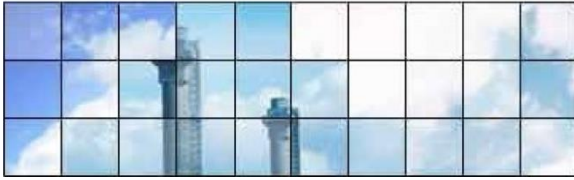Atmospheric Dispersion Modelling
Liaison Committee (ADMLC)

Dry Deposition and Surface Chemical Reactivity

ADMLC Seminar, Wednesday 4 October 2023

Simon Gant (ADMLC Chair, Health and Safety Executive)
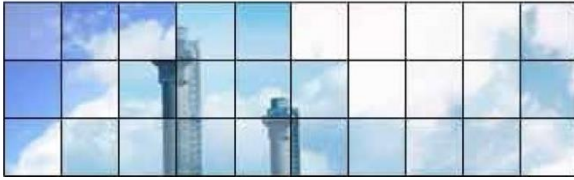
ADMLC Membership

6

ADMLC Recent Work

- **January 2021**: **"**Guidelines for the Preparation of Short Range Dispersion Modelling Assessments for Compliance with Regulatory Requirements" – An Update to the ADMLC 2004 Guidance
https://admlc.com/model-guidelines/

- **July 2021**: Report published on "Dense-gas dispersion for industrial regulation and emergency response" by Rachel Batt (HSE)
  – Spreadsheet of datasets for model validation
  – Spreadsheet of previous incidents
  – https://admlc.com/publications/

- **September 2021**: Report published on "A Review of Approaches to Dispersion Modelling of Odour Emissions and Intercomparison of Models and Odour Nuisance Assessment Criteria" by CERC and ELLE https://admlc.com/publications/

ADMLC Ongoing Work

- **Investigating the impact of applying different grid resolutions of numerical weather prediction met data in atmospheric dispersion modelling**
- Scope:
  - Review of NWP models
  - Comparison of model endpoints for NWP datasets
  - Comparison studies for regulatory atmospheric dispersion modelling
  - Potential for double counting of the impact of terrain
  - Use of NWP met data for probabilistic accident consequence assessments
- Project commissioned with CERC and UKHSA
- Feedback from ADMLC committee provided to contractors
- Thanks to external peer reviewer Jonathan Vogel (DTRA)
- Final report edits currently in progress
- Report to be published on ADMLC website soon (October 2023?)
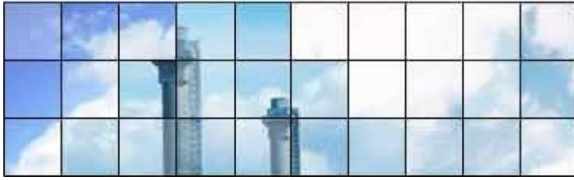
ADMLC Future Work

- **Review of methods used to assess the performance of atmospheric dispersion models**
- Scope:
  - Literature review
  - Case studies
  - Guidance on application of model evaluation methods to different scenarios
- Contract recently awarded to CERC and Steven Hanna
- Timeline: kick-off 17 October 2023, project duration 12 months
- Ron Meris (DTRA) kindly offered to provide external peer review

  ADMLC welcomes partnerships with other funding agencies or self-funding research organisations on topics of mutual interest

ADMLC Website Updates

- **H1 Tool**
  - H1 (formerly D1) was the Environment Agency's software tool to calculate the stack height for satisfactory dispersion of various substances
  - Withdrawn in 2016 and not Environment Agency current guidance
  - Still a useful method for calculating effective stack heights
  - ADMLC webpage currently down but should be online again soon

