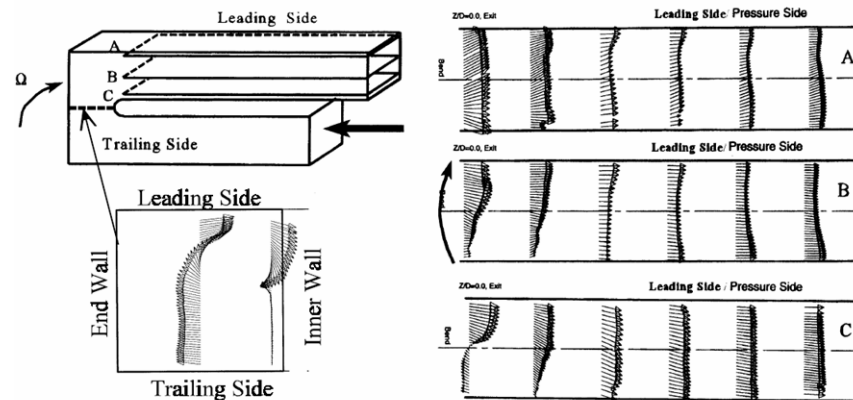
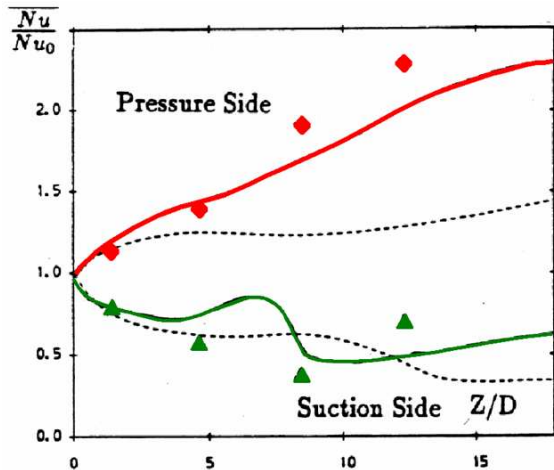


Computational Research: Blade Cooling

Stationary U-Bend

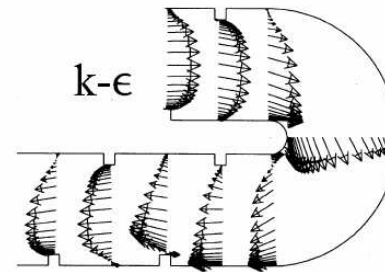
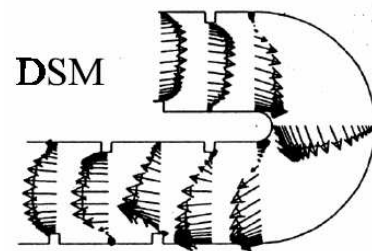
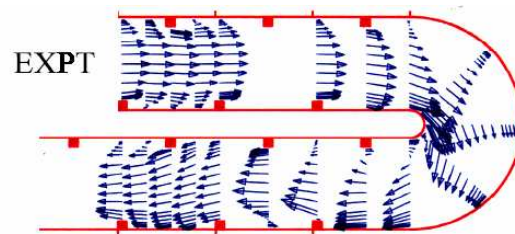
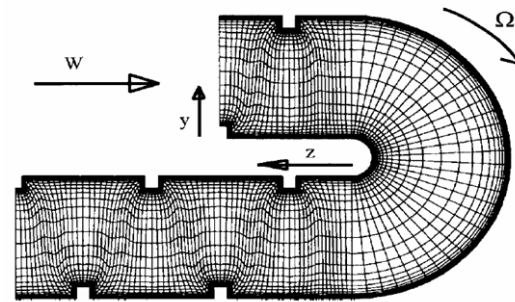
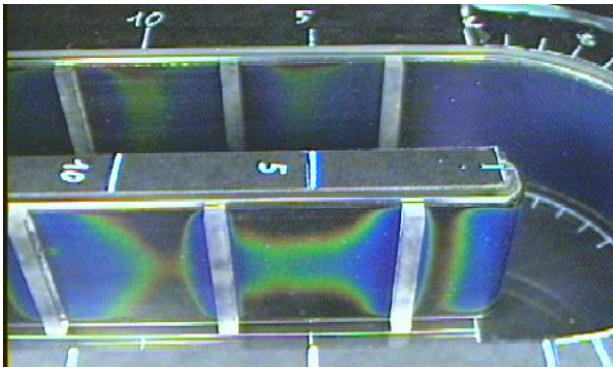


