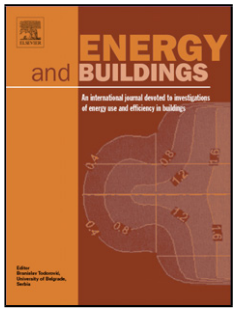

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<AT>Natural Convection Subject to Sinusoidal Thermal Forcing on Inclined Walls and Heat Source Located on Bottom Wall of an Attic-Shaped Space

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<ABS-HEAD>ABSTRACT

<ABS-P>Natural convection within an attic space under diurnal temperature condition on the sloping wall and a heat source located on the insulated bottom wall have been studied to show the basic flow features in the attic space over diurnal cycles. The finite volume numerical method has been employed to solve the governing equations. Effect of Rayleigh number (*Ra*), attic aspect ratio, heater location and its size are discussed on the transient flow pattern and heat transfer phenomenon after grid independency and time interval selection tests with a fixed prandtl number of 0.72 (air). Results are presented as a form of isotherms and streamlines. Also, heat transfer is presented as a form of Nusselt number. The numerical experiments show that, the flow in the attic space is stratified during the daytime heating stage; whereas the flow becomes unstable at the night-time cooling stage.

<KWD>Keywords: Free Convection; Sinusoidal Thermal Boundary Condition; Triangular Enclosure.

<H1>1. INTRODUCTION

Natural convection in enclosures has received extensive study during past two decades due to its prime importance and applications in nature and industry. Various cavities and spaces such as rectangular shapes, annular spaces, cylindrical cavities and so on, subjected to different thermal and moving boundary conditions have been investigated employing useful working fluids like water, air and etc. The comprehensive review and discussion about the researched topics can be found in [1-12]. However it is important to note that models attributed to rectangular cavities can't estimate the complete buoyancy driven flow within geometries with variable or sloping boundaries. Though the topic of natural convection within rectangular cavities has been studied for more than two decades, free convection inside triangular spaces or attic shaped regions, which can be found in many geophysical environments have received less attention.

Attic spaces existing in many buildings expose to different thermal boundary conditions during a day time dependent on the climate situation. Therefore, the natural convection process within the space should be precisely revealed. Since the thermal and fluid flow