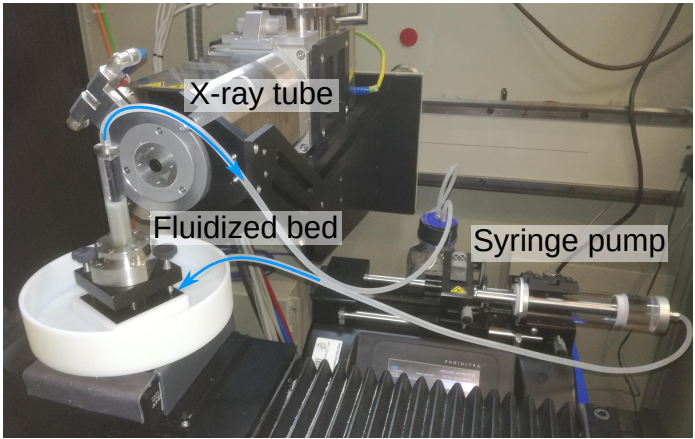
Experimental validation of X-DFA: A suspension of sedimenting particles



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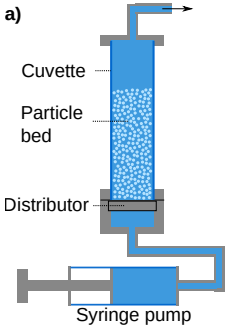
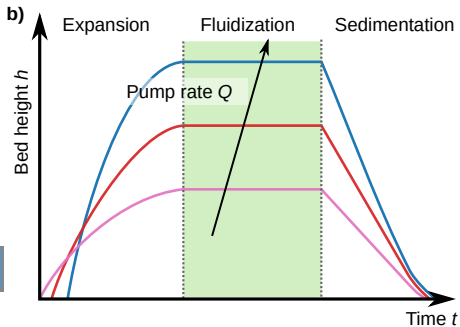
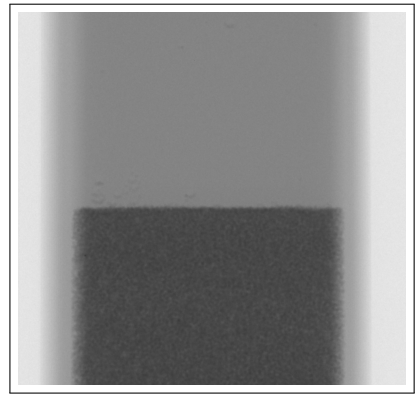




X-ray radiography



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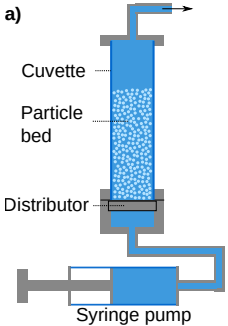
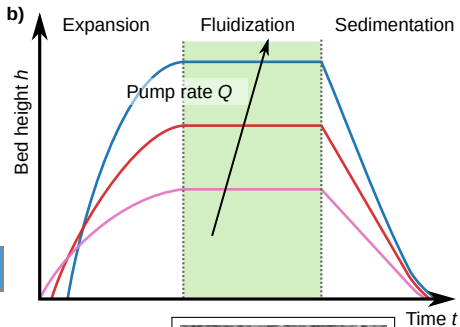
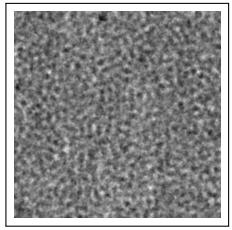
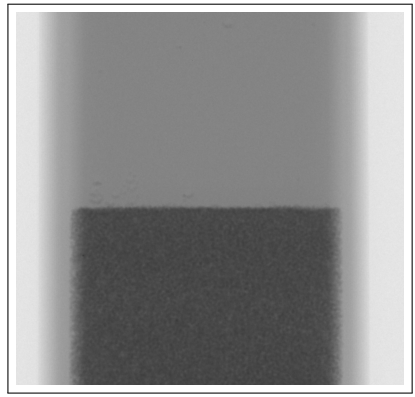




No reliable reference velocity!



