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## Image analysis for time-resolved analysis of microparticle resuspension kinetics on a ventilated duct surface

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Bretagne-Pays de la Loire  
École Mines-Télécom



# Image analysis for time-resolved study of micro-particle resuspension kinetics on a ventilated duct surface

Context and objectives

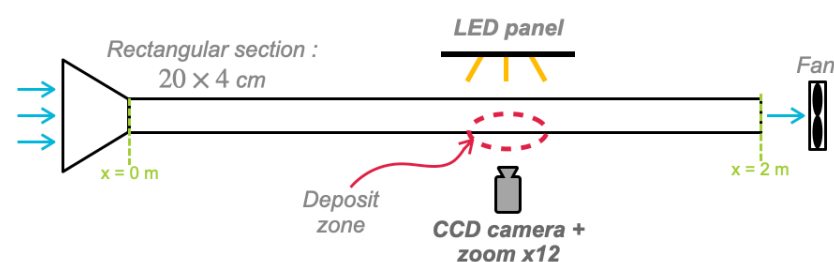
**Analyse the temporal evolution of particle number and deposit properties**

- ▶ **Monolayer deposit** of isolated bronze micro-particle
- ▶ **Glass surface** with nanometric roughness
- ▶ **Accelerated airflow** followed by a steady-state

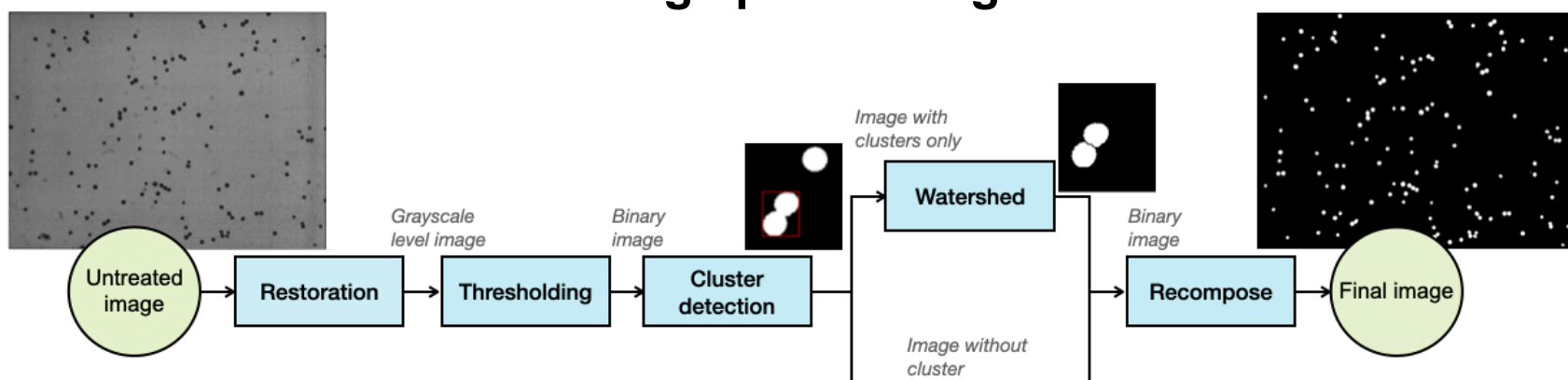
Methods

**Channel flow acquisition**

- ▶ Open-loop ventilated duct
- ▶ **Optical method**: 2320 x 1728 pxl<sup>2</sup> window, 30 Hz acquisition frequency, 0.86 mm/pxl resolution
- ▶ **Airflow properties** acquisition: hot wire and glue-on hot film probes



## Image processing



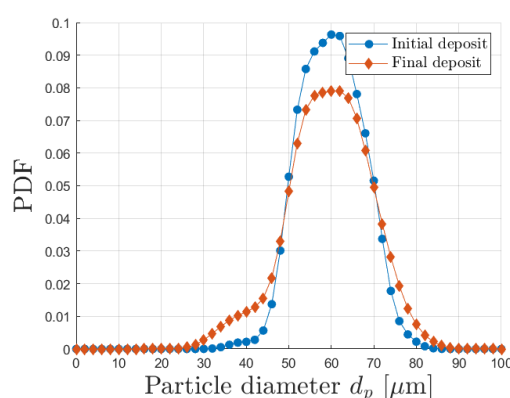
## Algorithm validation and results

- ▶ Creation of **synthetic images** and **numerical comparison** between particle number and size distribution

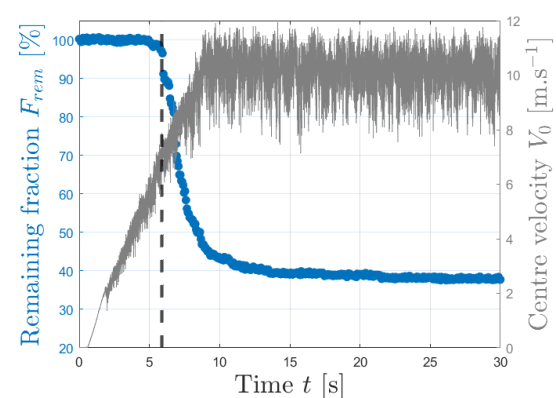
Sample n°	Particle number	Size distribution
	Relative difference [%]	Bhattacharyya distance [%]
1	2.6	0.36
2	2.9	0.39
3	3.1	0.27
4	4.0	0.33

- ▶ Comparison between **manual counting** and algorithm result on real images: **relative difference < 4%**

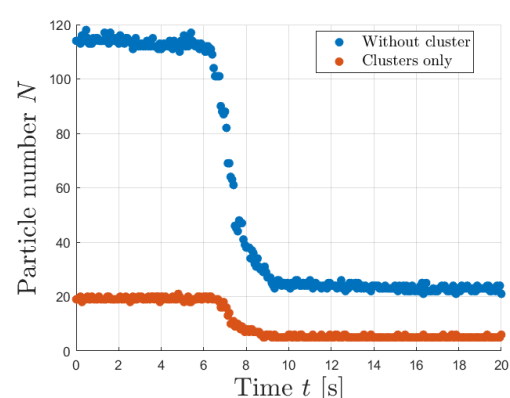
- ▶ Identification of particle sizes preferentially resuspended



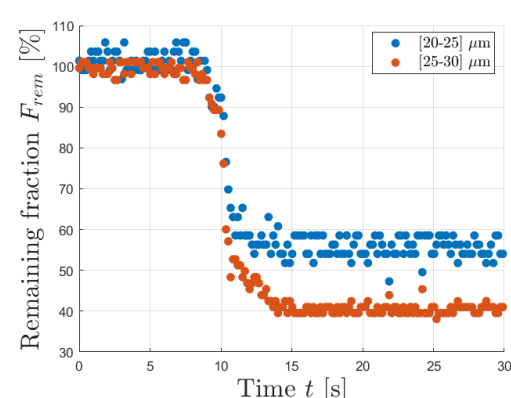
- ▶ Remaining particle fraction evolution with airflow properties



- ▶ Study of cluster behaviour



- ▶ Influence of the particle size



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### References

- Crocker, J. C. and Grier, D. G. (1996) *Journal of Colloid and Interface Science*, 179(1):298–310
- Giering, S. L. C., Hosking, B., Briggs, N. and Iversen, M. H. (2020) *Front. Mar. Sci.* 7:564
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