Influence of Rheology and Micropatterns on Spreading, Retraction and Fingering of an Impacting Drop - Electronic Supplementary Information (ESI)

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ESI CONTENTS

1. Table SI gives a full list of calculated Padé approximant values (A) for various combinations of fluids and surfaces when using the energy conservation approach.

2. Figures S1 to S4 are plots exploring scaling relations for maximum spreading as a function of We or Re for each fluid on all surfaces.

3. Figures S5 to S10 are additional plots of retraction rate data for all surfaces and fluids that were not included in the main text.

4. Figures S11 and S12 are additional plots showing deviation from circular spreading as a function of We for surfaces not included in the main text.

5. Figures S13 to S15 are additional plots showing the angular distribution of fingers at maximum spread for fluids and surfaces not included in the main text.

TABLE SI. Padé approximant values (A from Eq. 7 in the main text where $P = WeRe^{-2/5}$) found using least squares fitting to maximum spread data, with coefficients of determination R.

Fluid(s)	Surface(s)	A	R^2
Water	All	1.50 ± 0.01	0.90
10 vol % glycerol	All	1.40 ± 0.01	0.94
40 vol % glycerol	All	1.40 ± 0.01	0.95
0.05 wt % carbopol	All	1.10 ± 0.02	0.85
0.1 wt % carbopol	All	1.30 ± 0.01	0.84
All	Flat PDMS	1.24 ± 0.01	0.82
Newtonian solutions	All	1.45 ± 0.02	0.93
Non-Newtonian solutions	All	1.20 ± 0.01	0.85
All	All	1.37 ± 0.03	0.80
All from Laan et al. [1]		1.24 ± 0.01	0.95

[1] N. Laan, K. G. de Bruin, D. Bartolo, C. Josserand, and D. Bonn, Phys. Rev. Appl. **2**, 044018 (2014).

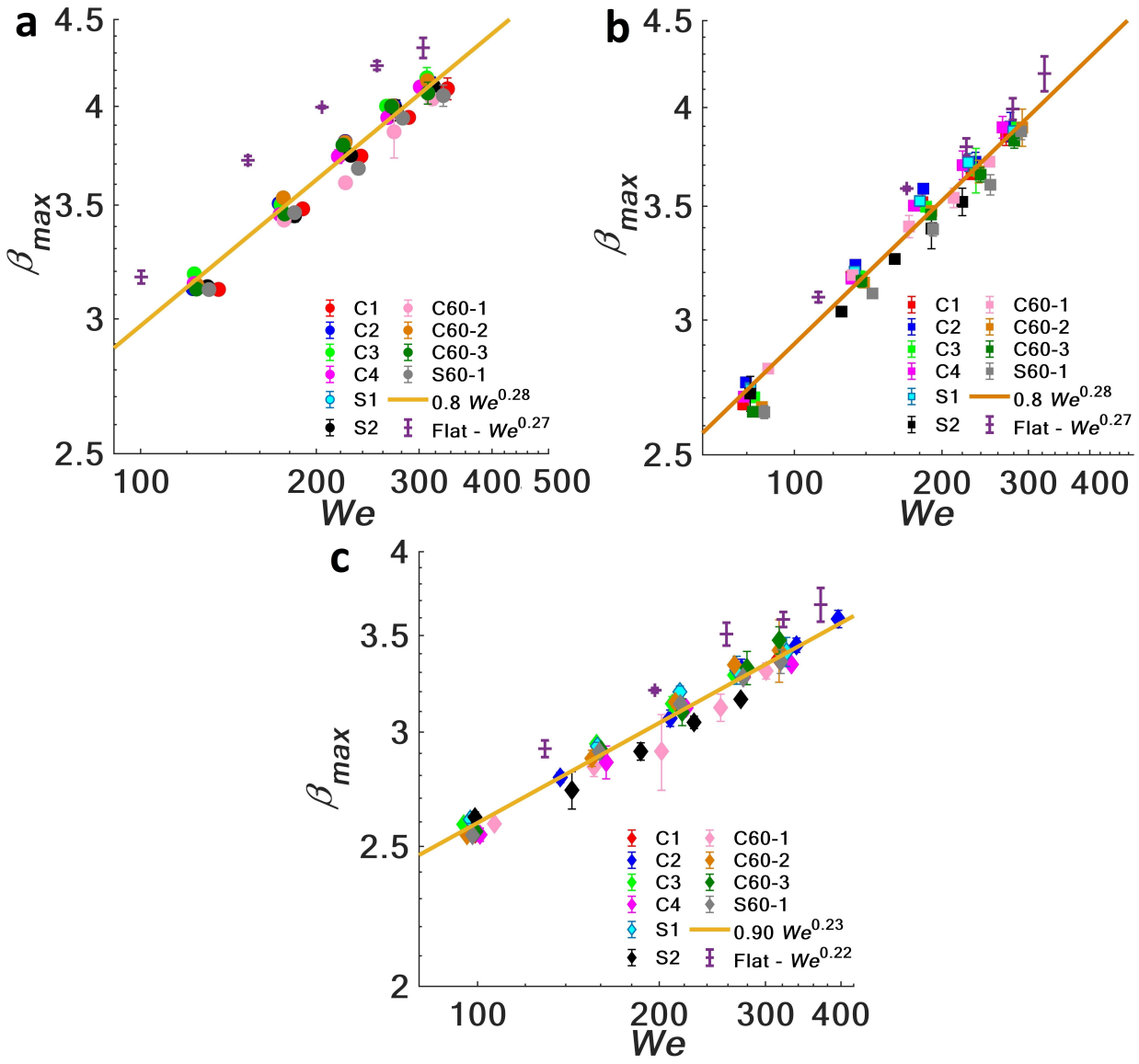

FIG. S1. Log-log plot of β_{max} vs We for (a) water, (b) 10 vol % glycerol and (c) 40 vol % glycerol on various surfaces. The legend includes details of plotted power law fits to the data for all micropillar surfaces, and for flat PDMS.

