

Dense Gas Release during Jack Rabbit II Field Experiment

L. Makke¹, F. Gomez¹, M. Nibart¹, P. Armand²

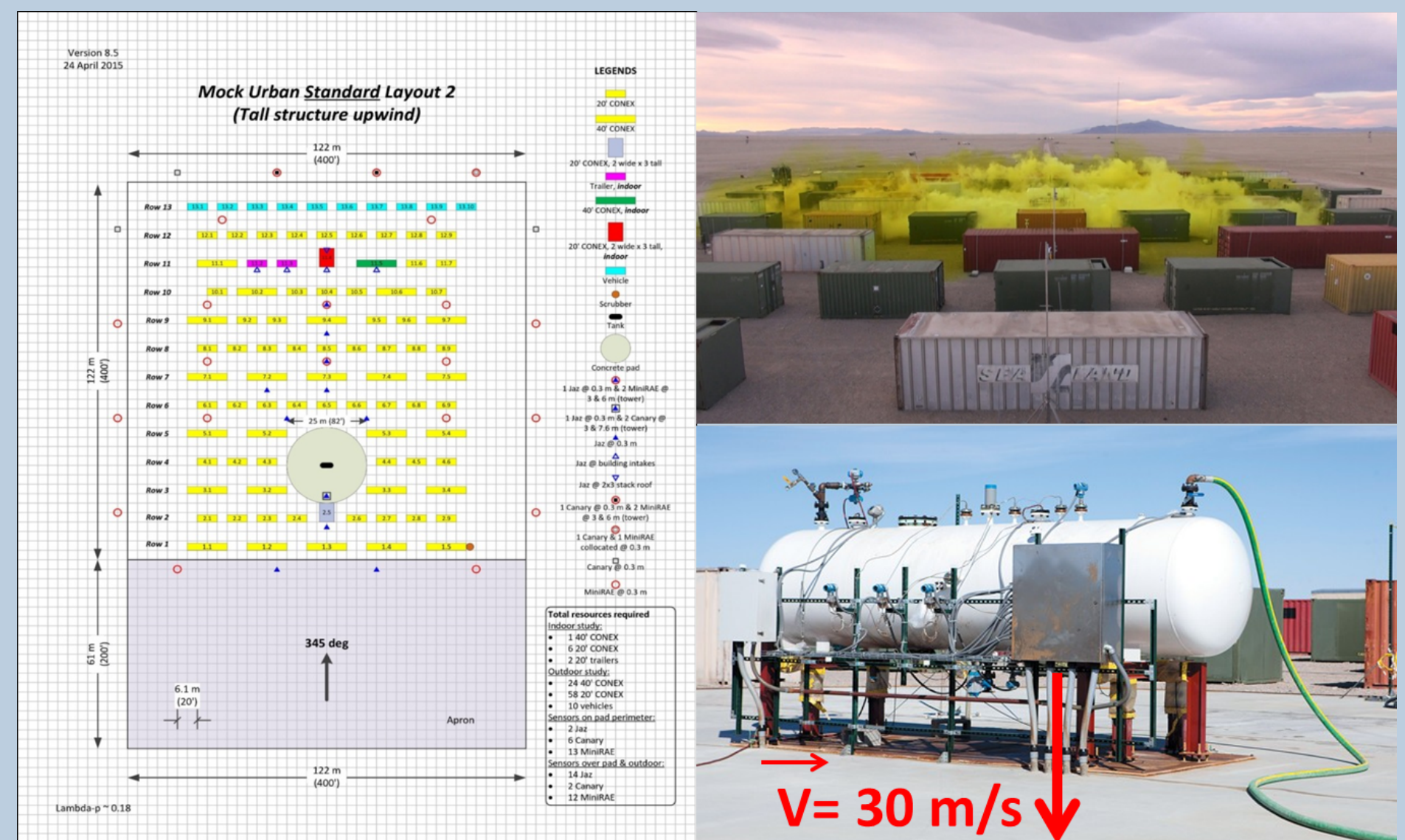
¹ ARIA Technologies, 8 rue de la ferme, Boulogne-Billancourt 92100, France