Rotating Duct & Rotating U-Bend



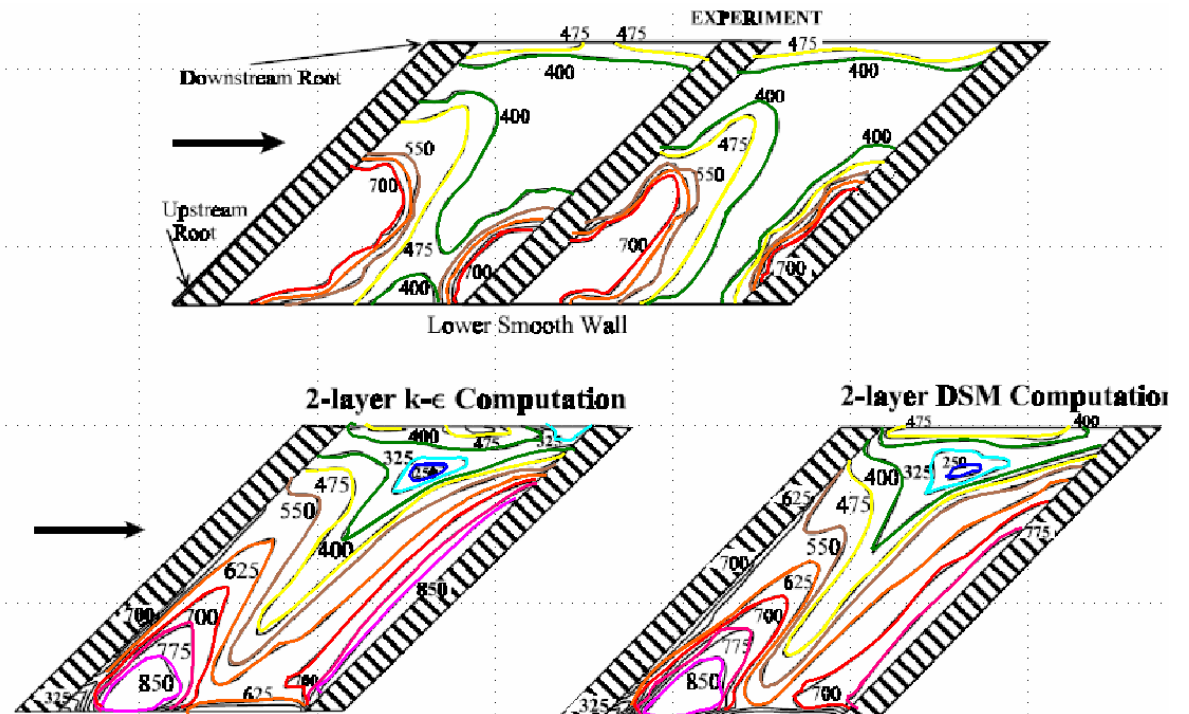
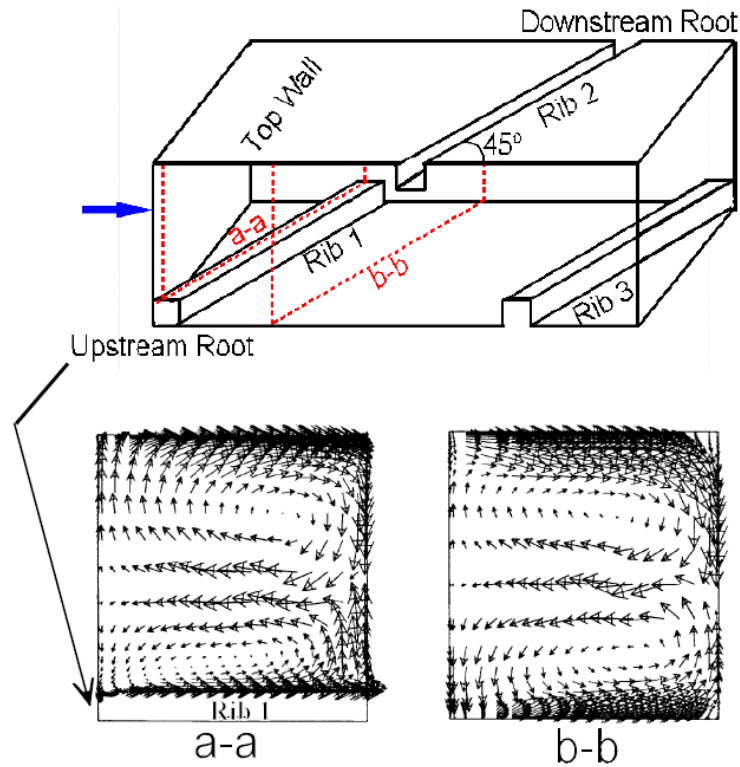
Computational Research: **Blade Cooling**

Ribbed U-Bend



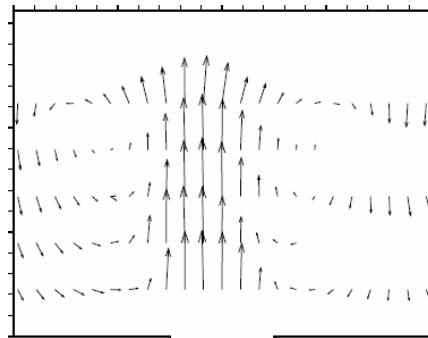
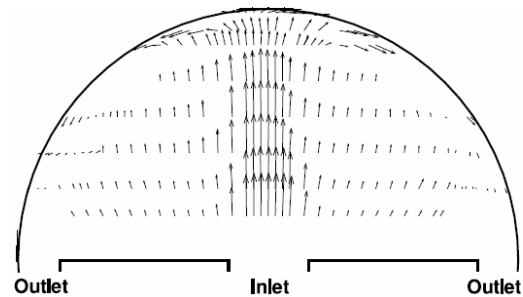
Computational Research: **Blade Cooling**

Duct with Inclined Staggered Ribs



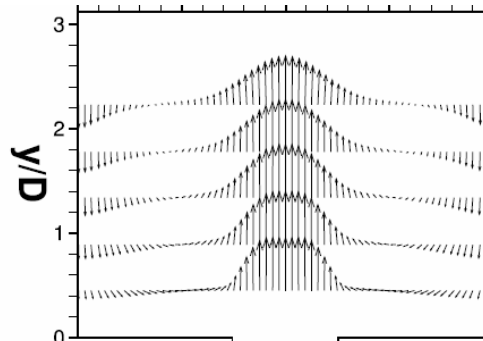
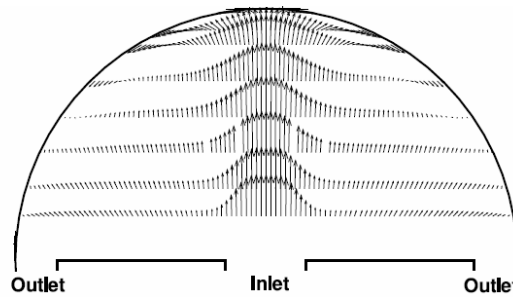
Computational Research: **Blade Cooling**

