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On non-Newtonian Fluid Flow with Leak Boundary Condition of Frictional Type

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Abstract: We study the stationary Navier–Stokes equation in a bounded domain modelling a flow of the inhomogeneous viscous incompressible non-Newtonian fluid with a non-polynomial growth under the subdifferential leak boundary condition. The weak formulation of the fluid flow problem is a hemivariational inequality associated with a nonconvex nonsmooth locally Lipschitz superpotential. The existence of a solution is shown through an abstract result on existence of a solution to a subdifferential operator inclusion and a hemivariational inequality in a reflexive Orlicz–Sobolev space. Uniqueness of the solution and its continuous dependence on the density of external forces are established. Furthermore, we demonstrate the sensitivity of the solution set of the fluid flow problem with respect to perturbations of the superpotential.