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

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Referee B

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:

1

This letter describes experimental studies of catastrophic phase inversion of oil-water dispersions in a Taylor Couette cell at turbulent flow. The effective viscosity of the dispersion at varying oil phase fractions is calculated from torque measurements. Drop sizes obtained with a microscope during the operation of the Taylor-Couette cell were measured and related to the phase inversion phenomenon.

The paper is well written and argued. The data is very interesting while the important findings of increased or decreased effective viscosity relative to the single phases, depending on the volume fraction is potentially very useful. The paper can be published provided the authors clarify the following:

Response:

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

2

In p. 4, 2nd column it is argued that the Hinze length scale is between 770 and 890 nm. Can the authors clarify what properties (density, viscosity) were used to estimate these values? Were the calculations done for example based on the oil properties for the oil continuous dispersion? Why is this estimate ‘symmetric’?

Response:

We erroneously had used the density of the mixture (ρ) in the Hinze equation, while it should be the density of the continuous phase. The force balance that Hinze derived balances external pressure forces (with density ρ_{cont}) with the interfacial tension forces (proportional to γ). We have now corrected this error and modified the equation to explicitly reflect this. We have recalculated d_{Hinze} just before and just after the jump, these numbers are now slightly different, but does not change the message of the story. We thank the referee for spotting this mistake.

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