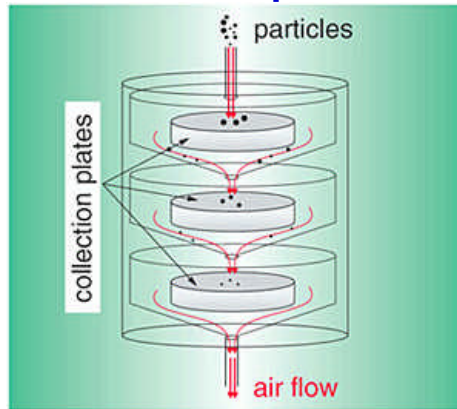


Examples of Computational Fluid Dynamics in the Ezekoye Group

Aerosol Impactor



Dr. O.A.(DK) Ezekoye
Professor and Graduate Advisor

Flames



Smoke Detector



Spark Plug



Some Recent CFD Journal Publications

Ekici, O., Ezekoye, O.A., Hall, M.J., and Matthews R.D., "Thermal and Flow Fields Modeling of Fast Spark Discharges in Air", ASME Journal of Fluids Engineering, accepted 2006

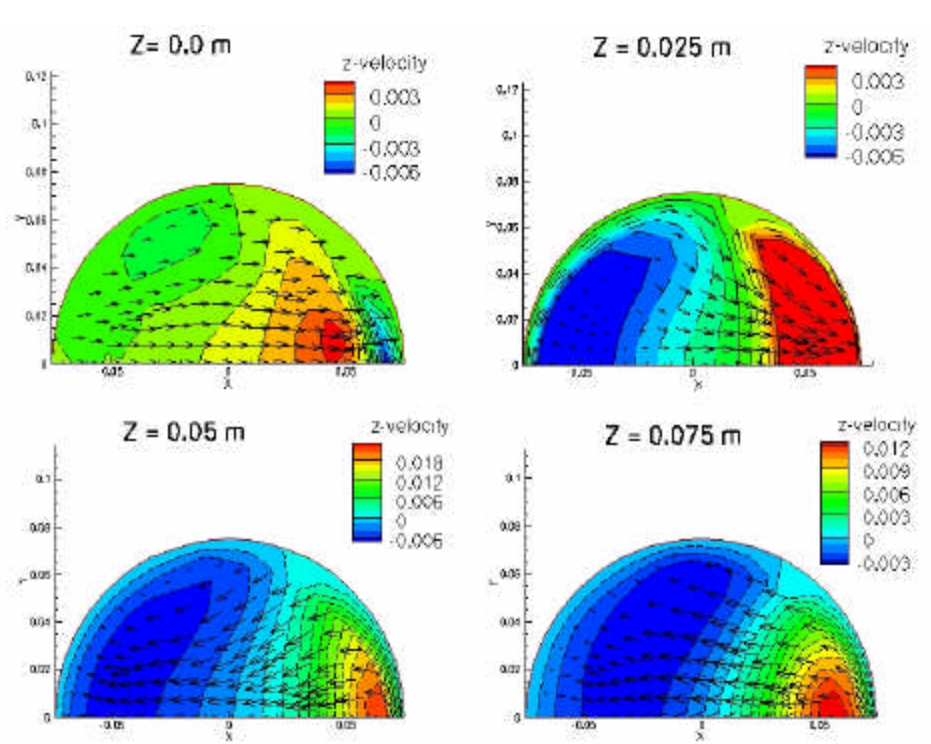
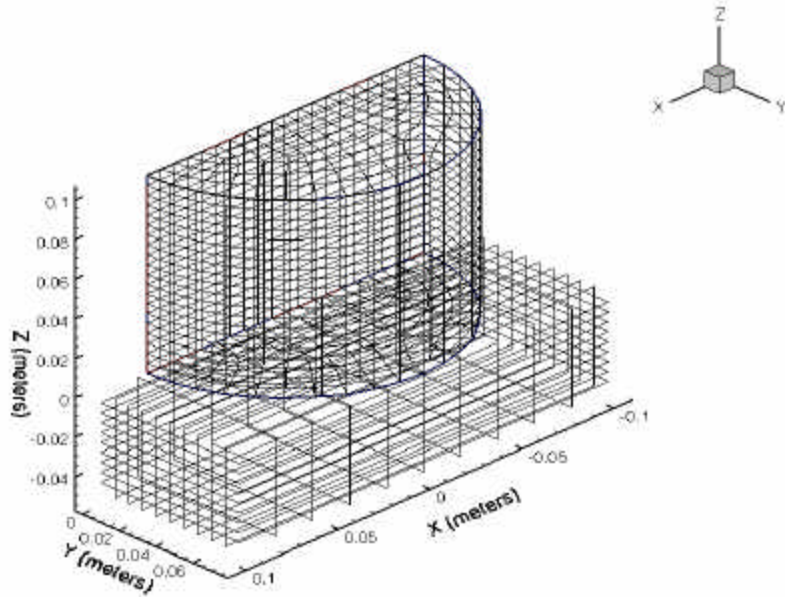
Barve, V.V., Ezekoye, O.A., Clemens, N.T. and Katta, V.R., "Numerical Study of the Evolution of Strongly Forced Axisymmetric Laminar Cold-Flow Jets" AIAA Journal accepted, 2006

