Weak Solution of a Nonlinear Stochastic Model

M. L. Hadji*
Laps, Badji Mokhtar University, BP12 23000 Annaba(Algeria)

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Abstract

In our work, we are interested in the study of fluid-saturated porous media, subject to a random disturbance when the phenomenon of consolidation is realized[1, 2]. The study of poroelastic properties or the problem of acoustic wave propagation in saturated porous media (e.g. oil exploration)[4, 6].

$$\begin{cases} \rho\partial_t^2 u - \lambda^*\partial_t\partial_x^2 u - (\lambda+2\mu)\partial_x^2 u - \mu^*\partial_x(|\partial_x u|^{q-2}\,\partial_x u) + \alpha\partial_x p = f + dW \\ c_0\partial_t p + \alpha\partial_t\partial_x u - k\partial_x^2 p = h \end{cases}$$

We solved a system of two PDEs in a bounded domain, modeling the velocity and pressure, the first equation has a non-linear part and another random part. A weak solution has been found in the space $H_0^1(\Omega)\cap H^2(\Omega)$ by the principle of the resolution of an EDS trajectory path[5]. Velocity and pressure were approached numerically by the Euler method for time and finite difference for the variable space, while respecting the numeric condition (CFL)[3].

References

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*ml_hadji@yahoo.fr

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