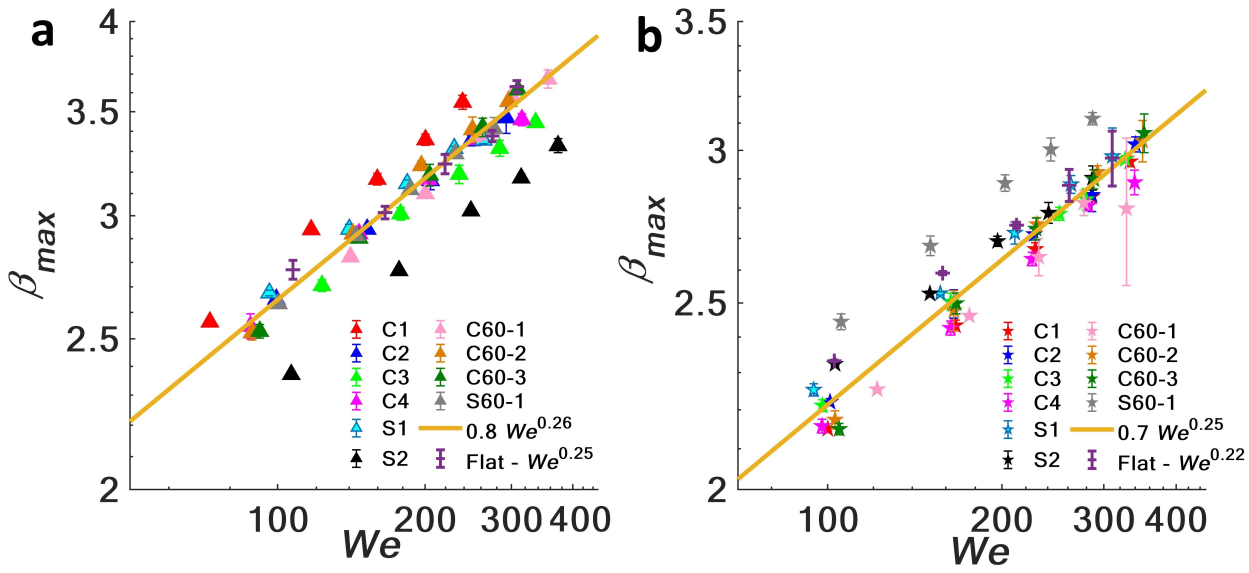

FIG. S2. Log-log plot of β_{max} vs We for (a) 0.05 wt% and (b) 0.1 wt% carbopol solutions on various surfaces. The legend includes details of plotted power law fits to the data for all micropillar surfaces, and for flat PDMS.

