Comment on Šperka, P., I. Křupka, M. Hartl (2014). “Evidence of Plug Flow in Rolling–Sliding Elastohydrodynamic Contact.” *Tribology Letters* 54(2): 151–160

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The authors were excited to see the recent paper by Šperka et al. (2014) as it seems to confirm recent findings in our own recent works [1–3]. The plug flow mechanism is important to explain the traction in elasto-hydrodynamic lubrication (EHL) contacts with and without nanoparticles. Although in our paper we do not explicitly call the mechanism plug flow for the case without particles, we do show that there is localized shear near the surfaces. This is essentially the same mechanism and just described differently. The presence of nanoparticles can further enhance the effect by forcing an intermediate lubricant layer to follow the nanoparticle as a plug. Using molecular dynamics, we showed that this could happen with and without the nanoparticles (i.e., for conventional fluids or lubricants and nanofluids), if the film is sufficiently thin. The authors originally investigated this when our experimental measurements with the nanofluid resulted in friction coefficients that were lower than expected in the EHL regime. There are also other differences between the work by Šperka et al. (2014) and ours. For instance, they use the particles in a controlled experiment to trace the velocity

profile, while in our paper, the particles enhance the mechanism. The geometry, surface material, lubricant composition, and operating conditions may also be different between the two works, but the observed mechanism is still very similar.

References

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