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Manuscript ID: LX16432

Title: Catastrophic phase inversion in high-Reynolds number turbulent Taylor–Couette flow

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Referee A

We thank the referee for her/his comments which had been very helpful for us. We will reply to each of her/his questions separately:

This paper concerns the behaviour of an oil-water emulsion in a Taylor-Couette apparatus. Using experiments, the paper demonstrates that the viscosity of such can be much larger or smaller than the viscosity of either fluid. The viscosity was also observed to undergo hysteresis. The change in viscosity was linked to the size of the droplets in the emulsion. The figures are good and are clearly explained. I do not find the paper suffers from the short form required for the journal - I found I fully understood the experiment and the results without having to refer to the supplemental material. The writing is very clear and the paper was straightforward to read. This is an excellent paper, clearly written, and of broad interest. I would support it's publication subject to minor corrections, detailed below. This re-search is of fundamental importance and also of broad practical interest, given the ubiquity of emulsions in food and oil production. The substantial increase and decrease in viscosity is surprising and of clear practical value. The fact that existing theories do not explain the droplet sizes is an exciting detail, opening up new avenues for research. I would say that this paper is "of singular appeal to all physicists" and "substantially advances the field".

Response:

We thank the referee for the high praise of our work. We will answer the questions from the referee below.

1

I suggest removing the two occurrences of the word "obviously" (it is my opinion that if something is obvious you do not need to say it). I do not think the sentences need it.

Response:

We agree with the referee and removed the two occurrences in the revised manuscript.

2

"the" is misspelt as "te" on page 2.

Response:

This typo has been corrected in the revised manuscript.

3

*“which opens ways to major drag reduction for the transport of emulsions” should be
“which opens ways to achieve major drag reductions for the transport of emulsions”*

Response:

We have changed the sentence in the revised manuscript according to the suggestion by the referee.

4

“is also highly relevant for in the transport and mixing of emulsions,” should be “is also highly relevant to the transport and mixing of emulsions,”

Response:

We changed this sentence in the revised manuscript according to the suggestion by the referee.

We thank the referee for her/his critical comments which had been very helpful for us and that have enhanced the manuscript.