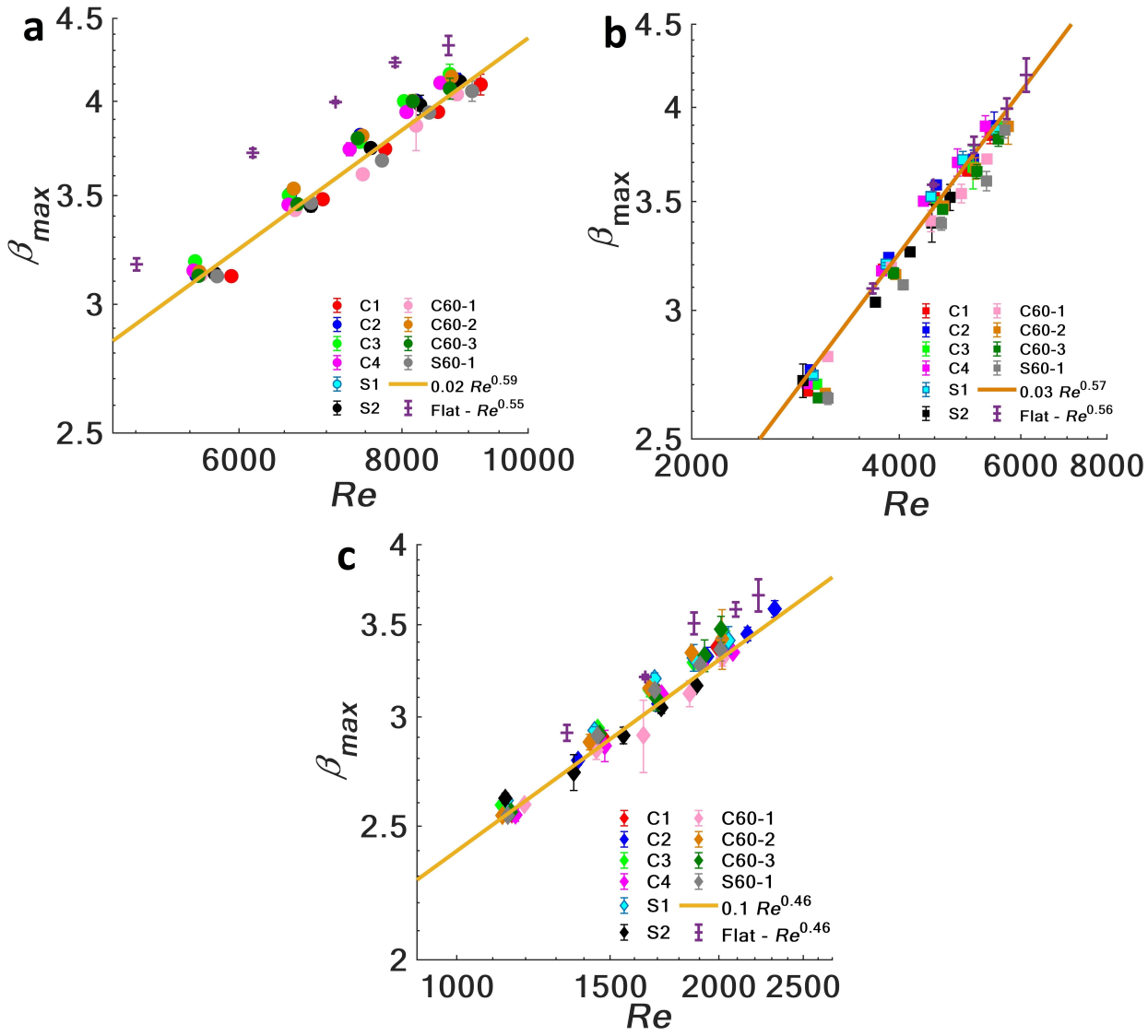

FIG. S3. Log-log plot of β_{max} vs Re for (a) water, (b) 10 vol % glycerol and (c) 40 vol % glycerol on various surfaces. The legend includes details of plotted power law fits to the data for all micropillar surfaces, and for flat PDMS.

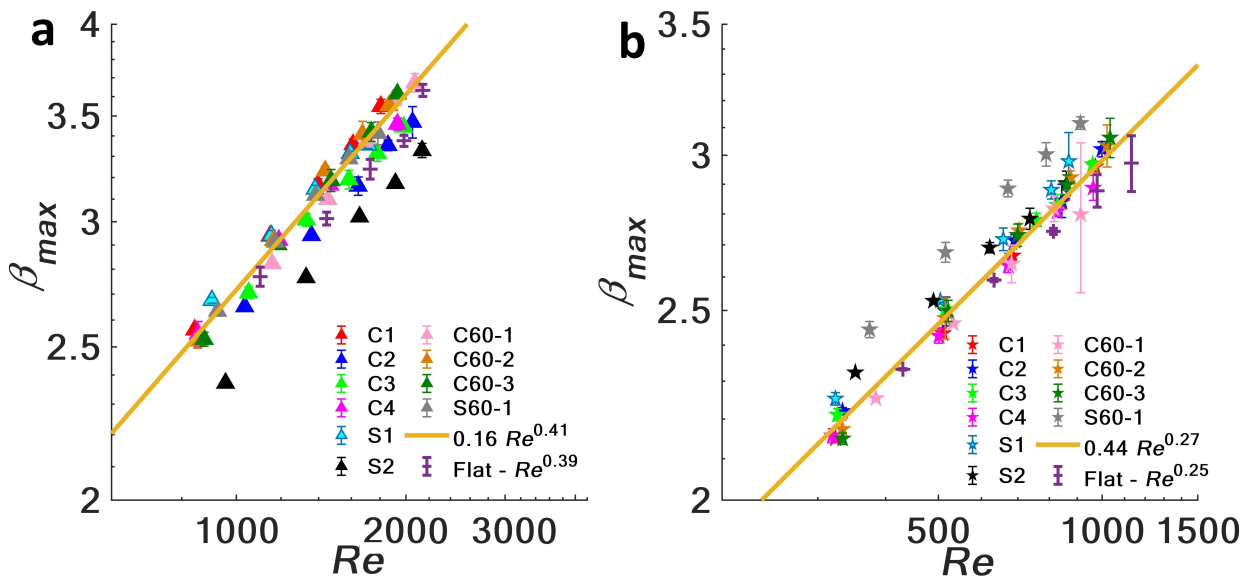

FIG. S4. Log-log plot of β_{max} vs Re for (a) 0.05 wt% and (b) 0.1 wt% carbopol solutions on various surfaces. The legend includes details of plotted power law fits to the data for all micropillar surfaces, and for flat PDMS.