Impingement Cooling – Velocity Comparisons



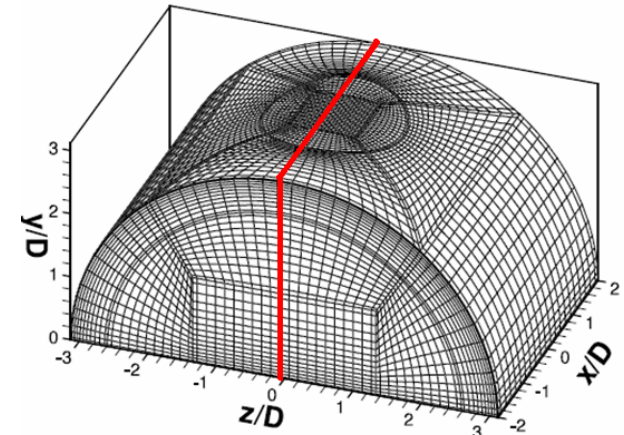
Inlet

Experiment



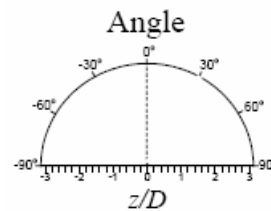
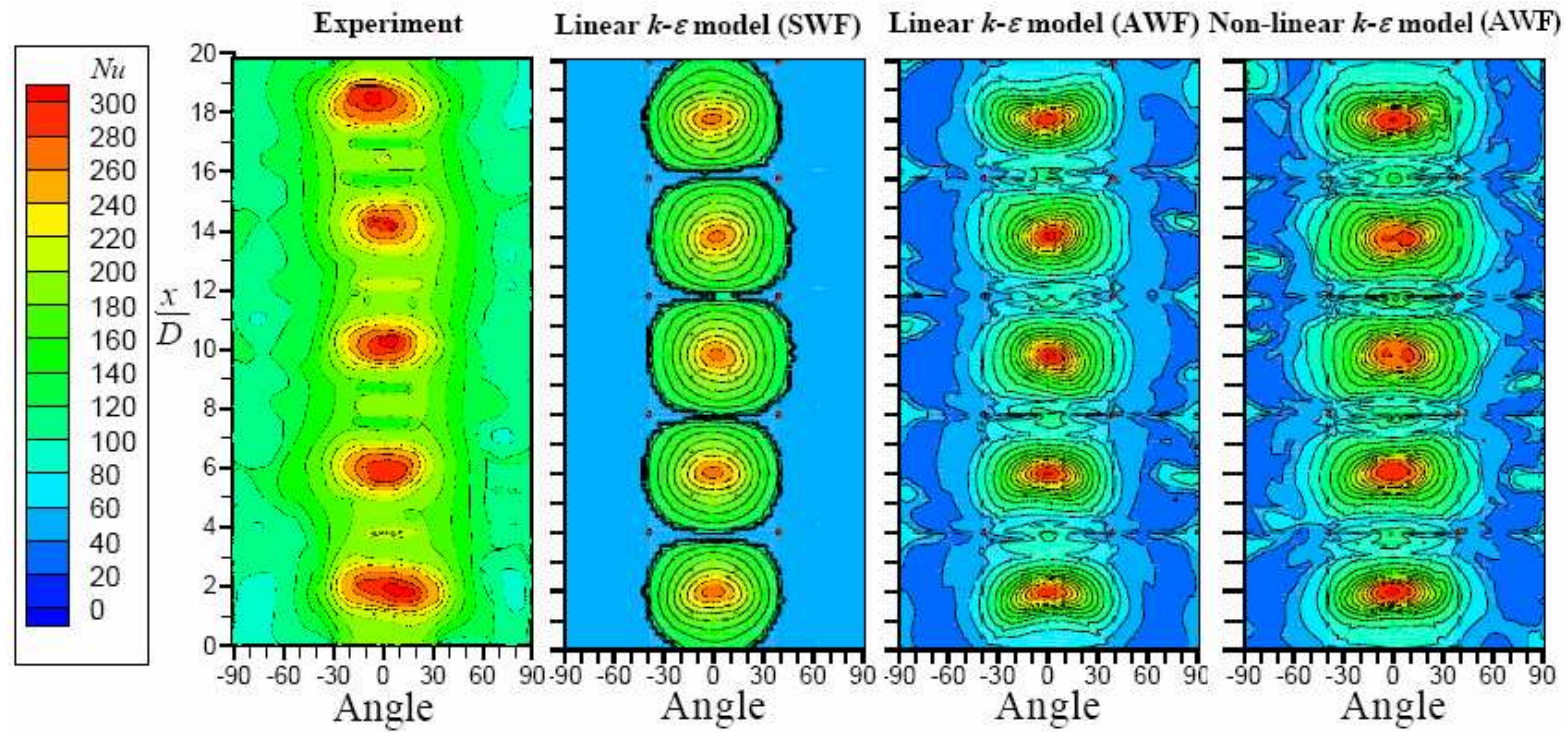
Inlet

Computations



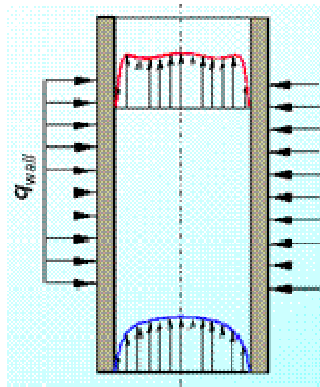
Computational Research: **Blade Cooling**

