Geophysical Research Abstracts,
Vol. 10, EGU2008-A-07569, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-07569
EGU General Assembly 2008

Intermittency and structure function of turbulent jets

E. Sekula, J. M. Redondo

Departament de Física Aplicada, Universitat Politécnica de Catalunya, Barcelona, Spain

Present work shows some results of research on turbulent jets and plumes, their structures and effects occurred in different configurations (free jet, wall jet, 'bubbly' jet). The proposed work is based principally on experiments. We discuss here in summary the series of detailed experiments that have been performed in laboratory utilizing visualizations methods (Particle Image Velocimetry) and Acoustic Doppler Velocimeter measurements of turbulence parameters in order to obtain a basic understanding of the turbulence phenomenon. Experimental techniques have developed very fast so we can use these new technologies that will increase our experience, even repeating some classical experiments under improved techniques. We aim to understand the behaviour of turbulent jets incorporating the recent advances in non-homogeneous turbulence, structure function analysis, multifractal techniques and extended self-similarity. One of the used configurations is the turbulent wall jet that occurs often in several environmental and industrial processes such as aeronautics design, heating, cooling, ventilation and environmental fluid dynamics. Other one is a 'bubbly' jet, a kind of jet 'filled' with bubbles. We used also two kinds of jet's sources with different Reynolds numbers. Results contain both measured (mean and fluctuation velocities, velocity amplitudes, signal-noise-ratio, etc.) and statistical values obtained with available and individually created programs (correlations, covariance, kurtosis, standard deviation, skewness) or turbulence intensity. We focus special attention on correlations and structure function which are helpful for energy distribution analysis. It is interesting to investigate the intermittency - the deviation of Kolmogorov K41 theory taking into account non-homogeneity, non isotropy and to use Extended Self Similarity (ESS) and the third order structure functions to investigate the scale to scale transfer of energy. The thorough examination of the performed results allow us to confirm the adaptation of measurement methods.