Title : Asymptotic analysis of a micropolar fluid flow in a very thin domain with multiscale oscillating roughness.

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Abstract: We consider an unsteady micropolar fluid flow in a two-dimensional thick domain Ω^{ϵ} with multiscale oscillating roughness. More precisely, the thickness and the roughness of the fluid domain are described by multiple separated scales of periodic oscillations i.e. $\Omega^{\epsilon} = \{ (z_1, z_2) : 0< z_1<L, 0< z_2 < h^m h^{\epsilon} (z_1) \}$ with $h^{\epsilon} (z_1) = h(z_1, \frac{z_1}{\epsilon}, \dots , \frac{z_1}{{\epsilon}^m})$, $0 < \epsilon <<1$ and $m \ge 2$. Furthermore the velocity field is assumed to satisfy a fluid-solid interface law of friction type.

The existence and uniqueness of a solution is established. Then the asymptotic behavior of the solution as ϵ tends to zero is studied by using the multiscale convergence method for reiterated homogenization leading to non-standard divergence free conditions for the limit velocity. Finally the well-posedness of the limit problem is derived.