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

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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 pxl² window, 30 Hz acquisition frequency, 0.86 mm/pxl resolution
- **Airflow properties** acquisition: hot wire and glue-on hot film probes

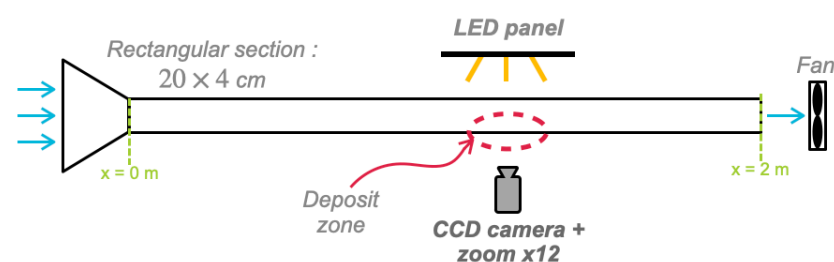
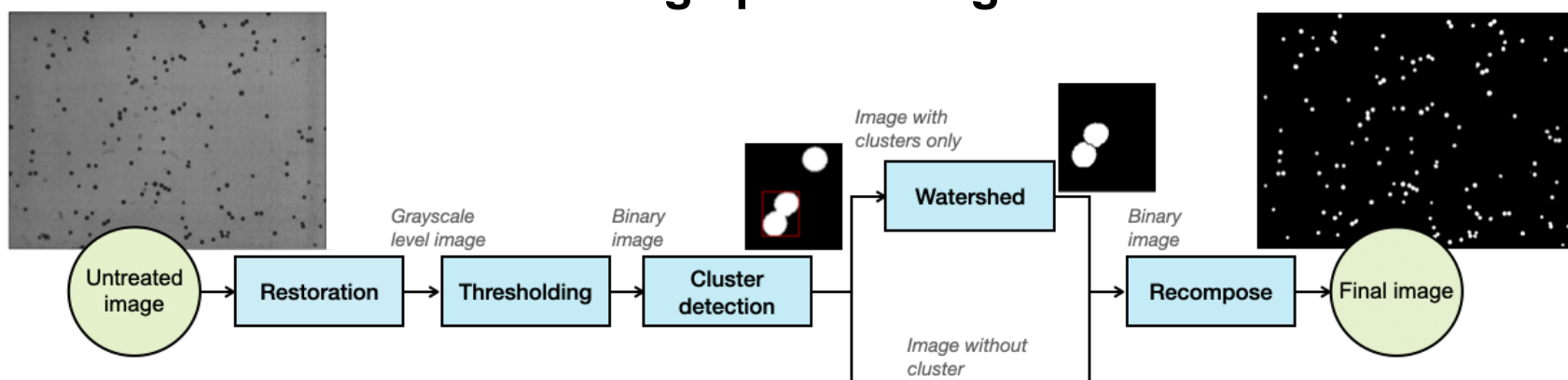


Image processing



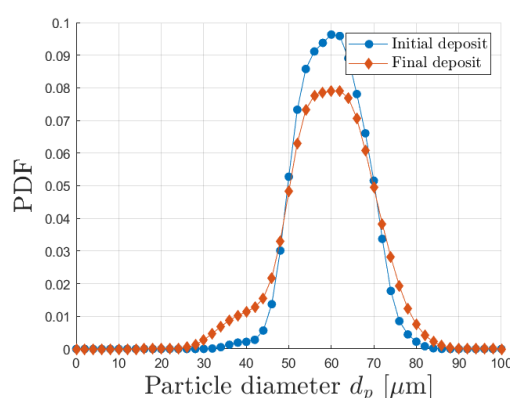
Algorithm validation and results

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

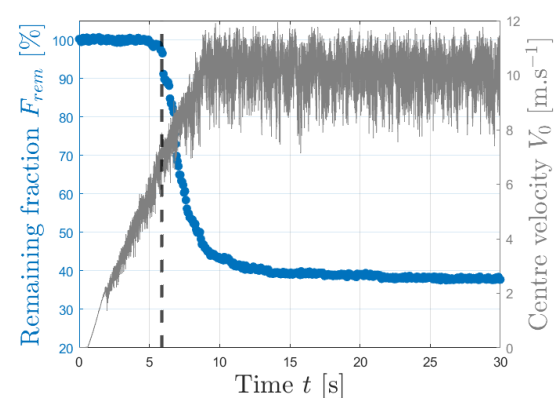
Sample n°	Particle number	Size distribution
	Relative difference [%]	Bhattacharyya distance [%]
1	2.6	0.36
2	2.9	0.39
3	3.1	0.27
4	4.0	0.33

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

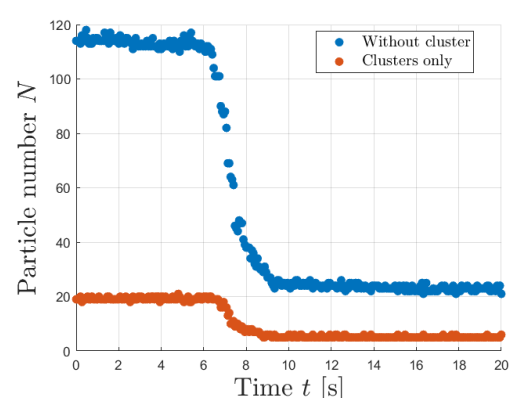
- Identification of particle sizes preferentially resuspended



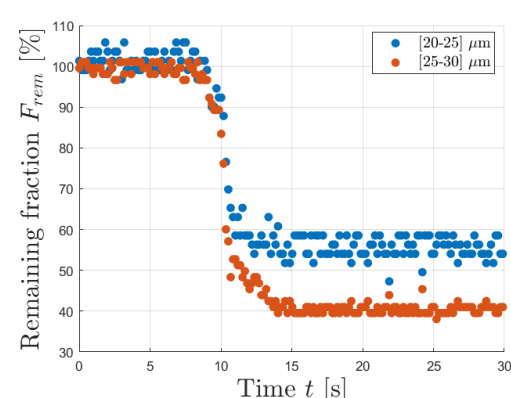
- Remaining particle fraction evolution with airflow properties



- Study of cluster behaviour



- Influence of the particle size



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Acknowledgments

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