Impingement Cooling – Local Nusselt Number

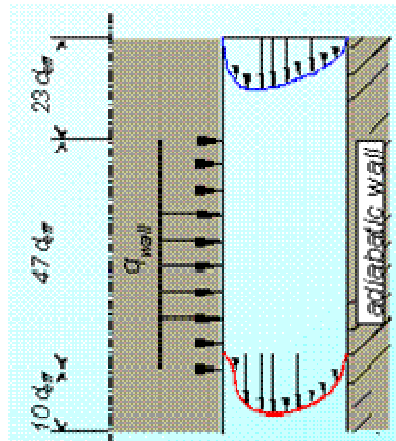


Computational Research: Nuclear Power Plants

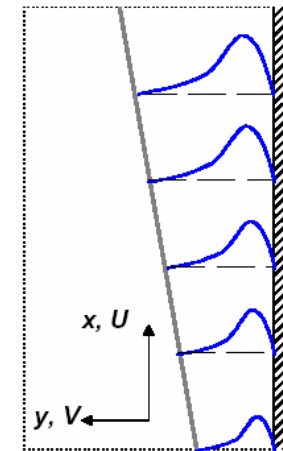
Buoyancy Assisted



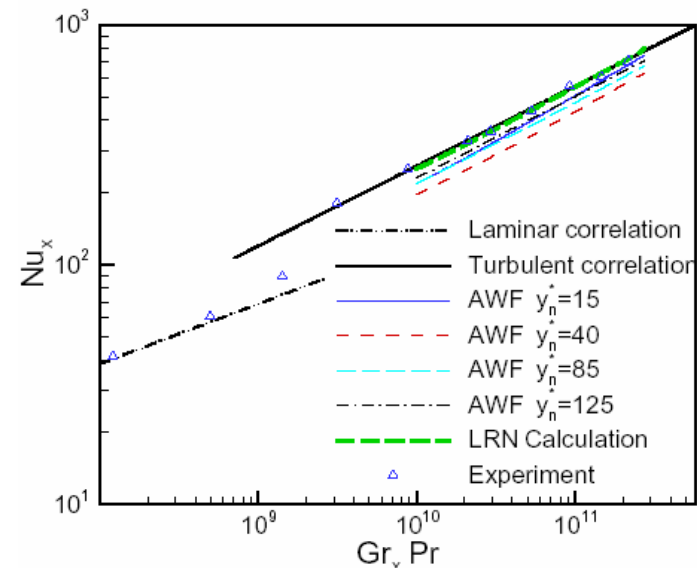
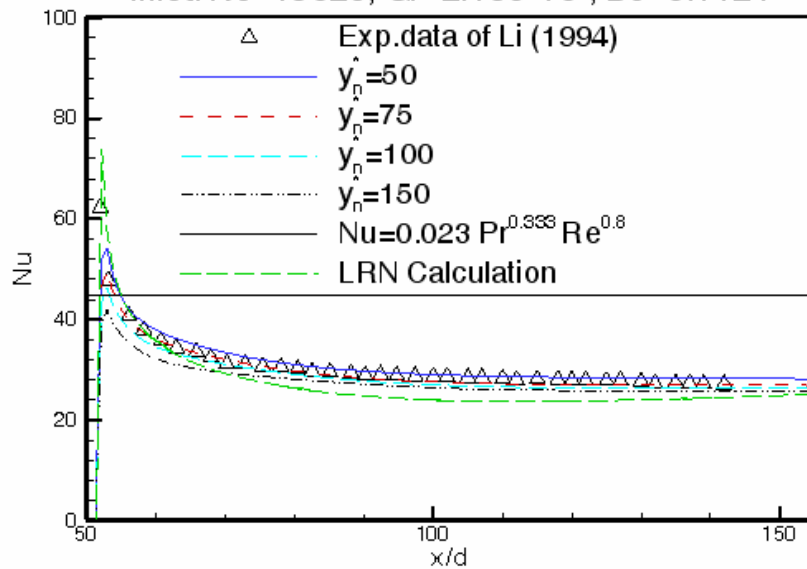
Buoyancy Opposed



Natural Convection

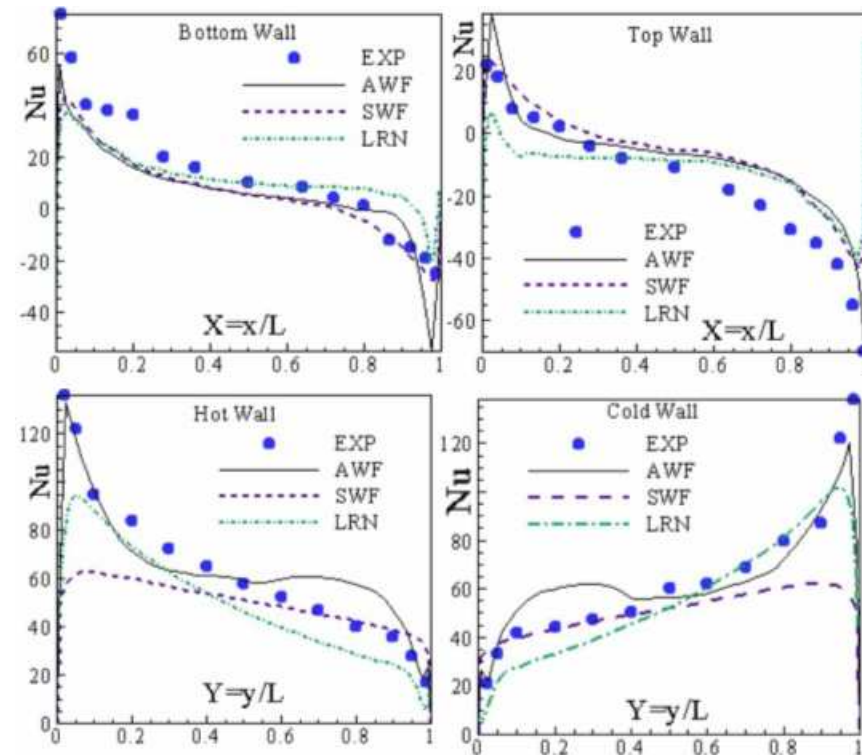
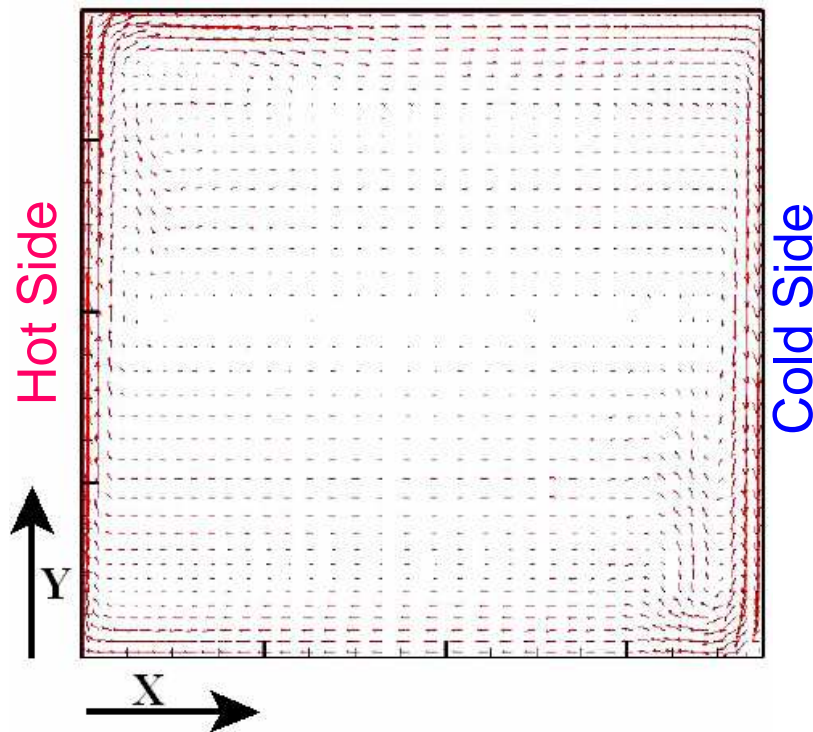