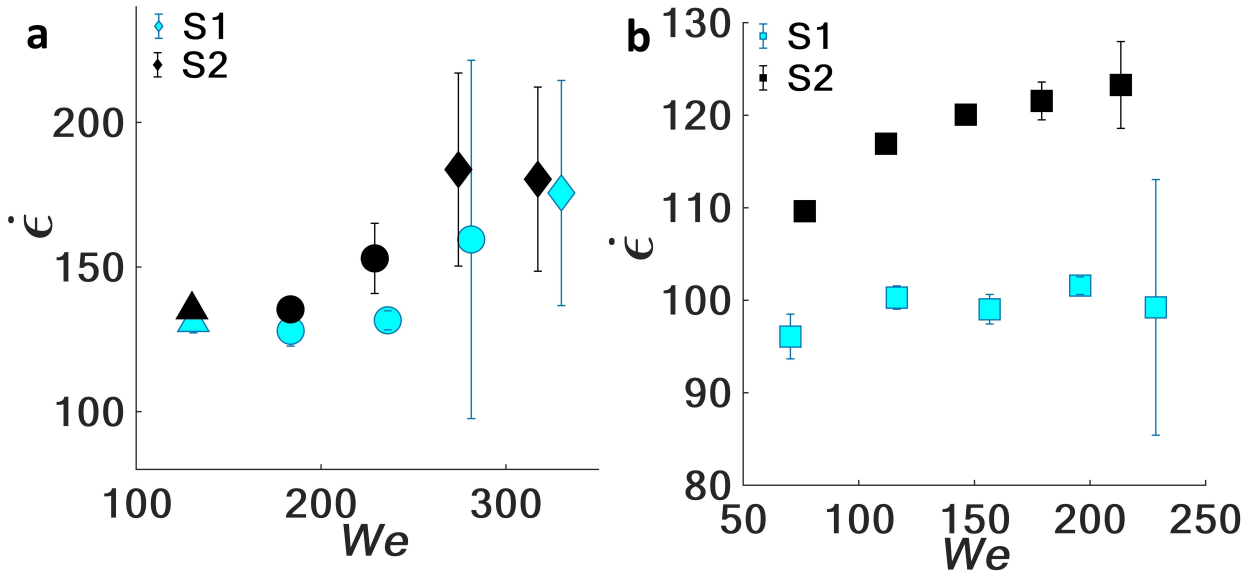

FIG. S5. Retraction rates as a function of We on surfaces S1 and S2 for (a) water, and (b) 0.1 wt % carbopol. In both figures the color represents the surface whereas the symbol shape represents the drop outcome cases from Table 3 in the main text: 3($\diamond$), 5($\circ$), 6($\triangle$) and 8 ($\square$). Error bars represent the standard deviation over three repeat measurements.

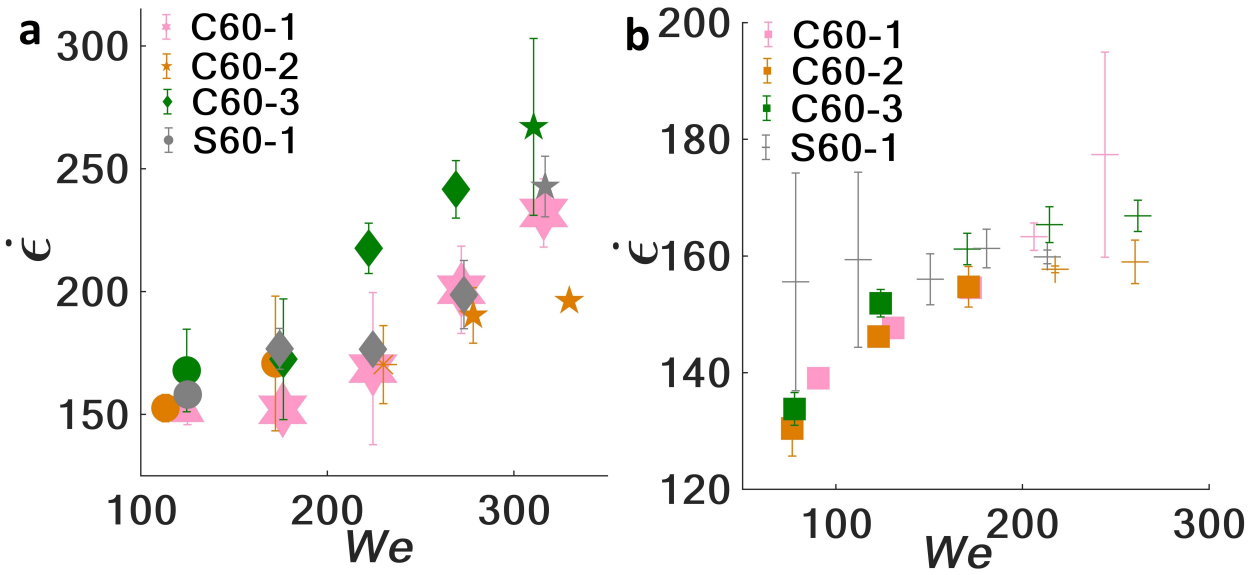

FIG. S6. Retraction rates as a function of We on surfaces C60-1,2,3 and S60-1 for (a) water, and (b) 0.1 wt % carbopol. In both figures the color represents the surface whereas the symbol shape represents the drop outcome cases from Table 3 in the main text: 1(★), 2(⋆), 3(◇), 4(∗), 5(○), 7(+) and 8 (□). Error bars represent the standard deviation over three repeat measurements.

