**TITLE: Stochastic velocity modeling of Magneto-Hydrodynamics Non-Darcy flow between two stationary parallel plates**

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**ABSTRACT:**

A stochastic model for the Magneto-Hydrodynamics (MHD) of a non-Darcy flow between two parallel plates has been presented in this paper. This is due to the significant importance and the wide range applications of such fluid along with the need for more real-life representative models, which are relatively few in the literature. The introduced novel model considered the included uncertainties in all parameters where a general numerical solution was derived using the Stochastic Finite Difference method based on Homogenous Chaos expansion (SFDHC). Four cases were studied in the investigation; stochastic medium porosity, stochastic Hartmann number, stochastic Forchheimer number, and stochastic pressure gradient. In each of the cases mentioned, the probability density function (PDF) of the resulting stochastic flow velocity was derived and evaluated concerning their mean and Standard Deviation (SD). In addition, the results in all of the four cases were further validated with the corresponding Monte Carlo Simulation (MCS) showing strong conformity. Moreover, the results of the model solution were tabulated and plotted using two common values for each parameter and a Gaussian stochastic process with 10% coefficient of variation for the uncertain one. Consequently, the velocity mean, SD and approximate range varied between $(٠.٨١٧٥, 0.8204)$, $(٠.٠٠١٨, ٠.٠٥٧٣)$, and $(٠.٠١٤٤, ٠.٤٨٨١)$ respectively. The results showed also that the largest effect of the uncertain parameters on the fluid velocity is caused by; the pressure gradient, the medium porosity, the Hartmann number and the Forchheimer number respectively. Furthermore, the results of this study provide the required uncertainty quantification for the problem under consideration.