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Ribbing in lubricated contacts : stability analysis & simulations

jeudi 10 juillet 2025 16:00 (20 minutes)

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Friction and wear in moving machine parts affect performance and lifespan, making lubrication essential for efficiency. So, in many applications, thin film lubrication studies help conserve resources, reduce pollution, and save energy.
Lubricated contacts can often be simplified to ball-on-a-plate set-up. Here, the sphere deforms elastically, and lubricant pressure spikes before dropping sharply to ambient pressure, creating conditions for cavitation bubbles. This air/vapor pocket, less viscous than the lubricant, can develop a Saffman-Taylor (ST) instability at the gas-lubricant interface, producing intricate interface corrugations around the bubble and in the wake of the rolling sphere which might perhaps explain oil loss in internal combustion engines.
As part of a joint-effort between two broad themes of wide academic and engineering interest, namely, Tribology studied at the small scale by LTDS (ECL), and Fluid Mechanics of large-scale inertial Two-Phase flows studied at LMFA (UCBL), the intern will study the role of pressure-dependent viscosity in the destabilization of the gas/lubricant meniscus which leads to ribbing. This is key part of a larger tribological puzzle : interface corrugations, and film rupture around the cavitation bubble in complex lubricated contacts. Results will be compared with existing experimental observations and DNS results (Basilisk flow solver).

Master

Mécanique

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