DNS of Buoyancy Driven Flow Inside a Horizontal Coaxial Cylinder

Date:
Tuesday, December 18, 2012
Abstract:

A direct numerical simulation of the buoyancy driven turbulent flow inside a horizontal annular cavity at higher Rayleigh number, Ra = 1.18x109, and the cylinders ratio of 4.87 has been carried out using the commercial code STAR-CCM+. Kinetic energy budgets have been calculated to verify the accuracy of the unstructured finite volume code on polyhedral cells in Direct Numerical Simulation (DNS) mode. Comparison of DNS results with wall resolved Unsteady RANS (URANS) models shows that the later models are able to capture the general flow features but fail to predict the large unsteadiness and high turbulence levels in the plume. However local heat transfer rates along the inner and outer cylinder walls are on average of acceptable accuracy for engineering purposes.

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