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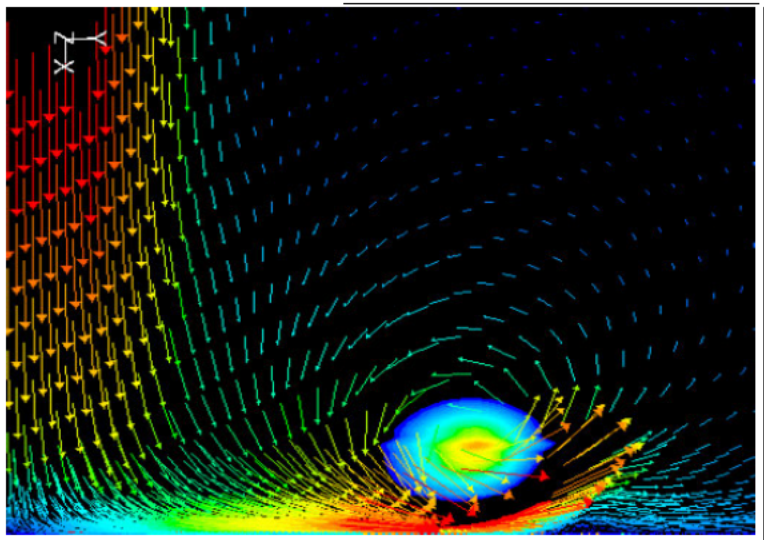
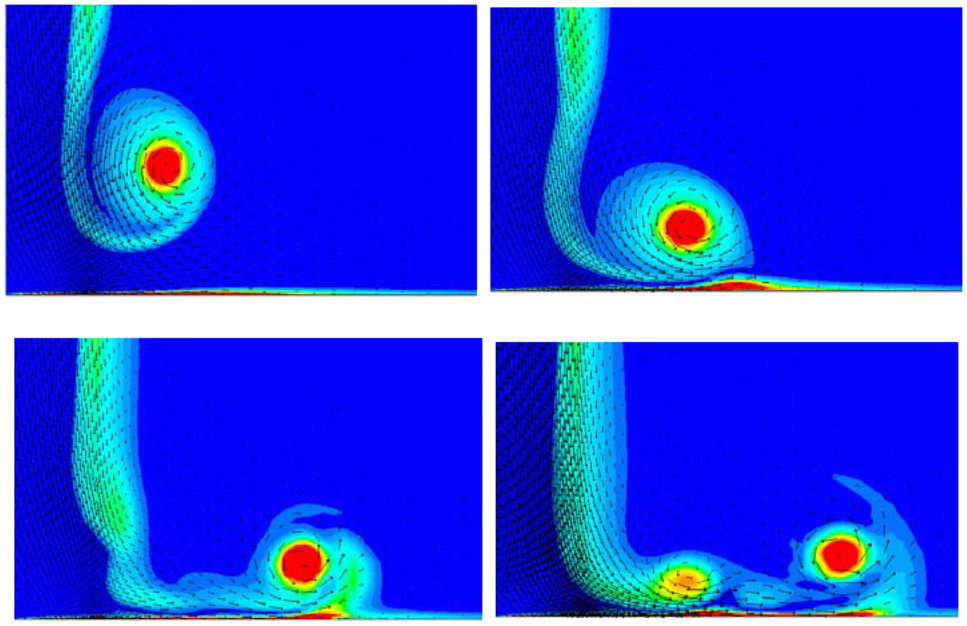
Downburst Simulations

Summary

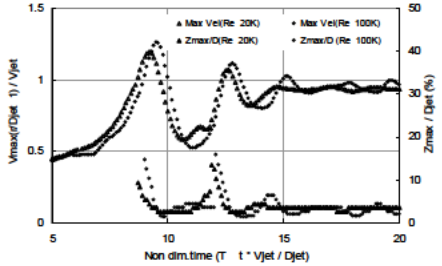
Downbursts are jet-like flows originated from a thunderstorm cloud-base and impinging on the ground surface generating short duration surface high intensity winds.
Numerical, laboratory and analytical modeling of impinging jets were conducted to determine the generic macro-flow dynamics of these winds. It was shown that the velocity profiles resulting from such events are different from straight boundary layer winds. The maximum velocity is encountered approx. at one jet diameter radially and very close above the surface.
The flow is Reynolds number dependent up to a critical regime above which the surface roughness becomes the dominant parameter.



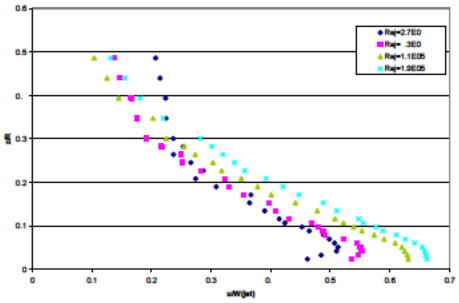


Downburst dynamics: Snapshots of Vorticity contours and Velocity Vectors

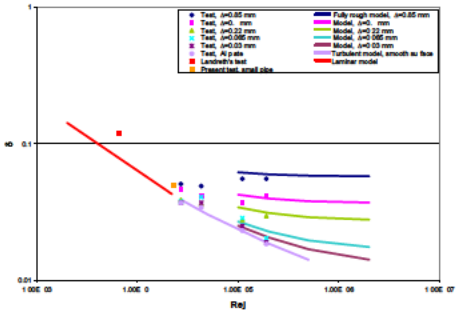
Large Impinging Jet Facility



Velocity Magnitude and Position vs. Time



Radial Velocity Profiles: Re dependency



Surface Layer Depth vs Re and Roughness