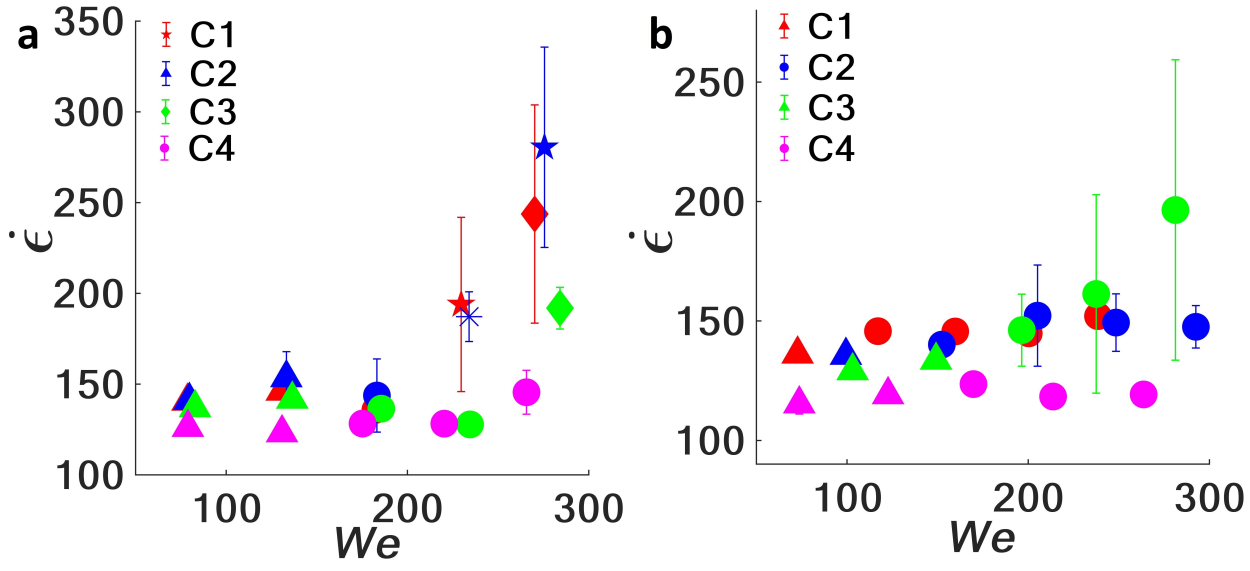

FIG. S7. Retraction rates as a function of We on surfaces C1-4 for (a) 10 vol % glycerol, and (b) 0.05 wt % carbopol. In both figures the color represents the surface whereas the symbol shape represents the drop outcome cases from Table 3 in the main text: 2(⋆), 3(◇), 4(∗), 5(○), 6(△) and 8 (□). Error bars represent the standard deviation over three repeat measurements.

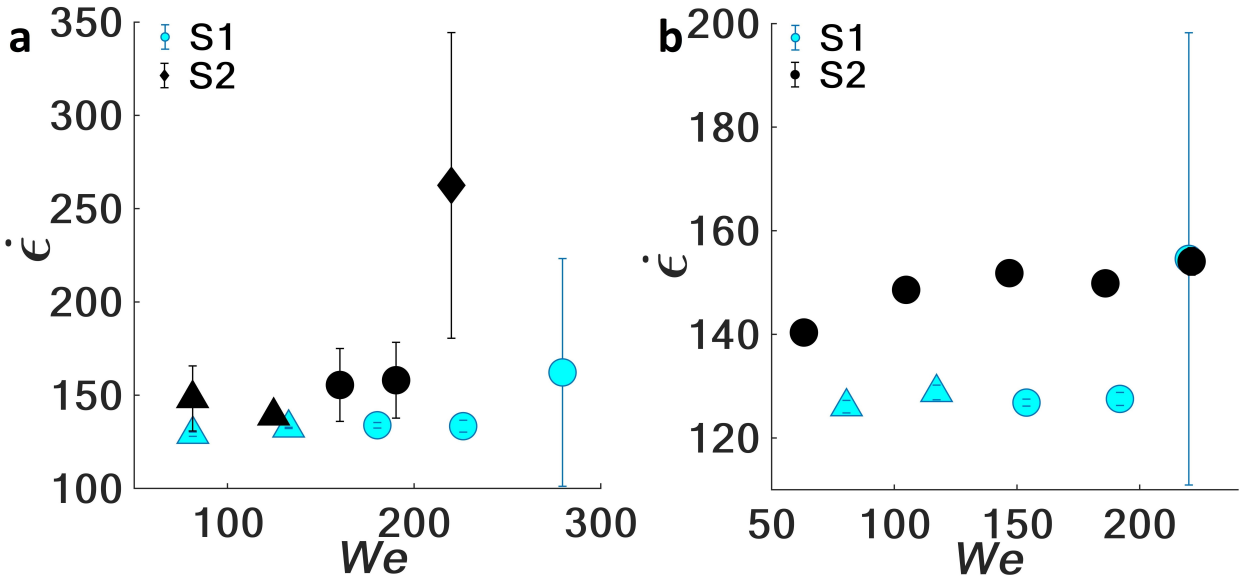

FIG. S8. Retraction rates as a function of We on surfaces S1 and S2 for (a) 10 vol % glycerol, and (b) 0.05 wt % carbopol. In both figures the color represents the surface whereas the symbol shape represents the drop outcome cases from Table 3 in the main text: 5(○) and 6(△). Error bars represent the standard deviation over three repeat measurements.

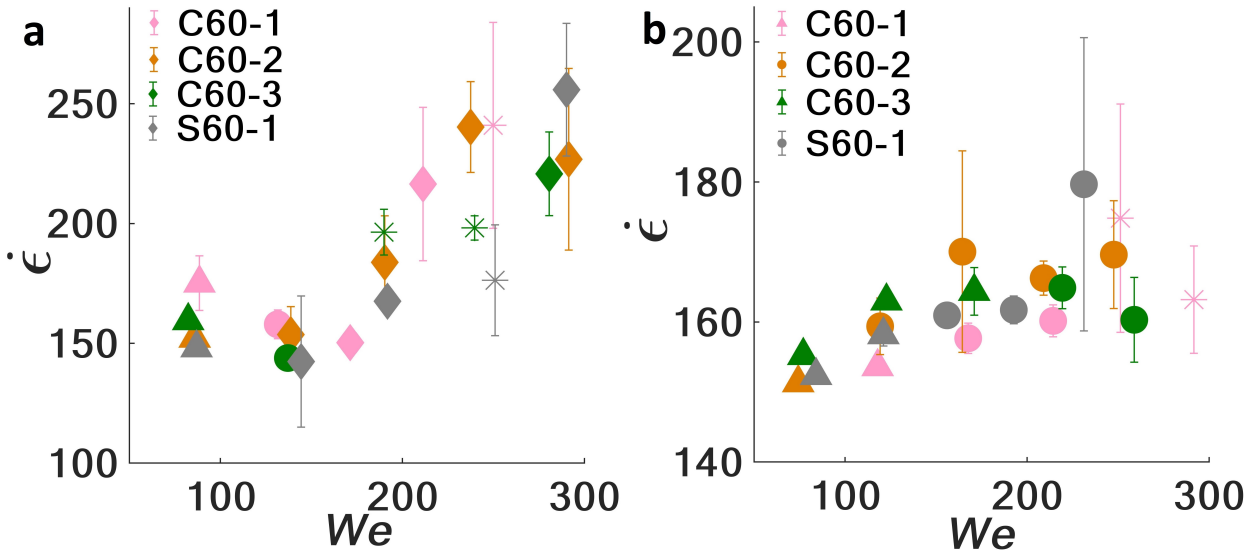

FIG. S9. Retraction rates as a function of We on surfaces C60-1,2,3 and S60-1 for (a) 10 vol % glycerol, and (b) 0.05 wt % carbopol. In both figures the color represents the surface whereas the symbol shape represents the drop outcome cases from Table 3 in the main text: 3(⋄), 4(∗), 5(○) and 6(△). Error bars represent the standard deviation over three repeat measurements.

