-failure-investigation-report-denbury-gulf-coast-pipelines-llc, https://www.huffingtonpost.co.uk/entry/gassing-satartia-mississippi-co2-pipeline_n_60ddea9fe4b0ddef8b0ddc8f

[2] https://www.phmsa.dot.gov/news/phmsa-announces-new-safety-measures-protect-americans-carbon-dioxide-pipeline-failures, https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=987

[3] https://www.dhs.gov/science-and-technology/csac, https://www.uvu.edu/es/jack-rabbit/

international group of gas transmission pipeline companies on the topic of improving dispersion models and undertaking new large-scale experiments in support of CO_2 pipeline projects.

The aim of this ADMLC webinar is to bring together experts from the fields of atmospheric dispersion modelling, field testing and pipeline risk assessment to share their thoughts on how best to tackle the current issues, to discuss the pros and cons of different approaches, and to establish links between groups of experts working on related topics. This includes model developers and users, test engineers and agencies involved in risk assessment, emergency planning and incident response.

The webinar will follow a similar format to previous ADMLC webinars (see https://admlc.com/events) with some introductory remarks to set the scene and six 20 minute talks, followed by a discussion session, where active participation from the audience is encouraged. A list of the speakers is given below:

- **Simon Gant (HSE, UK and ADMLC chair) "**Welcome and introduction to the webinar"
- **Max Kieba (PHMSA)** "Introductory remarks and review of the Satartia CO_2 pipeline incident"
- **Dan Allason, Ann Halford and Karen Warhurst (DNV, UK)** "Carbon dioxide pipeline experiments and modelling"
- **Laurent Joubert (INERIS, France)** "Experimental campaign of massive CO_2 releases in urban areas"
- **Chris Dixon (Shell, UK)** "Development of a shallow-layer model for dense-gas dispersion"
- **Sam Wang (Texas A&M, USA)** "Determination of potential impact radius for CO_2 pipelines using machine learning approach"
- **Mike Brown (Los Alamos National Laboratory, USA)** "QUIC mountainous terrain and dense gas capabilities"
- **Ian Sykes (Xator Corporation)** "SCIPUFF modelling of dense-gas dispersion"

Our hope is that the webinar will bring together representatives from industry, academia, government departments and consultancies, and provide an opportunity to share knowledge and experience in this field. The webinar is free to attend and will be hosted on Microsoft Teams. If you would like to register for the event, please email: admlc@ukhsa.gov.uk.