- **Safety and Reliability Directorate (SRD) Reports**
  - Historical reports produced by SRD (UK Atomic Energy Authority)
  - Examples:
    - The accidental release of anhydrous ammonia to the atmosphere – a systematic study of factors influencing cloud density and dispersion.
    - Discharge rate calculation methods for use in plant safety assessments.
    - Discharge of liquid ammonia to moist atmospheres – survey of experimental data and model for estimating initial conditions for dispersion calculations.
  - https://admlc.com/safety-and-reliability-directorate-srd-series-reports/

ADMLC Webinars

- **May 2021**: "Dispersion modelling and satellites"

- **February 2022**: "Use of dispersion modelling for sensor network design to facilitate source attribution, emissions estimation and incident response"

- **March 2023**: "Dense gas dispersion modelling in complex terrain, with a focus on carbon dioxide pipelines"

- **December 2023**: "Modelling katabatic flows"

- **TBC**: "Modelling wildfires?"

- Recordings available: http://www.admlc.com/events

Dry deposition and surface chemical reactivity

Motivation

- Jack Rabbit chlorine and ammonia trials
  - Initial modelling studies indicated that dry deposition could significantly reduce airborne concentrations
  - Recent deposition measurements in University of Arkansas laboratory
  - How can we measure dry deposition in JRIII field experiments?
- Nitrogen deposition to the environment
  - Studies by RIVM and potential impact on farming and industry
  - UK restrictions on land-use due to potential emissions
  - Useful to discuss basis of models, validation etc.
- Meeting aims: bring together experts from environmental, defence and industrial safety sectors
  - Model developers, test engineers, measurement specialists and users of atmospheric dispersion modelling outputs influenced by dry deposition

Seminar Programme

10:00	Simon Gant (HSE)	ADMLC Chair welcome
10:20	Steve Hanna (Hanna Consultants)	"Time variability in ammonia deposition and re-evaporation as a cloud from a one-minute accidental release passes by"
10:45	Jon Pleim (US EPA)	"Bidirectional ammonia flux modelling in the CMAQ-EPIC system"
11:10	Tom Spicer (University of Arkansas)	"Chlorine and ammonia environmental surface reactivity and adsorption/desorption modelled as dry deposition for large-scale release consequence assessment"
11:35	Benjamin Loubet (INRAE)	"Modelling ammonia deposition near large agricultural sources with a coupled Lagrangian stochastic, k-ε, and diffusion resistance approach"
12:00	Lunch	

Seminar Programme

13:00	Nebila Lichiheb (NOAA)	"Processes of ammonia surface-atmosphere exchange in different ecosystems across the U.S."
13:25	Marsailidh Twigg (UKCEH)	"Measurement and modelling concentrations and dry deposition of ammonia: methods and challenges"
13:50	Roy Wichink Kruit (RIVM)	"Measurement-model fusion techniques to quantify nitrogen deposition in the Netherlands"
14:15	Tea & Coffee	
14:35	Oscar Björnham (FOI)	"An exploration of dry deposition research by FOI - with emphases on winter conditions"
15:00	Helen Webster (Met Office)	"Modelling dry deposition in an operational Lagrangian model"
15:25	David Carruthers (CERC)	"Description and evaluation of particulate deposition modelling in ADMS"
15:50	Simon Gant (HSE)	Closing remarks

Thank you

Dry deposition and surface chemical reactivity

Speakers:

- Steven Hanna (Hanna Consultants)
- Jon Pleim (US EPA)
- Tom Spicer (University of Arkansas)
- Benjamin Loubet (INRAE)
- Nebila Lichiheb (NOAA)
- Marsailidh Twigg (UKCEH)
- Roy Wichink Kruit (RIVM)
- Oscar Björnham (FOI)
- Helen Webster (Met Office)
- David Carruthers (CERC)

Thank you

Thanks to ADMLC Secretariat for organising this webinar

- – Justin Smith and Peter Bedwell (UKHSA)

We would welcome feedback: admlc@ukhsa.gov.uk

- – What worked well?
- – What could we improve?
- – Future ideas for ADMLC webinars and seminars?