Supplementary material: Comparison of three scenarios for the calculation of $\tilde{L}_{min}$.

For the calculation of the minimum contact length ($\tilde{L}_{min}$), the following three scenarios were considered: (i) a red-white area redistribution achieved with a vertical line segment, (ii) a second redistribution with an inclined straight line, and (iii) a third redistribution with a circular arc centered at the right intersection of the drum with the free surface.

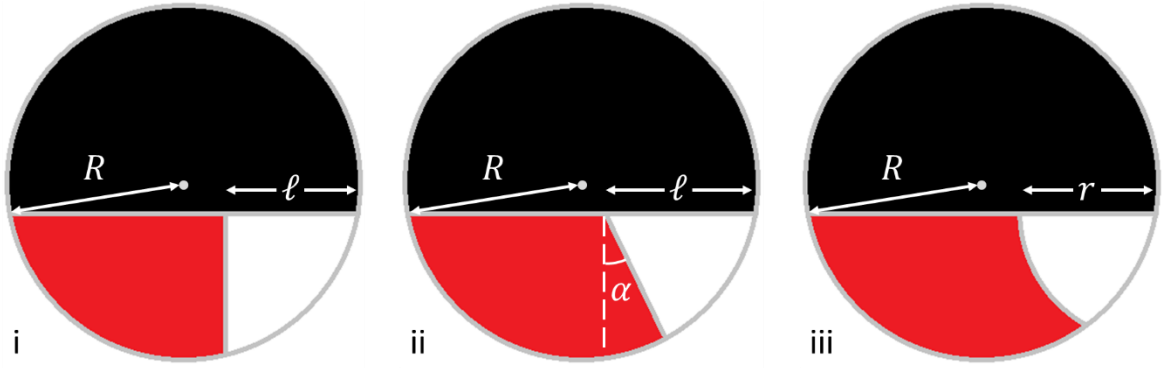

Fig. 1: Three scenarios are tested for the computation of the minimum contact length $\tilde{L}_{min}$: a vertical separating straight line (i), an inclined straight line (ii), and a circular arc (iii).

In all scenarios, an iterative procedure is used to find the solution. For the special case (ii), ℓ and α form the solution, from which $\tilde{L}_{\min}$ is derived. In Table 1, each separating curve's length was used as $\tilde{L}_{\min}$ for the calculation of the mixing index (M).

Tab. 1: Mixing index (M) calculated on images using the three different red/white redistribution strategies (Images can be seen in the manuscript).

Image	scenario (i)	scenario (ii)	scenario (iii)
8a	0.9838	0.9839	0.9839
8b	0.9411	0.9411	0.9411
8c	0.9642	0.9642	0.9642
8d / 9b	0.9655	0.9655	0.9655
9a	$2.38 \cdot 10^{-4}$	$2.38 \cdot 10^{-4}$	$-12.08 \cdot 10^{-4}$
9c	0.2134	0.2134	0.2123
9e	0.7557	0.7449	0.7532
9f	0.6538	0.6451	0.6508

With a maximum deviation of 2.5 % from the reference scenario (i), the differences in the mixing index values are negligible for most images. Figure 2, which shows the evolution of the three mixing indices calculated with the experimental image sequence of the rotating drum, also confirms this finding.

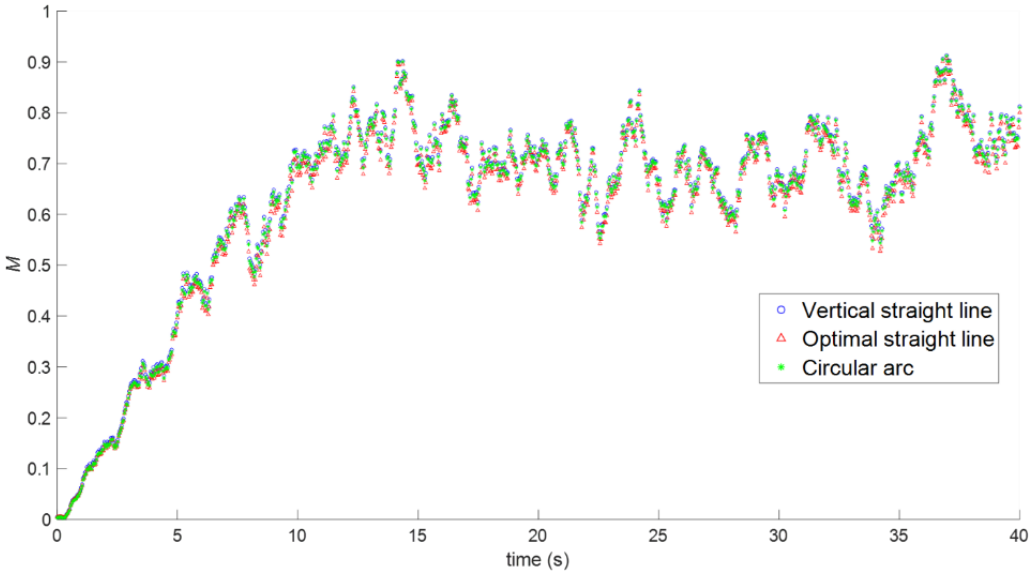

Fig. 1: Evolution of mixing index with our modified contact method as a function of time.

Owing to the pixelized nature of the images and the way the modified contacts are counted, in both cases (ii) and (iii) the separating curve would not be smooth, as assumed up to this point, but rather formed by short horizontal and vertical line pixel segments. Therefore, it would actually be more appropriate to use the Manhattan distance of the endpoints of the separating curve ($|\Delta x| + |\Delta y|$) as $\tilde{L}_{\min}$ instead of the Euclidean length of the smooth curve. However, this distance is bigger than the Euclidean length, which would defeat the purpose of trying to find a shorter boundary for the same area. Following this analysis, it was decided to keep the simplest scenario (i).