Inlet: $Re=15023$, $Gr=2.163 \cdot 10^8$, $Bo=0.1124$



Computational Research: Nuclear Power Plants

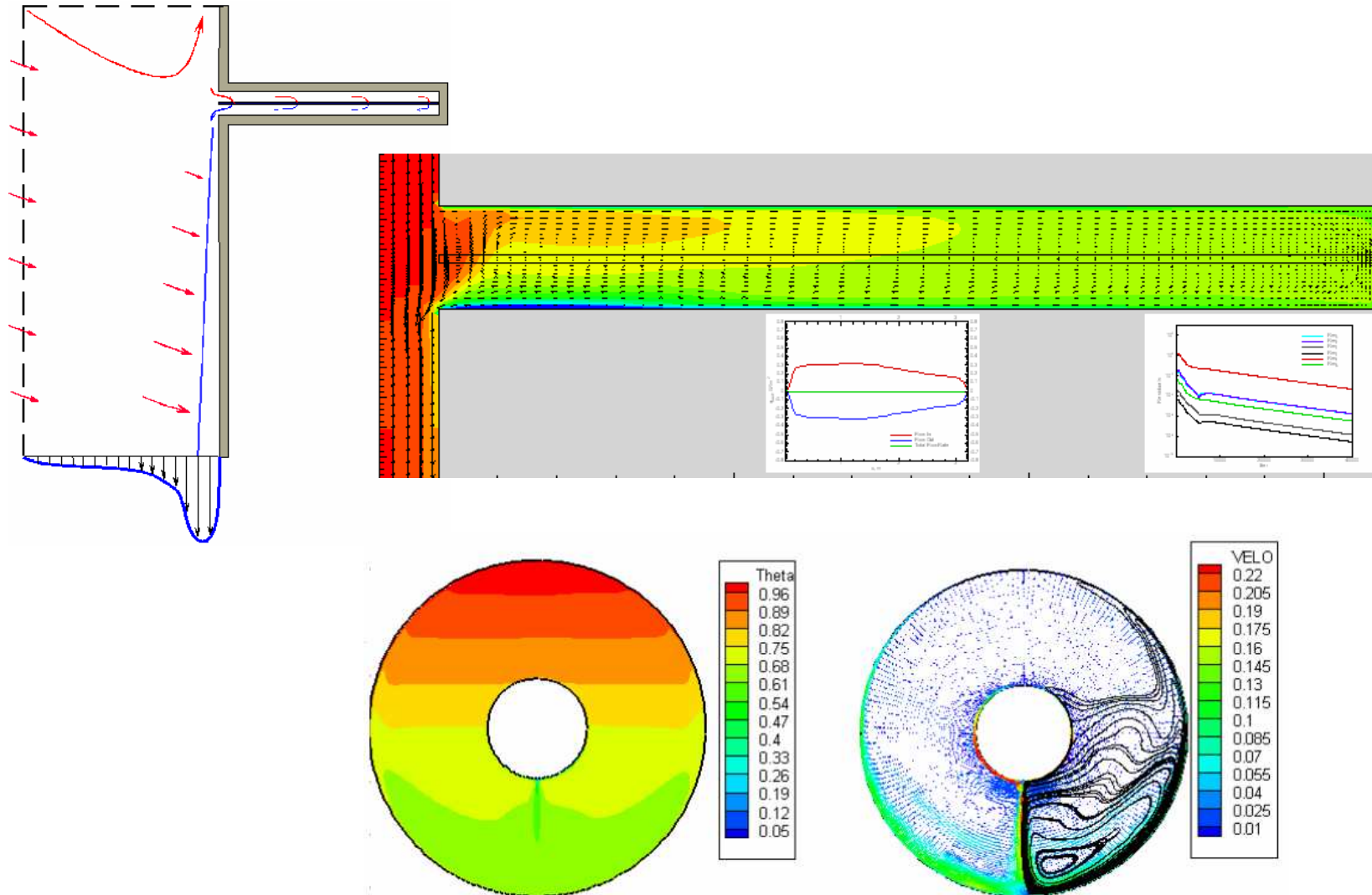
Comparisons of Local Wall Heat Flux rates



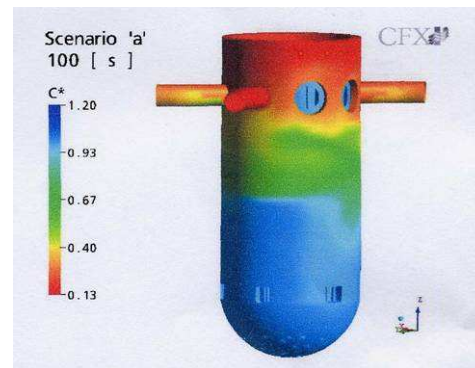
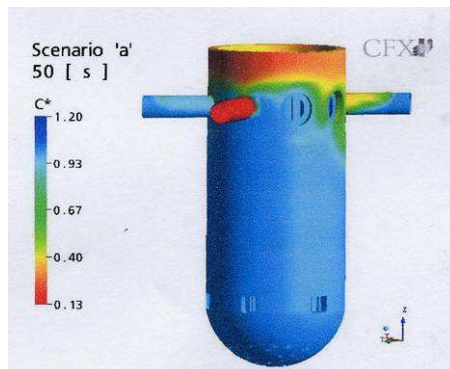
Buoyant Flows in Square Cavities

Computational Research: **Nuclear Power Plants**

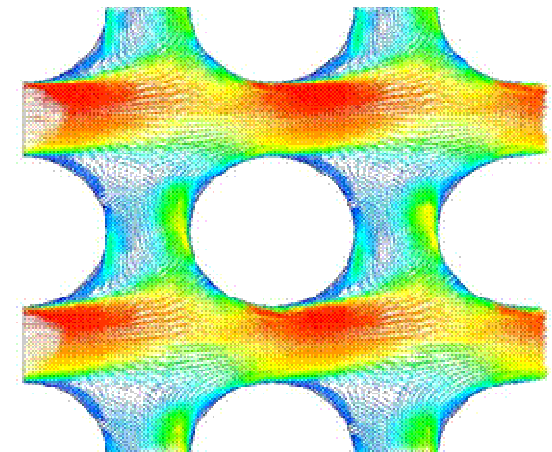
Buoyant Flows in a Horizontal Penetration Cavity



