

First demonstration of PIV measurements in sCO₂ flows inside microchannel near the critical point

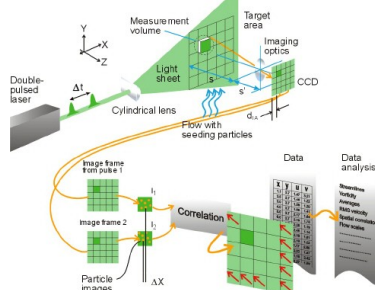
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Motivation

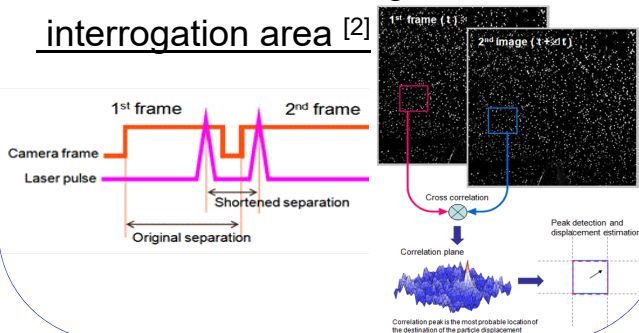
Particle image velocimetry (PIV) enables researchers to measure flow field and turbidimetric energy of a flow without disturbing it. To our best knowledge, though this preliminary work is meant to demonstrate that PIV can be applied, this is the first PIV measurements in CO₂ flows at microscale for these high-pressure conditions.

Particle image velocimetry

1. Principle of particle image velocimetry [1]

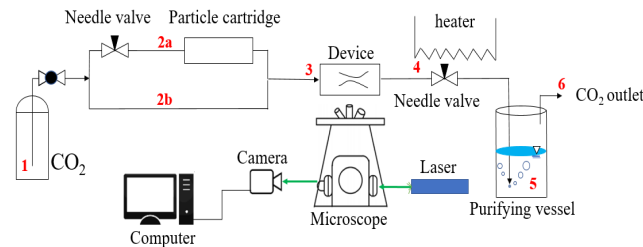


2. Timing images and cross-correlation of raw images in interrogation area [2]

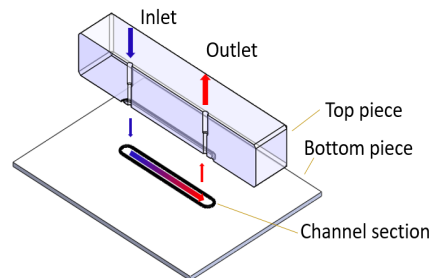


Experimental setup

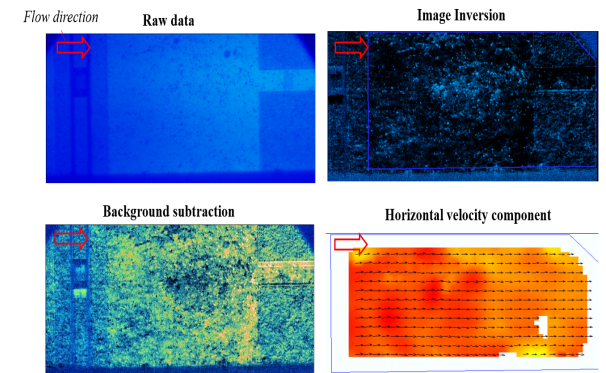
1. fluid delivery system and sampling setup



2. Microfluidic device



Results



Velocity of a particle that was obtained using PIV analysis was 30-50 m/s that is consistent with the first principles calculation.

Acknowledgments

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REFERENCES

- [1] DantecDynamics, 2019, "<https://www.dantecdynamics.com/measurement-principles-of-piv>."
[2] Seika, 2019, "https://www.seika-di.com/en/measurement/principle_of_piv.htm."