Comparisons of numerical methods for yield stress fluids in complex geometry

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The Bingham model is among the most popular models for the simulation of yield stress fluid flows. However the lack of smoothness of the resulting equations makes it numerically challenging to compute precise interfaces between the fluid and rigid zones, which are the crucial features of such flows. While the community has been considering regularized models for a long time in order to circumvent this difficulty, state-of-the-art methods now use the exact non-smooth equations formulated as variational inequalities, despite the numerical cost of their resolution.
In this talk, we compare different optimization methods to solve this problem, namely the well-known Augmented Lagrangian method - the first optimization method introduced in this context to solve the exact model - and the more recent proximal method FISTA - introduced for yield stress flows less than a decade ago. The compromises between precision and speed for the different methods are discussed, as well as details on the practical implementations, in particular the choice of the convergence criteria.

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