METHOD OF STRAIGHT LINES FOR A BINGHAM PROBLEM
AS A MODEL FOR THE FLOW OF WAXY CRUDE OILS

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Abstract. In this work, we develop a method of straight lines for solving a
Bingham problem that models the flow of waxy crude oils. The model describes
the flow of mineral oils with a high content of paraffin at temperatures below
the cloud point (i.e. the crystallization temperature of paraffin) and more
specifically below the pour point at which the crystals aggregate themselves
and the oil takes a jelly-like structure. From the rheological point of view
such a system can be modelled as a Bingham fluid whose parameters evolve
according to the volume fractions of crystallized paraffin and the aggregation
degree of crystals. We prove that the method is well defined for all times, a
monotone property, qualitative behaviour of the solution, and a convergence
theorem. The results are compared with numerical experiments at the end of
this article.

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