Computational Research: **Nuclear Power Plants**



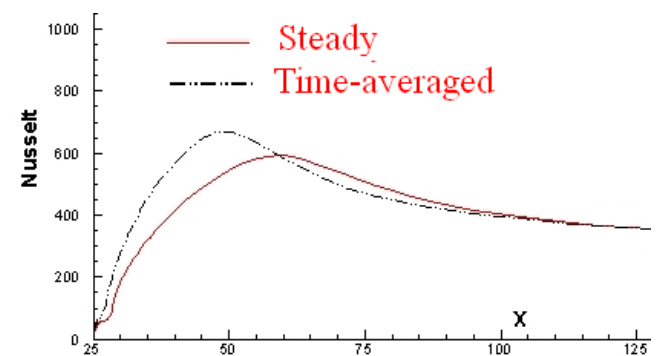
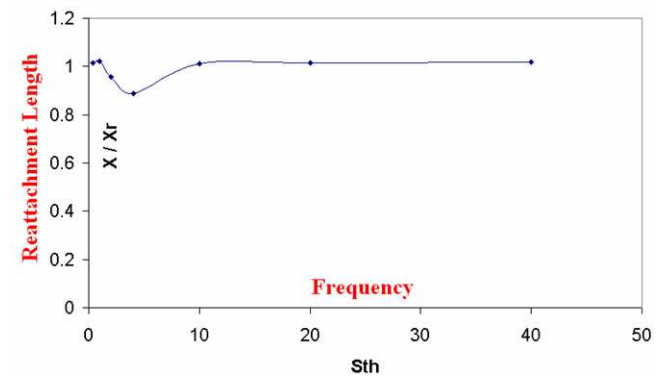
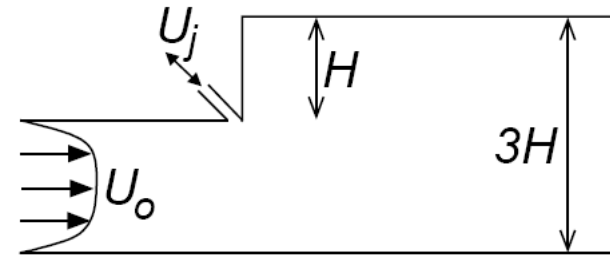
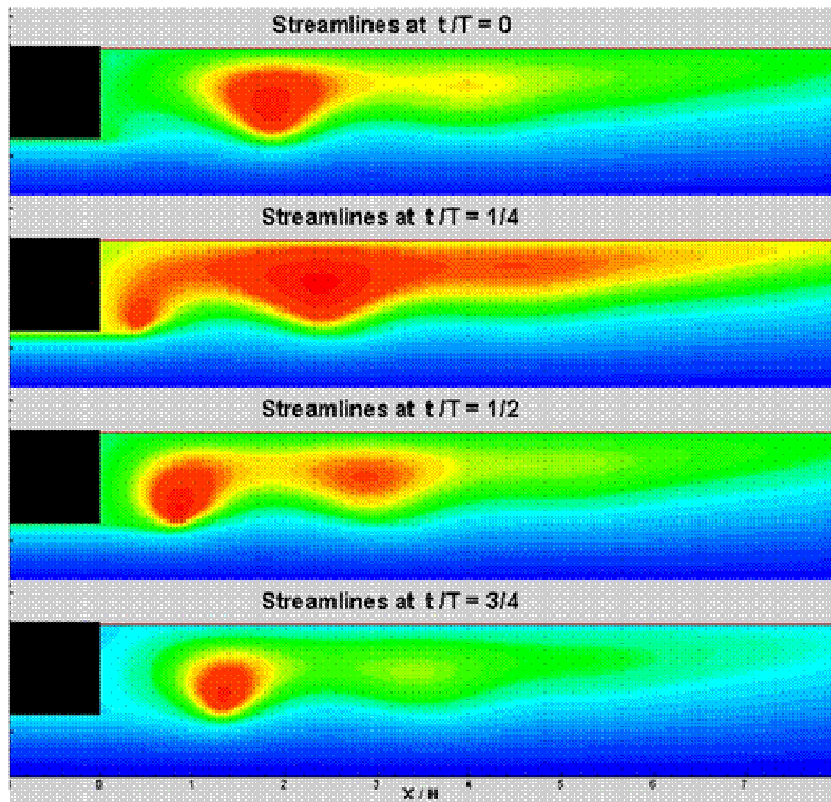
Relatively warm and low-borated water injected from a single cold leg into the downcomer of a PWR



Large Eddy Simulation of flow across in-line tube bundles.

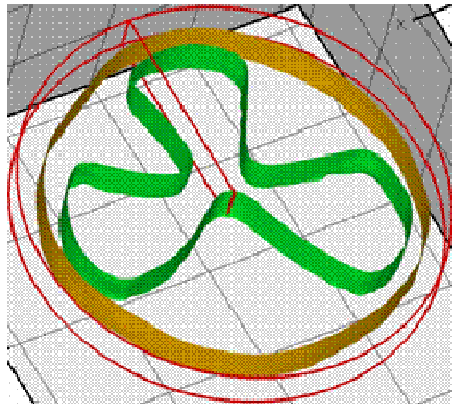
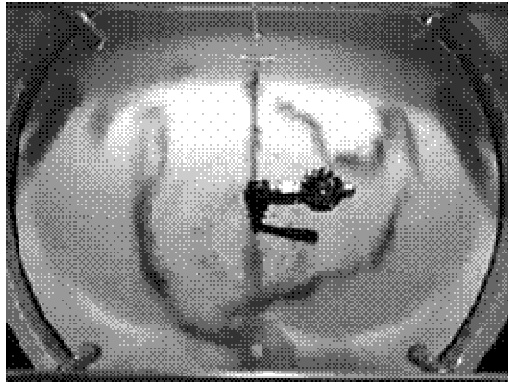
Computational Research: **Turbulence**

