Technische Universität München

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The “GraVent DDT Database”

www.td.mw.tum.de/ddt

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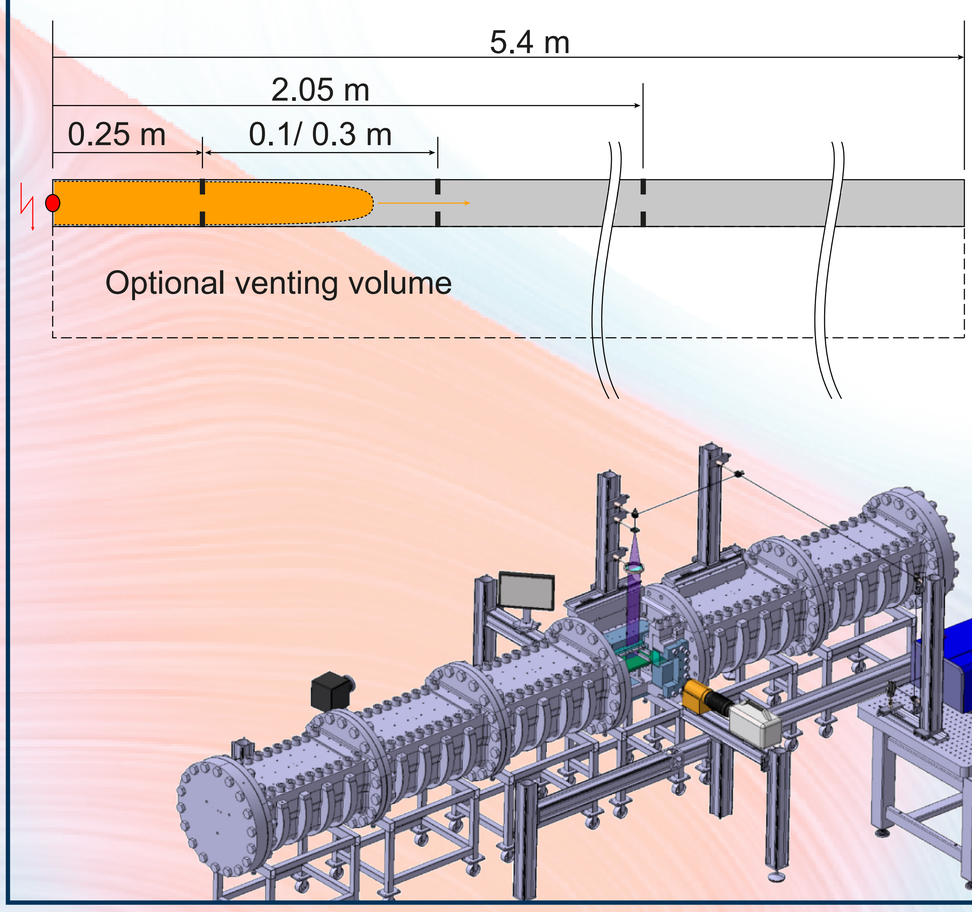
Concept

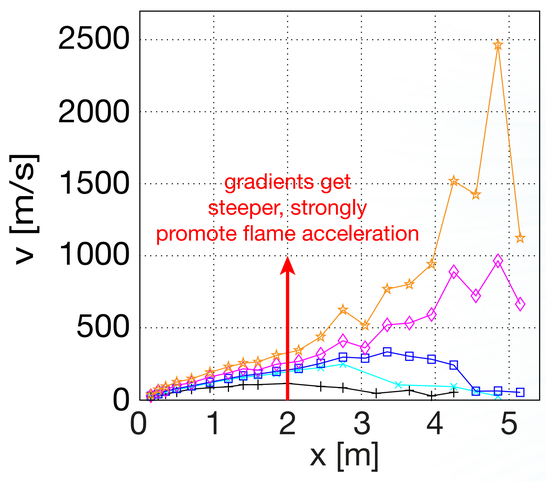
About 8000 tests have been conducted at the ”GraVent” facility, which is an entirely closed explosion channel with a rectangular cross-section (0.3 m width; 0.06 m height) and up to 5.4 m length. So far, H_2-air mixtures have been studied, both with spatial concentration gradients and water mist.
To share the results, we developed an open-access online platform.
We provide both conventional data (photodiodes, pressure transducers) and results from optical high-speed measurements (shadowgraphy, 20 kHz OH-PLIF). We hope that the data will be used in the community to support theoretical and numerical analyses in the future.