X-ray radiography



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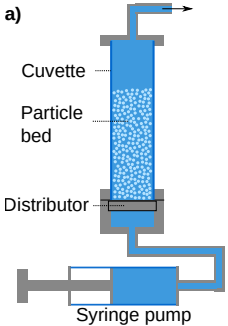
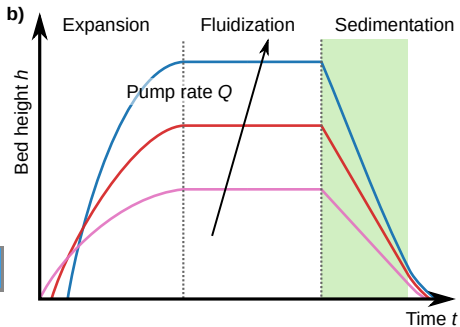
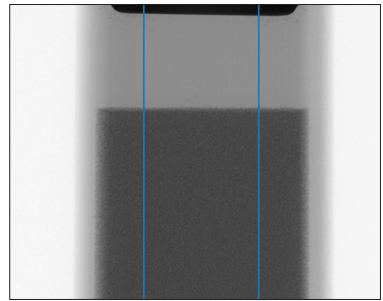




X-ray radiography



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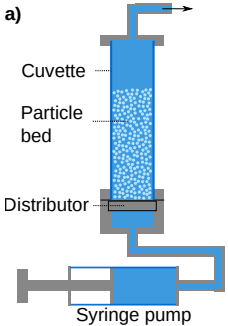
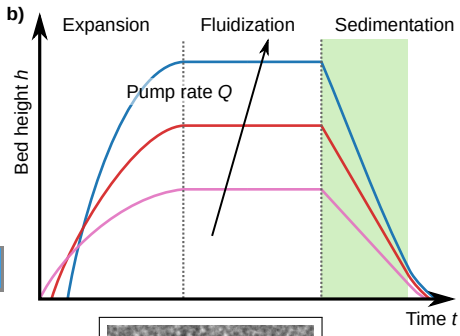
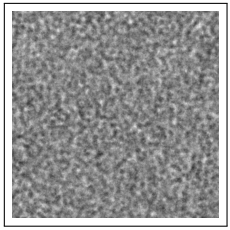
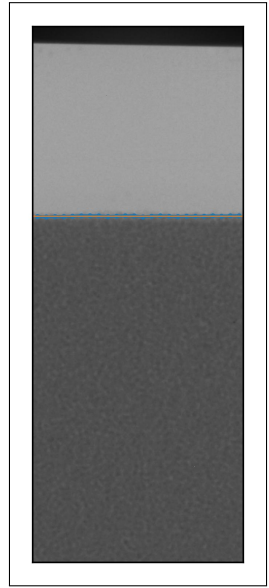






Comparison of $\langle v \rangle_{xdfa}$ and $\langle v \rangle_{front}$

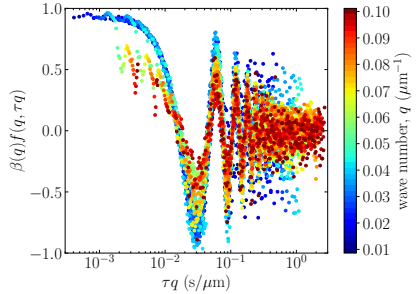
X-ray radiography

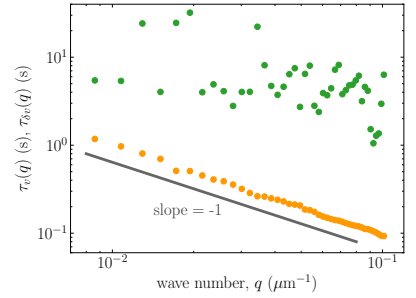


X-DFA for a suspension of sedimenting particles

$$f(q,\tau) = \cos(q\langle v_s\rangle\tau)\exp\left(-\frac{1}{2}q^2\delta v^2\tau^2\right)$$

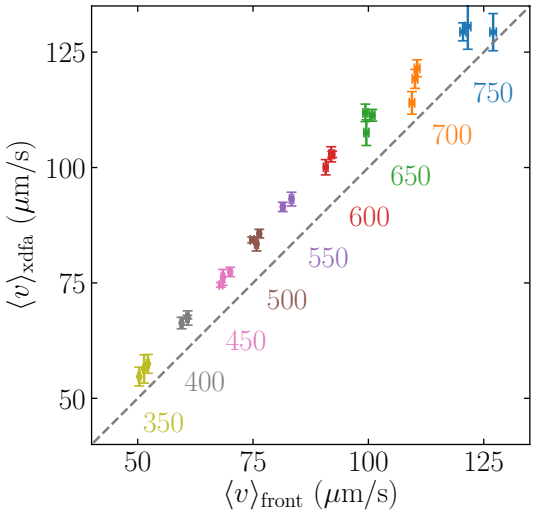
$$\langle v_s\rangle = \langle \Delta r\rangle/\tau_\nu, \langle \delta v\rangle = \langle \delta r\rangle/\tau_{\delta\nu}$$