² CEA, DAM, DIF, F-91297 Arpaion, France

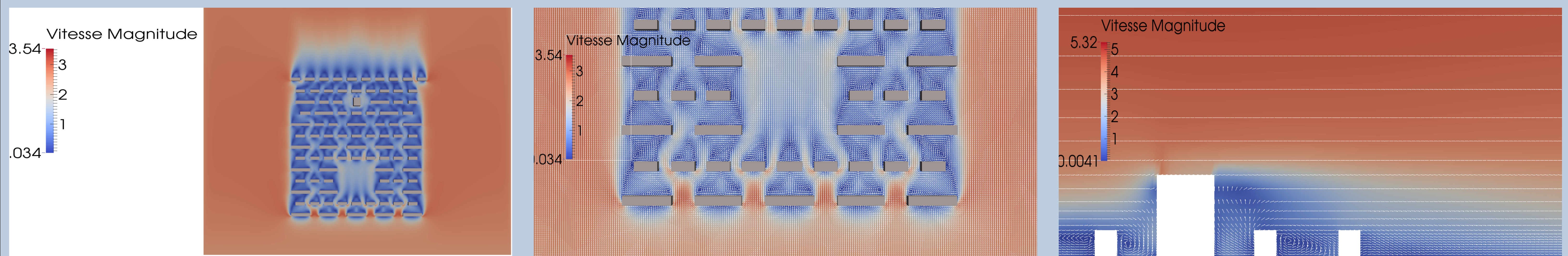


Context

- Chlorine Transport : toxic chemical agent for the population
- Jack Rabbit II Field Experiment in Dugway Proving Ground (Utah, USA)
- 10 tons of pressurized chlorine blown within an elapsed time of 20 sec for the flash and 90 sec for the pool



Wind Field Results



Horizontal slice of wind field at $z=1$ m

Zoom on the horizontal slice of wind field at $z=1$ m

Sagittal slice of wind field at $x=0$ m

Boundary conditions

- Inlet at South, East, West and Top boundary faces
- A free outlet at the North faces
- Rough wall at ground and buildings boundary faces

Numerical parameters

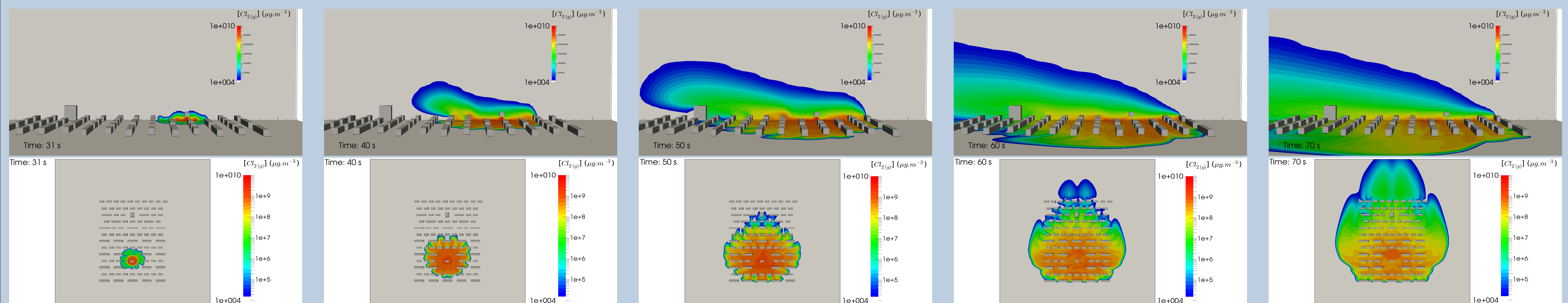
- $k-\epsilon$ model was used as turbulent closure
- Time step : 0.05 s
- Upwind scheme for scalar transport

Models and HPC Ressource

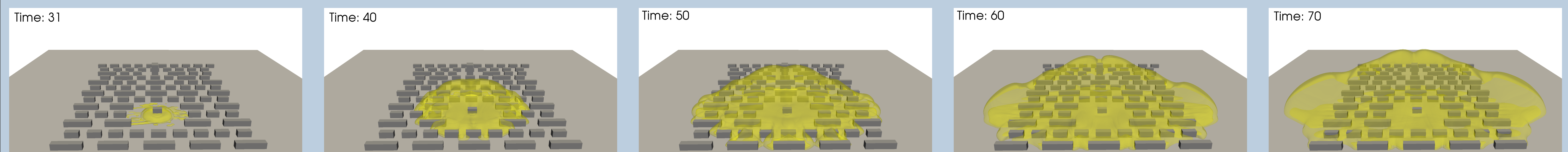
- ATRCOD was used to compute chlorine source term release:
 - Flashing gas chlorine impinging jet : 30m/s
 - Boiling pool of chlorine
- Code_Saturne[®] V4 was used to perform the wind field and the dispersion
- PSWIFT was used as the initialization of Code_Saturne[®]
- The simulations were performed at the CCRT thanks to CEA-DAM:
 - the structured mesh contains 5M cells
 - 1m30s physical time simulated within 64 cores
- Paraview V4.0 was used to display the pictures

Dispersion Results

Evolution of vertical and horizontal slices of chlorine concentration



Evolution of isovolume chlorine concentration



Acknowledgements

This research was fully supported by the LIRC laboratory of CEA-DAM. The supports are gratefully acknowledged.

References

[1] Félix Gomez, Maxime Nibart: *Jack Rabbit II, PMSS and Code_Saturne modeling comparison*, Report for CEA-DAM, (2016)