

# Supplemental Material

## Post processing of Mie scattering images

Figure S1 illustrates the post processing steps used to extract the progress variable contours from the Mie-scattering images. For the purposes of illustration, a single frame (time step) is selected. The raw images are subjected to a combination of Gaussian filtering, median filtering, and bilateral filtering to smooth out the sharpness in the image caused by the particles. For the Gaussian filter, we used the default standard deviation of 0.5 and a filter size of  $k = 2 \times \text{ceil}(2 \times \sigma) + 1 = 3$ . We used a symmetric median filter with a window size of 10 pixels.

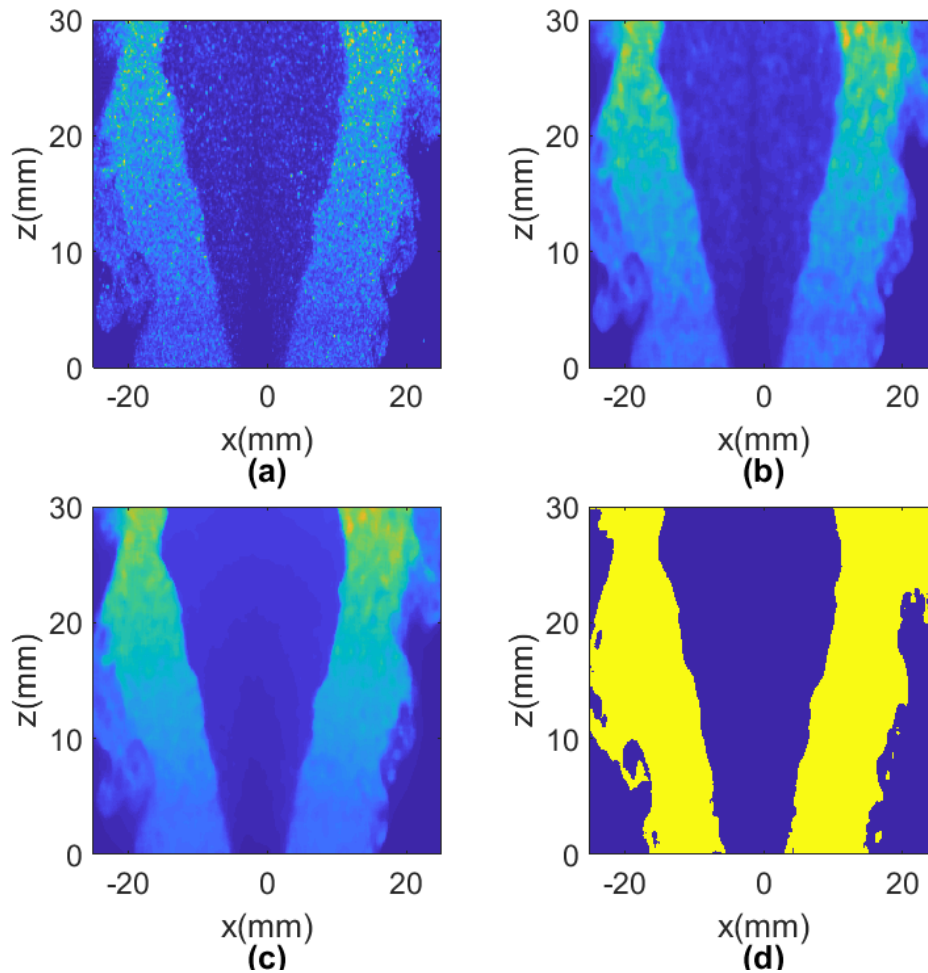


Figure S1: Processing of Mie-scattering images: (a) Instantaneous raw Mie-scattering image, (b) Gaussian filtered image, (c) Bilateral filtered image, (d) Final binarized image

Once the image is filtered, a three-level thresholding function is employed and the minimum threshold value is selected for binarization. The multi-level thresholding is done to account for the variation in the intensity of signal, particularly in the downstream direction. This process is repeated for all frames and the binarized images are averaged over time to yield the progress variable,  $\bar{c}$ .