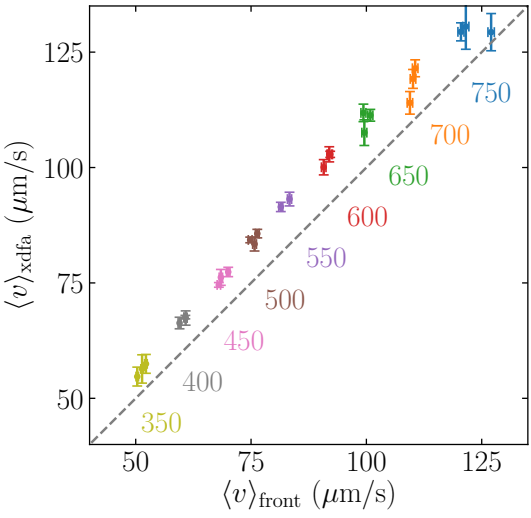
In collaboration with Manuel Escobedo, University of Düsseldorf

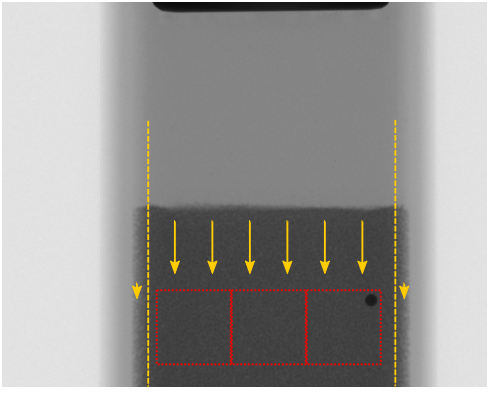
Front tracking vs. X-DFA



$\langle v \rangle_{\mathrm{xdfa}} > \langle v \rangle_{\mathrm{front}}$ by 9.4%

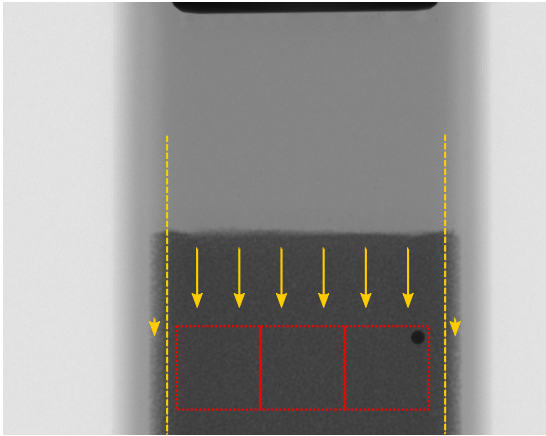
Front tracking vs. X-DFA





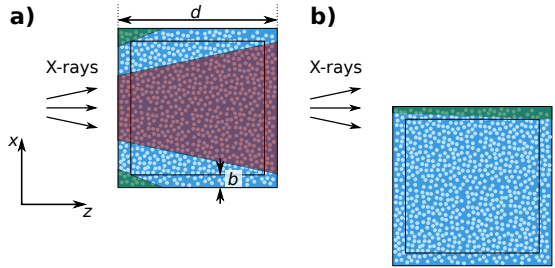
$\langle v \rangle_{\mathrm{xdfa}} > \langle v \rangle_{\mathrm{front}}$ by 9.4%

Estimate width of boundary layer



$\langle v \rangle_{\text{xdfa}} > \langle v \rangle_{\text{front}}$ by 9.4%

$\langle v \rangle_{\text{xdfa}}$ takes two layers into account
$\langle v \rangle_{\text{front}}$ takes four layers into account



Estimation:
Boundary velocity = 0
Else = const.
$\rightarrow b \approx 3$ particle diameters


Thank you for your attention!