Pulsating Flows

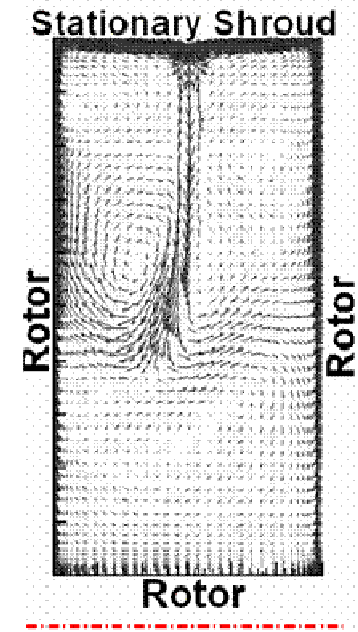


Computational Research: **Rotating Cavity Flows**

Three-Dimensional and Unsteady Turbulent Flows



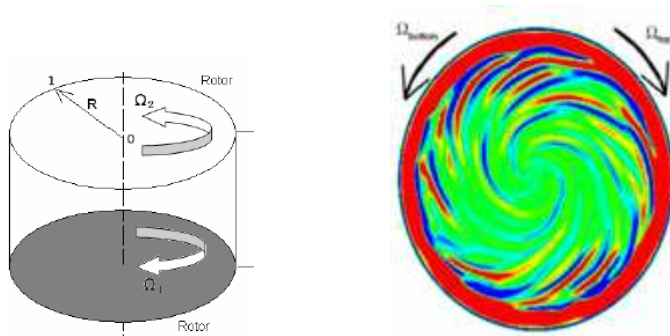
Rotor-Stator Flow Computation



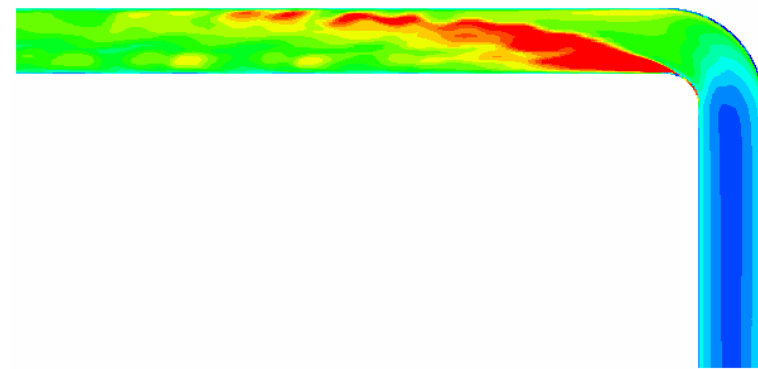
2-D Time-Dependent Computation
Of Co-Rotating Cavity

Computational Research: **Turbulence**

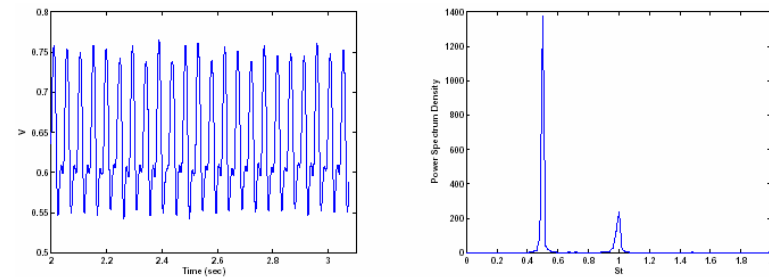
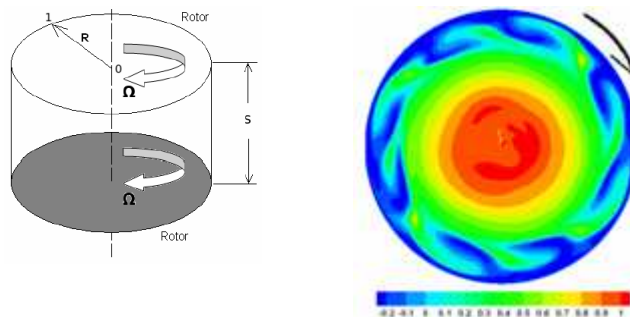
Counter-Rotating Disk Cavity Instantaneous Vorticity Fields



High-Re Turbulent Flow in a 90deg pipe bend with a rough inner surface.



Co-Rotating Disk Cavity Instantaneous Vorticity Field

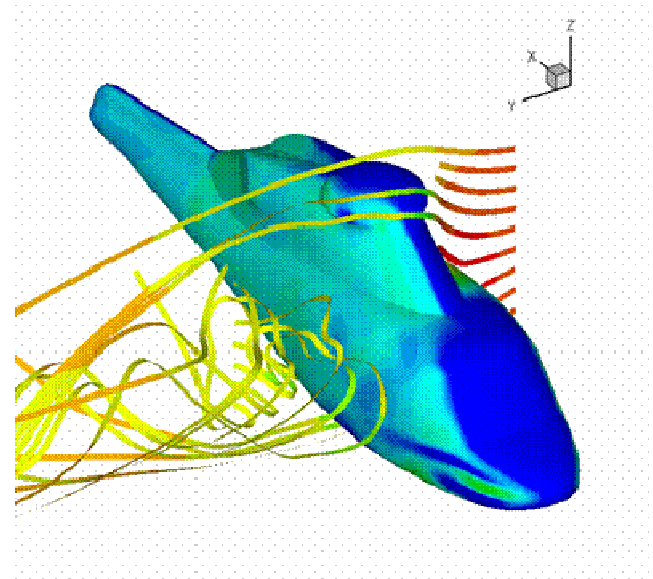
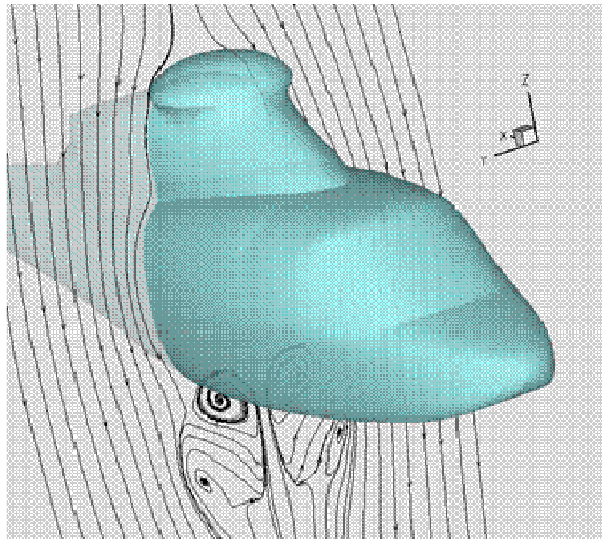


Time-History & Frequency Spectrum of Axial Velocity.

