





Natural convection inside heated channel of a facility representing prismatic modular reactor core

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Abstract

The newly developed Plenum-to-Plenum facility (P2PF) at Missouri S&T has shown to be an innovative separate effects test facility representing the geometry of prismatic modular reactors. Thermal and velocity fields inside this dual channel facility have been investigated under different natural circulation intensities. It is found that temperature and velocity profiles are function of the measurements locations and the amount of heat supplied to the channel. Quantification of the overall Rayleigh number (Ra) versus overall Reynold number (Re) are found to be related by $Re \propto Ra^{0.58}$. Upper plenum mixing was characterized by determining the modified Reynold number (Re_m) and Froude number ($1/Fr^2$) dimensionless groups. Analysis of these dimensionless groups along with observable turbulence amplifications emphasize relevance of adopting axial temperature