



Investigation into the detonation performance of Urea Hydrogen Peroxide

1. Context

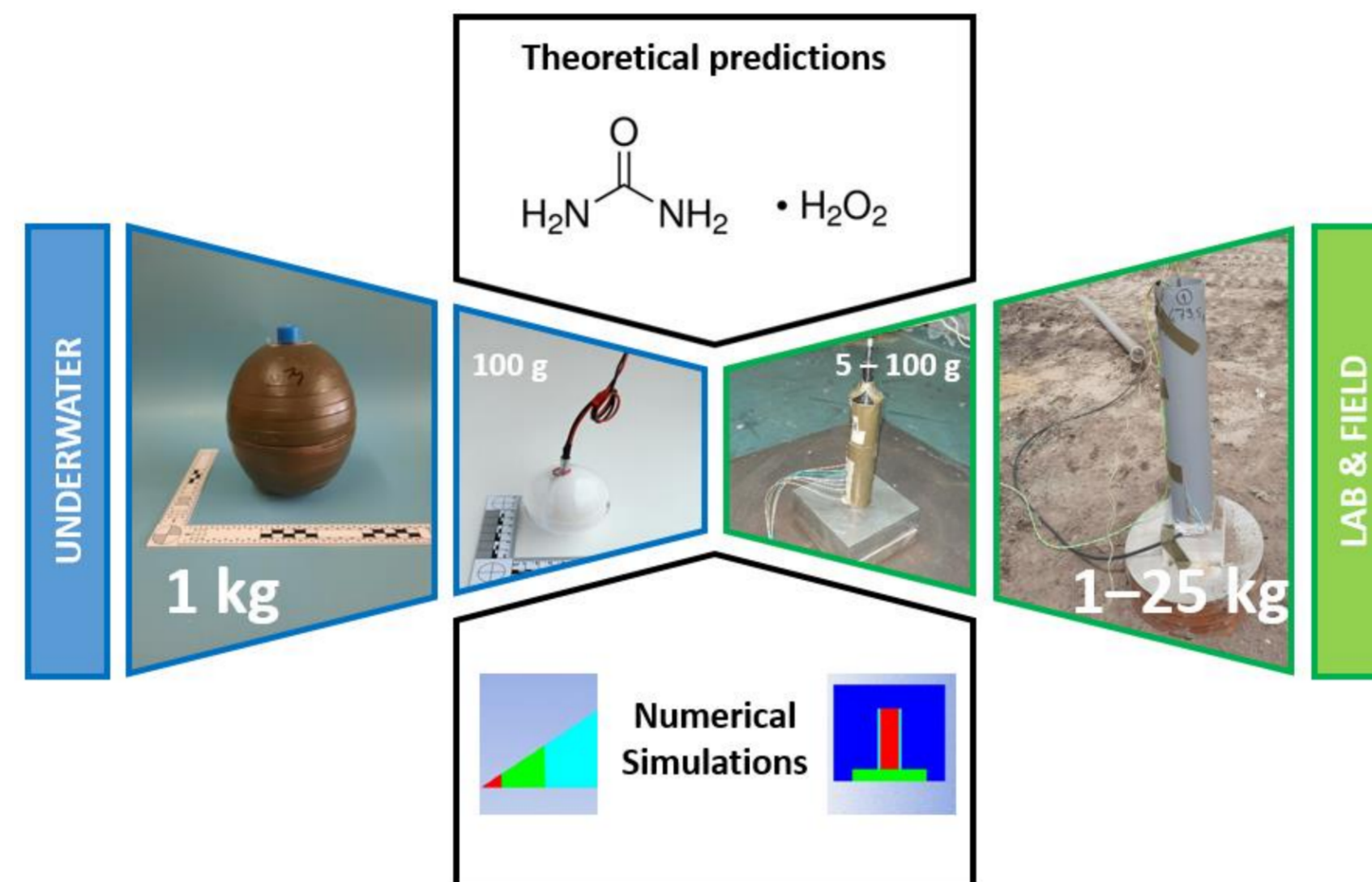
- Current Home Made Explosive (HME) threat worldwide:
 - Mixing of highly energetic pyrotechnics
 - Synthesis of **peroxide explosives**
- Carbamide Peroxide or **Urea Hydrogen Peroxide (UHP)**, widely used in the dental, cosmetic and pharmaceutical industries, has proven detonable at small-scale under heavy confinement [1].