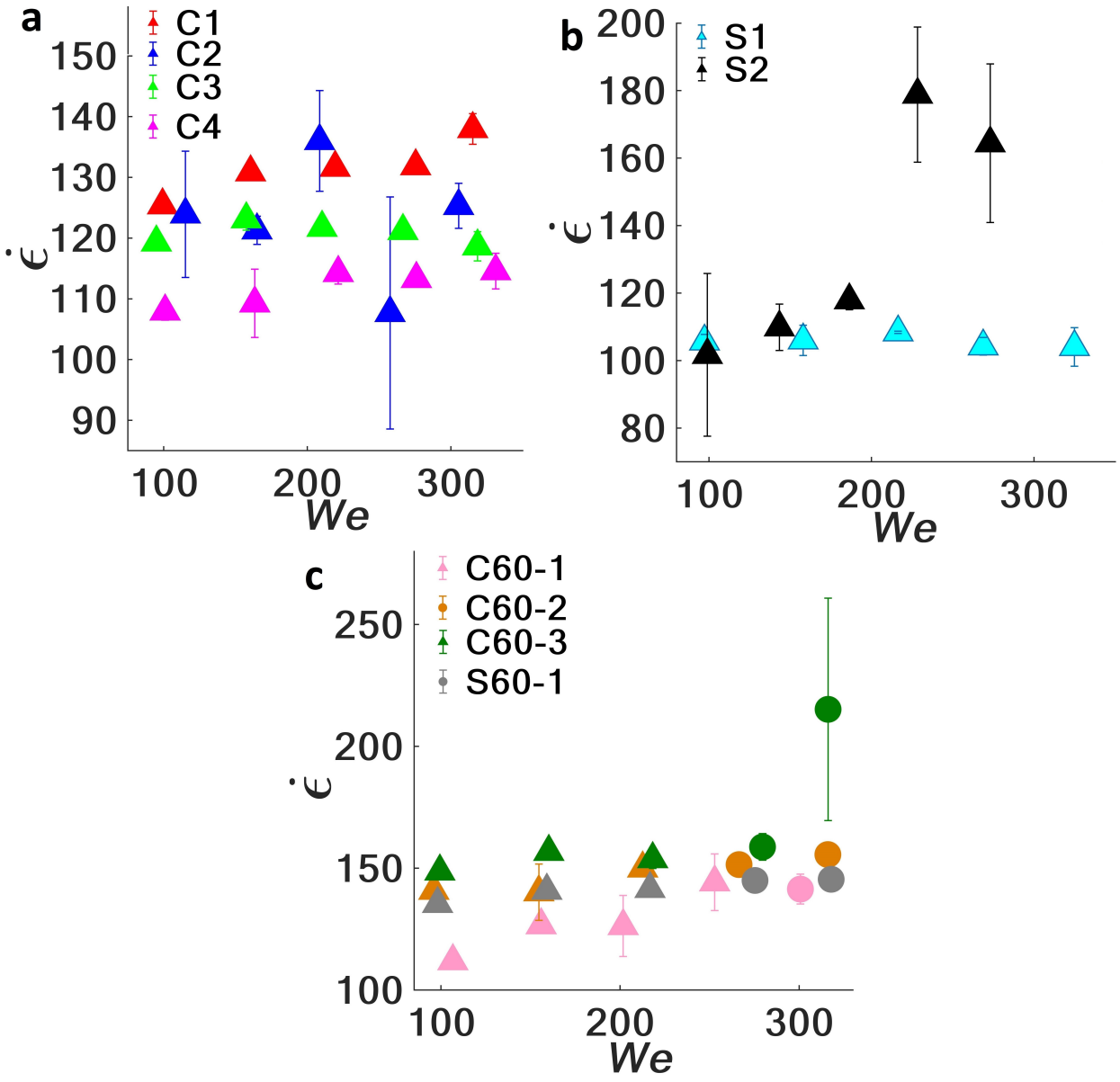

FIG. S10. Retraction rates as a function of We for 40 vol % glycerol solutions on surfaces (a) C1-4, (b) S1, S2 (c) C60-1,2,3, and S60-1. In both figures the color represents the surface whereas the symbol shape represents the drop outcome cases from Table 3 in the main text: 5(○) and 6(△). Error bars represent the standard deviation over three repeat measurements.

