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A comparison of boundary element and spectral collocation approaches to the thermally coupled MHD problem. (English) [Zbl 1470.76065]

Summary: The thermally coupled full magnetohydrodynamic (MHD) flow is numerically investigated in a square cavity subject to an externally applied uniform magnetic field. The governing equations given in terms of stream function, vorticity, temperature, magnetic stream function, and current density, are discretized spatially using both the dual reciprocity boundary element method (DRBEM) and the Chebyshev spectral collocation method (CSCM) while an unconditionally stable backward difference scheme is employed for the time integration. Apart from the novelty of the methodology that allows the use of two different methods, the work aims to accommodate various characteristics related to the application of approaches differ in nature and origin. The qualitative and quantitative comparison of the methods are conducted in several test cases. The numerical simulations indicate that the effect of the physical controlling parameters of the MHD problem on the flow and heat transfer can be monitored equally well by both proposed schemes.

For the entire collection see [Zbl 1471.65009].

MSC:
76M15 Boundary element methods applied to problems in fluid mechanics
76W05 Magnetohydrodynamics and electrohydrodynamics

Full Text: DOI

References:

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