2. Objectives and challenges

- Characterise UHP detonation performance for **risk assessment** purposes [2].
- Collect **maximum experimental data**, particularly desirable for evaluating the performance of non-ideal explosives: lab, field and underwater instrumented firings, with military reference explosive, supported by thermochemical calculations and numerical simulations.
- Assess the **level of agreement** between:
 - Laboratory, field and underwater data
 - Small-scale and large-scale experiments
 - Experiments, theory and simulations

3. General approach



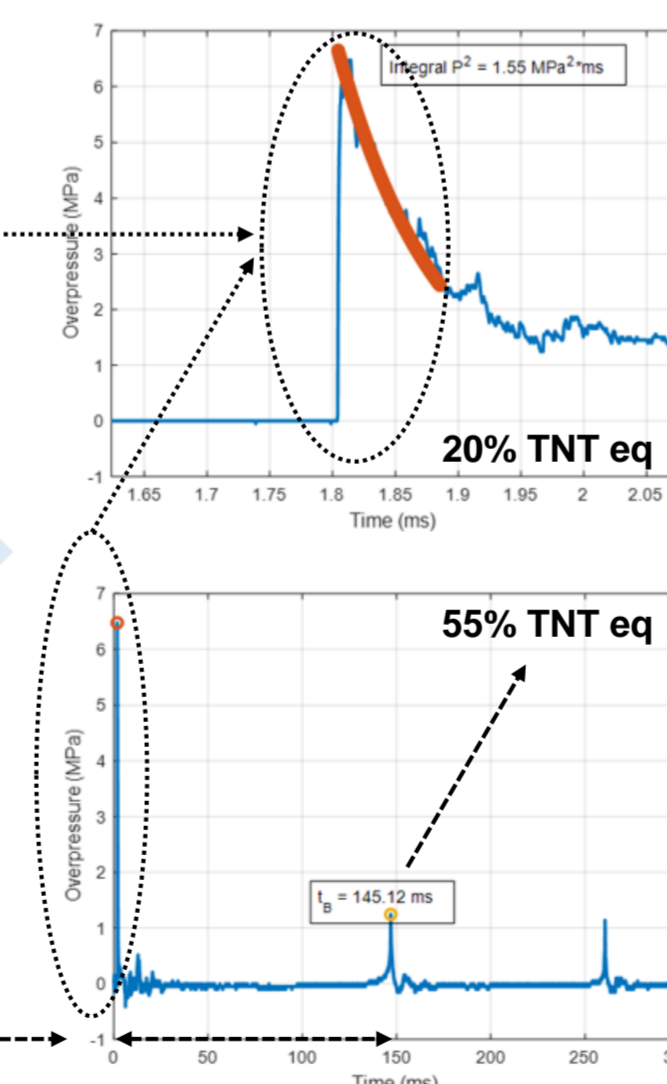
4. Preliminary results

➤ Underwater firings:

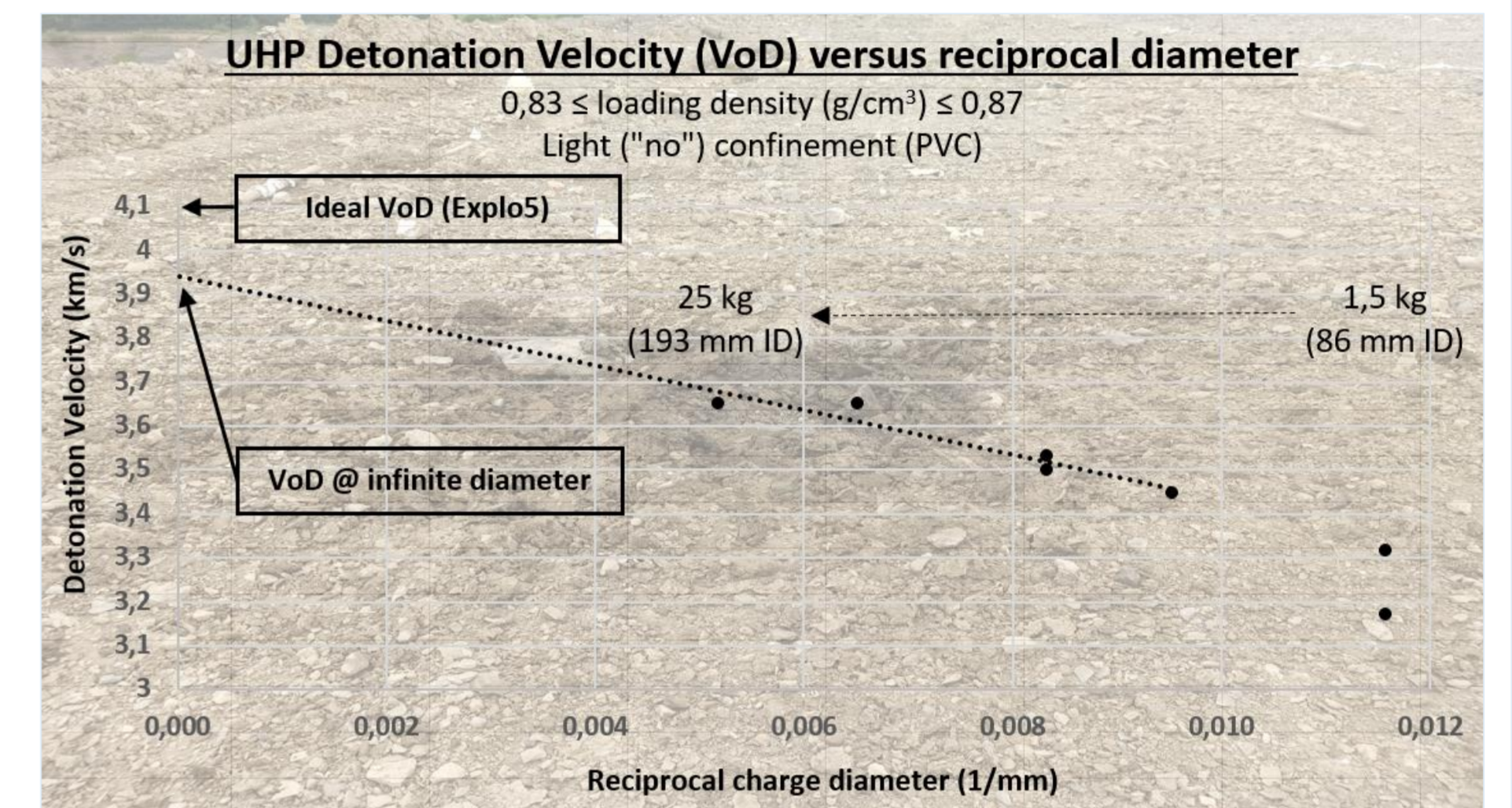
Shock pressure (Brisance)



Bubble period (Explosive Power)



➤ Field firings: Detonation velocity & Blast parameters



5. What's next

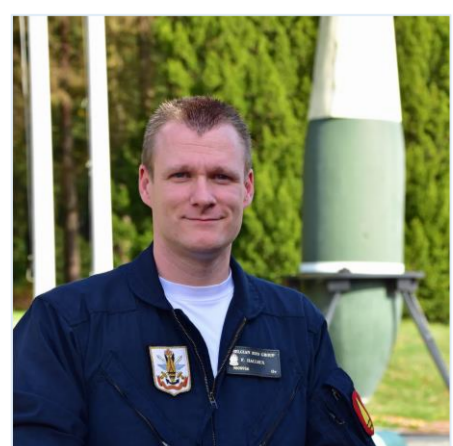
- Non-ideality vs **numerical simulations**
- **Size effects** vs validity of small-scale set-ups
- Propose and discuss **TNT equivalences for UHP**

References

[1] F. Halleux, J.-F. Pons, I. Wilson, R. Van Riet, M. Lefebvre, Small-Scale Detonation of Industrial Urea-Hydrogen Peroxide, *Propellants, Explosives, Pyrotechnics* **2022**, 47 (2), e202100250.
 [2] F. Halleux, J.-F. Pons, I. Wilson, R. Van Riet, B. Simoens, M. Lefebvre, Detonation Performance of Urea Hydrogen Peroxide, *Proceedings of the 24th Seminar on New Trends in Research of Energetic Materials*, Pardubice, Czech Republic, April 6–8, **2022**, 333–337.

Acknowledgements

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