The Southwest Mechanics Lecture Series

at

Texas A&M University

THE SPATIAL STRUCTURE OF TURBULENT RAYLEIGH-BENARD CONVECTION

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Date: **Wednesday 23 April 2003**
Time: **4:00 p.m.**
Location: **Room 110 Civil Engineering Building**

The structure of convection between horizontal planes at Rayleigh numbers in excess of 10^9 has been studied using stereoscopic PIV to characterize the complete four-dimensional spatial correlation tensor. Analysis by proper orthogonal decomposition reveals two distinct modes of motion: large-scales in the form of random cells spanning the entire depth, and small-scales in the form of thermals. The eigenvalue spectrum shows that the large scales contain well over half of the turbulent kinetic energy. PIV movies reveal how the large scales interact with the small scales in a closely coupled manner. Lastly, it is shown, using averaging times in excess of 400 hours, that the large-scale "wind of turbulence", which has been proposed by others to exist in the mean, actually averages to zero, given sufficient averaging time.

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