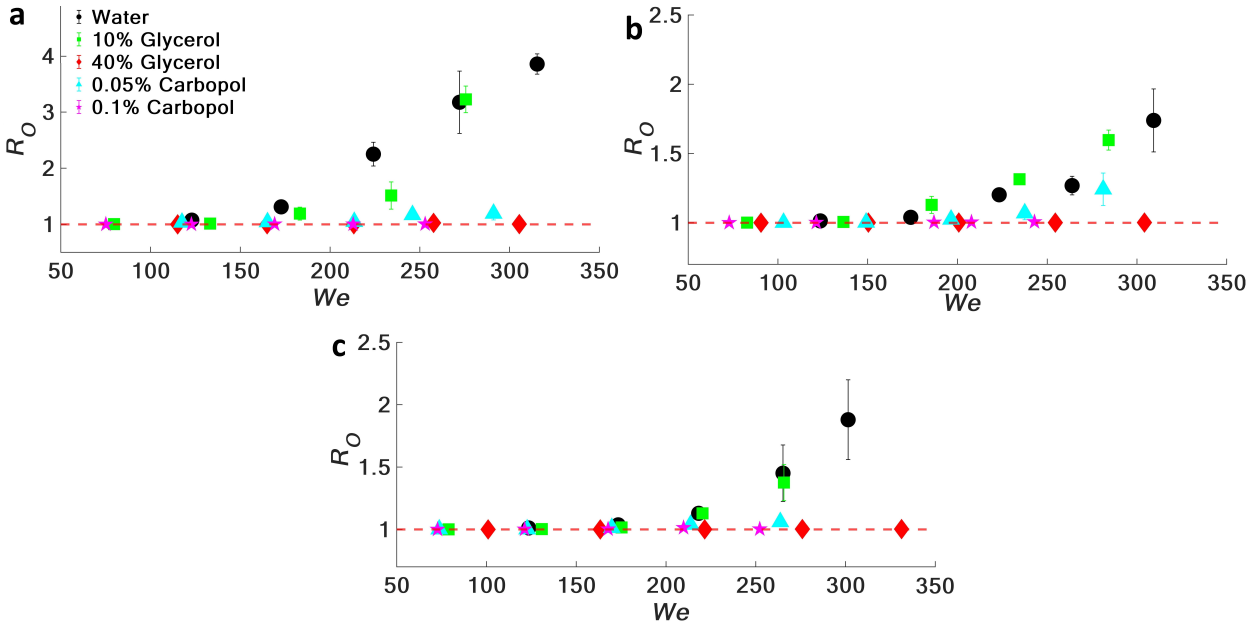

FIG. S11. Roundness measurements (Eq. 12 in the main text) for droplets at maximum spread on surfaces (a) C2, (b) C3, and (c) C4. The red dashed line indicates a perfect circle, and error bars represent the standard deviation over three trials for each set of experimental conditions.

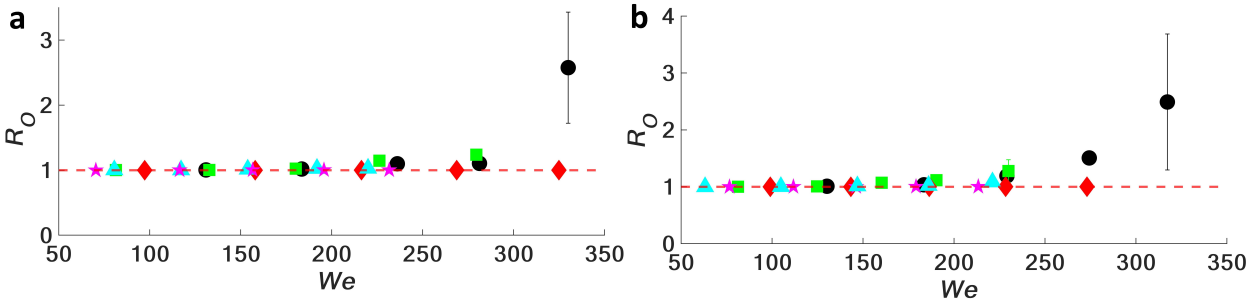

FIG. S12. Roundness measurements (Eq. 12 in the main text) for droplets at maximum spread on surface (a) S1, and (b) S2. The red dashed line indicates a perfect circle, and error bars represent the standard deviation over three trials for each set of experimental conditions.

