FINITE ELEMENT COMPUTATIONS OF HYDRO MECHANICAL COUPLED PROBLEMS USING A LOCAL SECOND GRADIENT MODEL

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Soils and rocks are mainly porous materials filled by a fluid. It is very important then to study numerically hydromechanical problems. This has been extensively done in the past and this presentation is not intended neither to give new results within this field nor to discuss general equations (general means here taking into account non saturated cases).

However, when highly strained, geomaterials exhibit clear localized ruptures, this phenomena has been extensively studied especially when the geomaterial is assumed to be a monophasic material. In this case, it is well known that in order to properly compute post localized paths it is necessary to use an enhanced model. Many enhancements have been proposed and studied. We will use here the so called local second gradient model.

The main assumptions of this work are the following. We are dealing with quasi static problems (this means that all inertia terms are neglected). The porous skeleton is assumed to be filled of one fluid. The geometrical effects are taken into account (which means that for the skeleton the current configuration is different from the reference one). The constitutive equation used for the skeleton is an hypo elasto plastic model.

The theory of local second gradient model is extended and then applied in a hydromechanical coupled problem, in the case of fully saturated geomaterials. The corresponding finite element method taking into account the geometrical non linearities is detailed. Preliminary results using the finite element code developed in this context are then discussed. They deal with post localization modelling.