Computational Research: **External Aerodynamics**

Calculation of aerodynamic forces and moments

at all flight conditions, including hover, yaw, side gusts, etc.



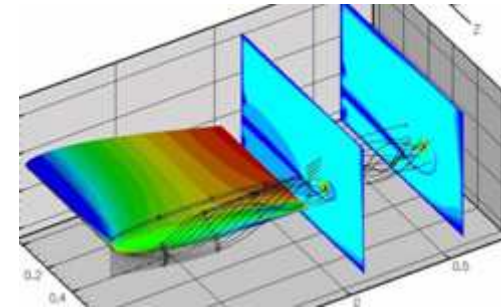
Unsteady RANS, Block structured Grid, up to 198 processors

Computational Research: **External Aerodynamics**

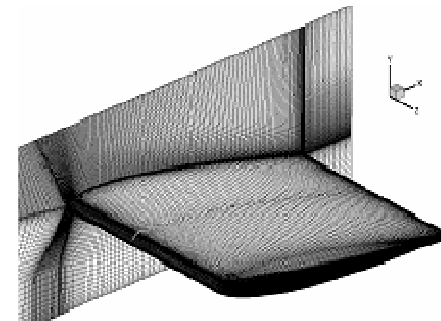
Trailing Vortices in Aircraft Wake



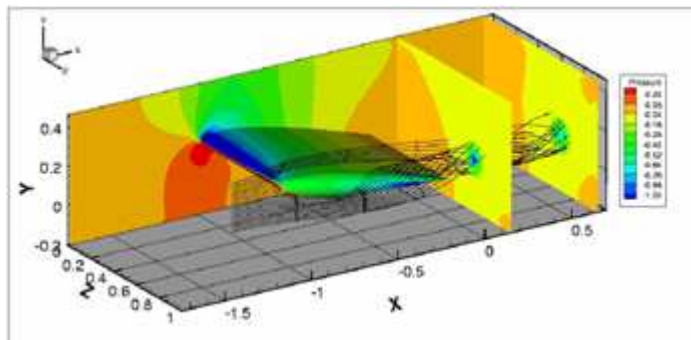
Application



Experiment



Computational Mesh



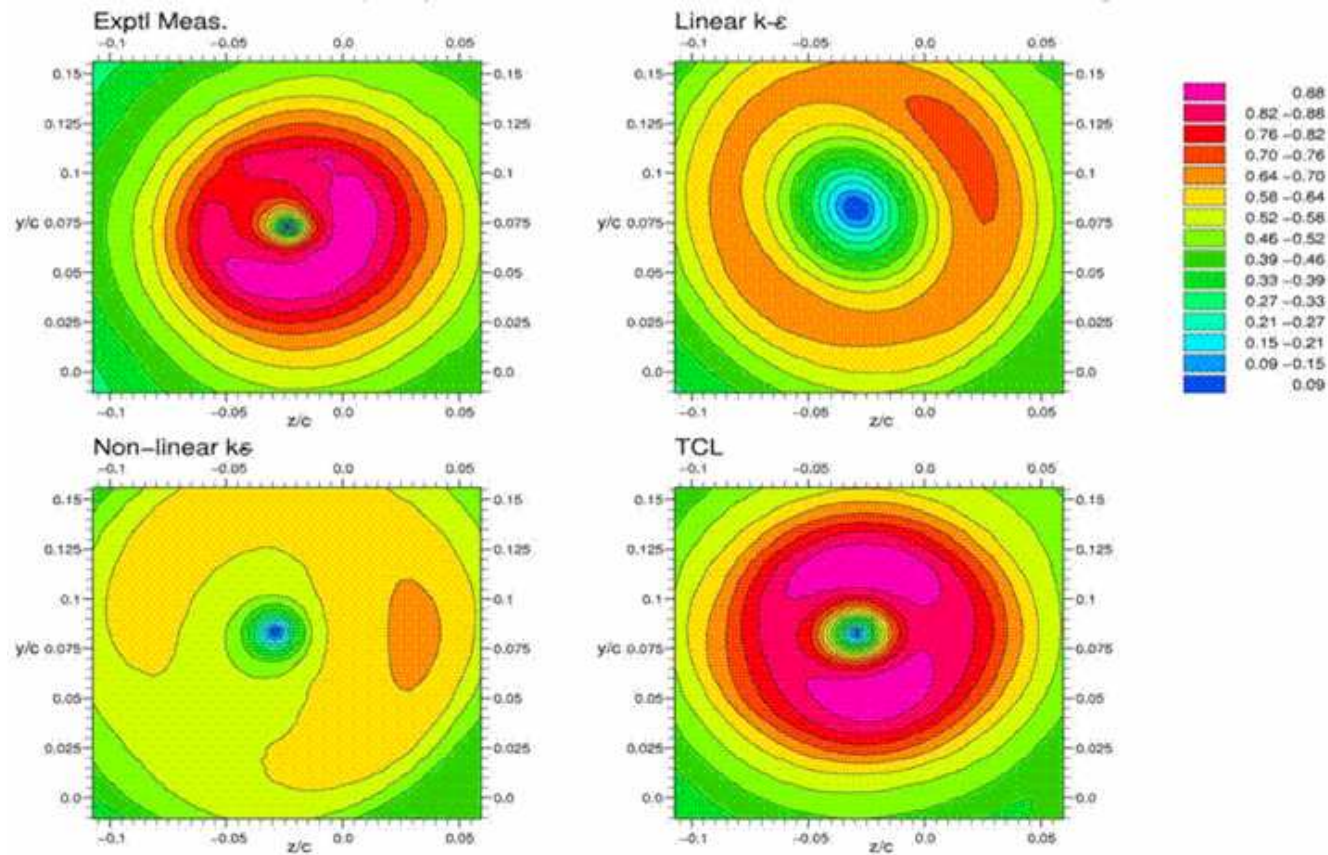
Predicted Pressure and Flow

Computational Research: External Aerodynamics

Downstream Vortex

Experiment

Computation



Computation

Computation