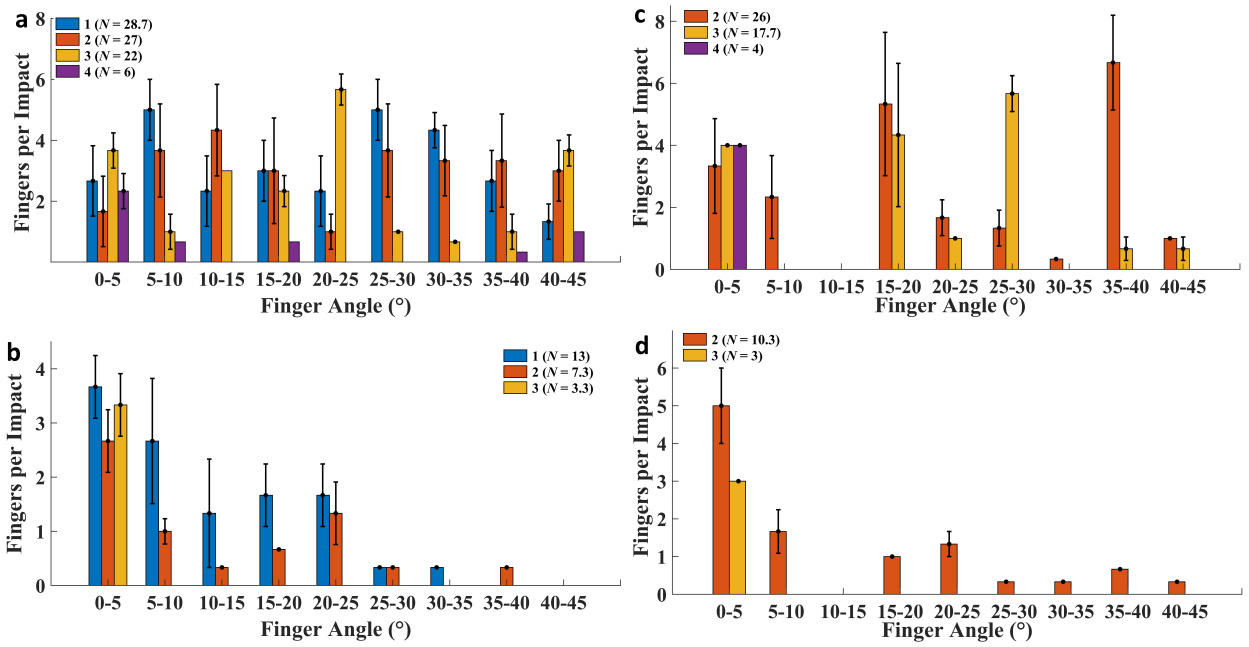

FIG. S13. Angular distribution of fingers at maximum spread for water on surfaces (a) C2 and (b) C4, and for 10 vol % glycerol on surfaces (c) C2 and (d) C4. The legend indicates the drop release point (Table 6 in the main text), error bars indicate the standard deviation over three experiments, and N is the average total number of fingers per experiment.

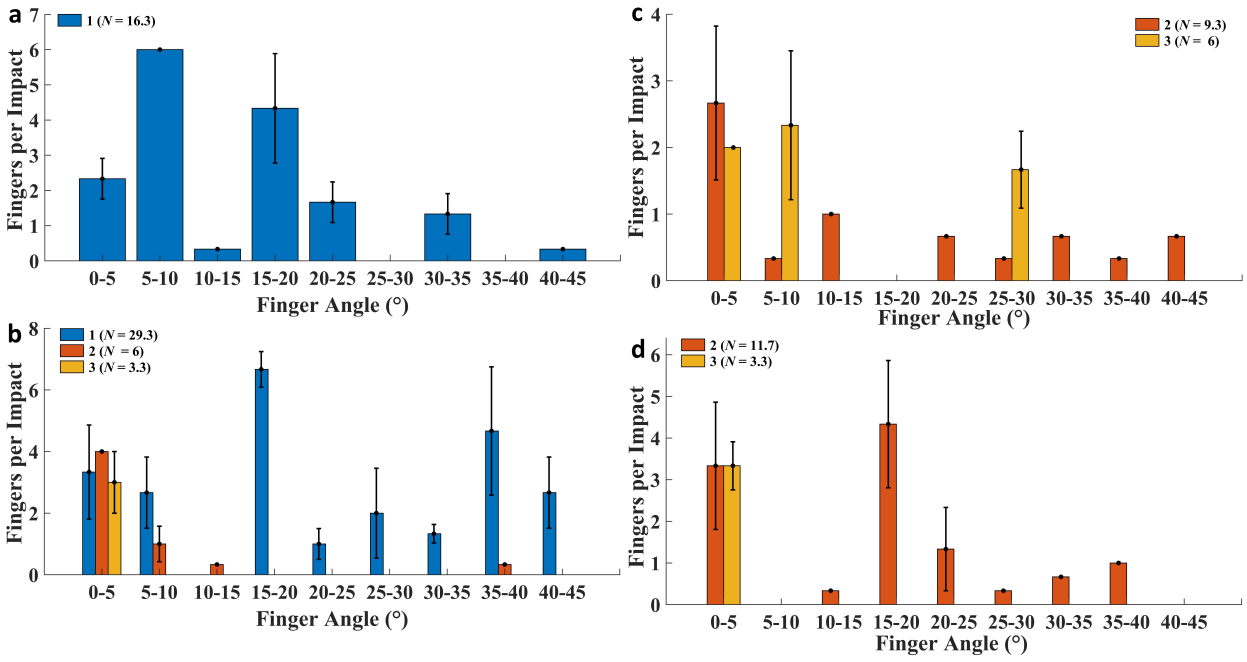

FIG. S14. Angular distribution of fingers at maximum spread for water on surfaces (a) S1 and (b) S2, and for 10 vol % glycerol on surfaces (c) S1 and (d) S2. The legend indicates the drop release point (Table 6 in the main text), error bars indicate the standard deviation over three experiments, and N is the average total number of fingers per experiment.

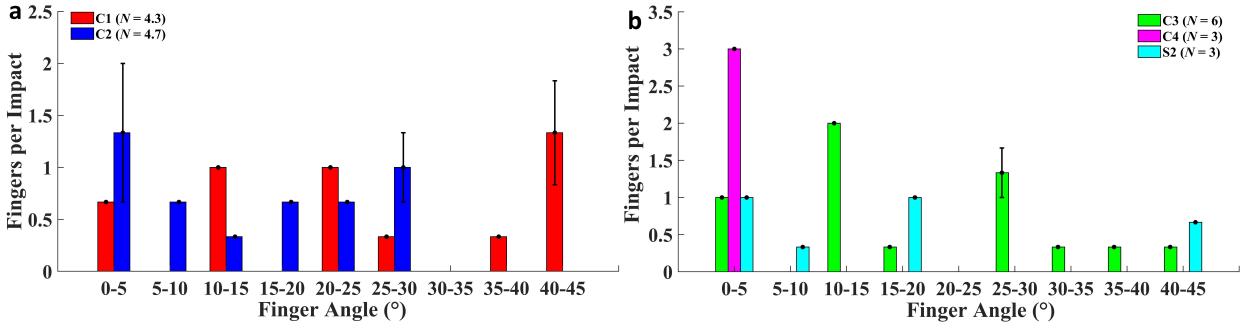

FIG. S15. Angular distribution of fingers at maximum spread for 0.05 wt % carbopol droplets falling from drop release point 2 on surfaces (a) C1, C2 and (b) C3, C4, and S2. The error bars indicate the standard deviation over three drop impact experiments, and N is the average total number of fingers per experiment.