Experimental setup

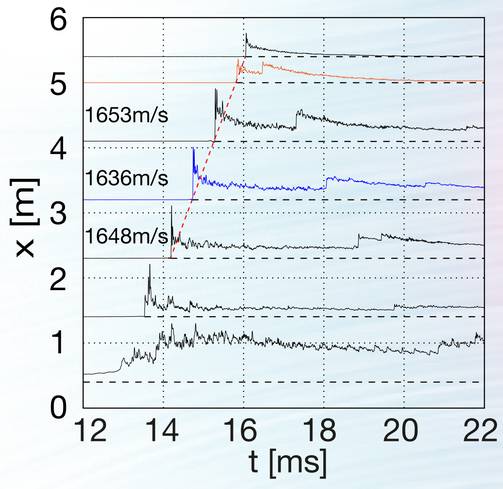
- Entirely closed rectangular channel (5.4 (l) x 0.3 (w) x 0.06 m (h))
- Obstructed and unobstructed configurations
- Atmospheric initial conditions
- Optional vertical concentration gradients and water injection



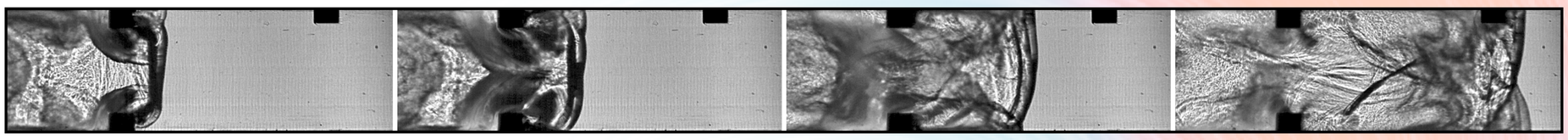
Exemplary data



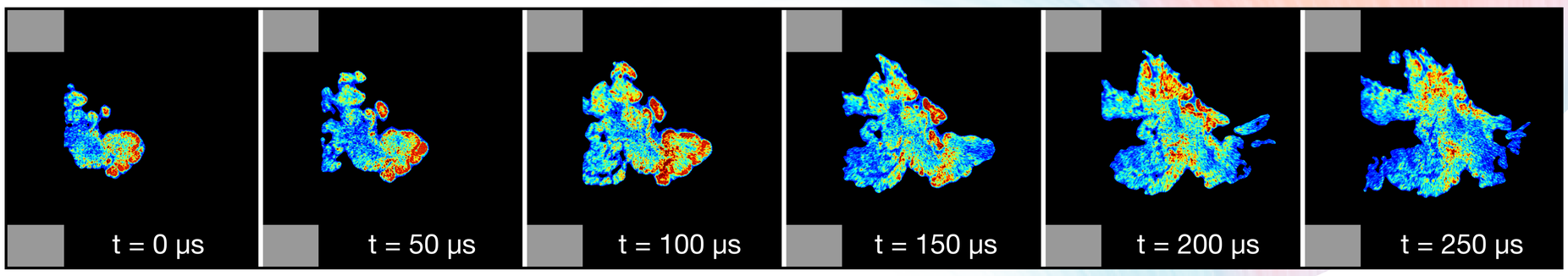
Effect of transverse concentration gradients on flame acceleration and DDT[1,2].



Detonation velocity determination from pressure transducer data [1].



80 kHz shadowgraph sequence of onset of detonation at a 30 % blockage ratio obstacle [1].



20 kHz OH-PLIF sequence of a slow turbulent deflagration behind a 30 % blockage ratio obstacle. Mean flame speed is 120 m/s, the flame front is corrugated [1].

Related publications

[1] L.R. Boeck, Deflagration-to-Detonation Transition and Detonation Propagation in H_2-Air Mixtures with Transverse Concentration Gradients, Ph.D. Thesis, Technical University of Munich, 2015
[2] L.R. Boeck, J. Hasslberger, T. Sattelmayer, Flame Acceleration in Hydrogen/Air Mixtures with Concentration Gradients, Combustion Science and Technology, 186:10-11, pp. 1650-1661, 2014
[3] L.R. Boeck, F. Berger, J. Hasslberger, T. Sattelmayer, Detonation Propagation in Hydrogen-Air Mixtures with Concentration Gradients, in: Transient Combustion and Detonation Phenomena: Fundamentals and Application, Chapter: Propagation Detonations, Torus Press, Editors: G.D. Roy, S.M. Frolov, pp. 306-314, 2014
[4] L.R. Boeck, A. Kink, D. Oezdin, J. Hasslberger, T. Sattelmayer, Influence of Water Mist on Flame Acceleration, DDT and Detonation in H_2-Air Mixtures, International Journal of Hydrogen Energy, 40:21, pp. 6995-7004, 2015

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