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Meshless Method for Solving Fixed Boundary Problem of Axisymmetric Plasma Equilibrium RYOTA IMAZAWA, YASUNORI KAWANO, KIYOSHI ITAMI, Japan Atomic Energy Agency — This study is to solve Grad-Shafranov (GS) equation with the fixed plasma boundary by utilizing the meshless method for the first time. The previous studies have utilized the finite element method (FEM) to solve the equilibrium inside the fixed separatrix. In order to avoid the difficulty of FEM (e.g. mesh problem, difficulty of coding, expensive calculation cost, etc.), this study proposes the new method to apply the meshless methods, especially RBF-MFS and Kansa's method to inhomogeneous and nonlinear partial differential equations (PDE). Although the RBF-MFS and Kansa's method are applicable to the inhomogeneous PDE, the application of these methods to the GS equation is not straight-forward. Since the current profile is usually parameterized by the normalized poloidal flux, the inhomogeneous term of the GS equation contains the normalized poloidal flux, not just a poloidal flux. This is the difficulty for solving the GS equation. Accuracy and calculation time of the meshless method and FEM are compared in the condition of the same total number of nodes. The results show that the error of magnetic field obtained by the meshless methods is one hundredth of that by FEM and that the calculation time of the meshless method is one tenth of that of FEM. Moreover, this study shows that the meshless methods can be easily accelerated by parallel computing.

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