Upadhyay, R.R. and Ezekoye, O.A., "Treatment of Size Dependent Aerosol Transport Processes using Quadrature Based Moment Methods ", Journal of Aerosol Science, doi:10.1016/j.jaerosci.2005.06.002 (2005)

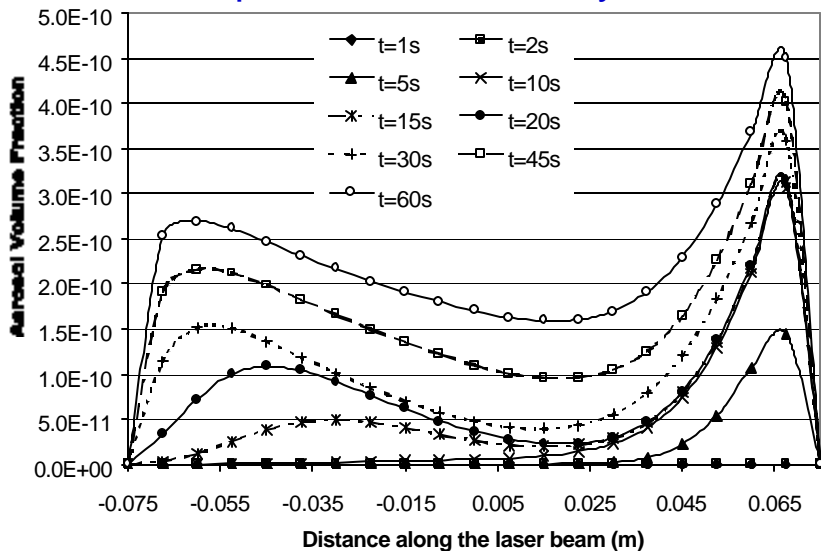
Upadhyay, R.R. and Ezekoye, O.A., "Smoke Buildup and Light Scattering in a Cylindrical Cavity above a Uniform Flow", Journal of Aerosol Science, v36, Issue 4, Pages 471-493, 2005

Results (Aerosol Applications)

Simulation of smoke entry and light scattering in a photoelectric smoke detector model



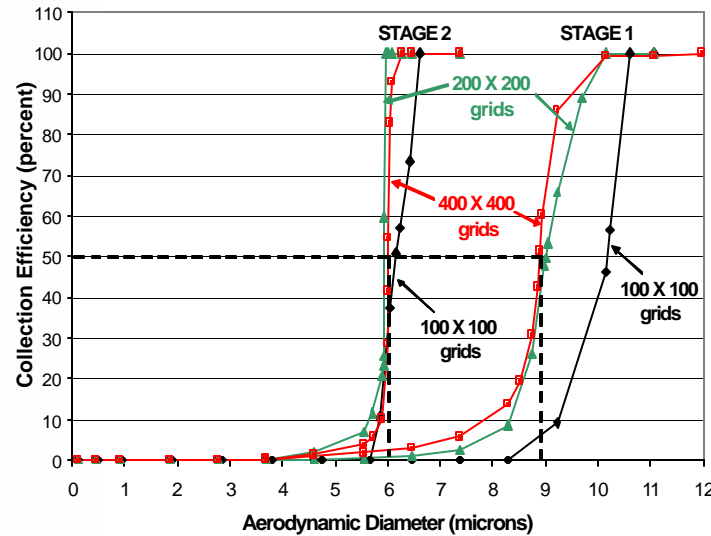
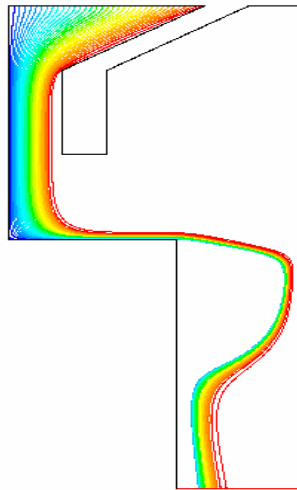
Computational Geometry.



Velocity profiles at different slices of the cylindrical cavity

Aerosol volume fraction profiles inside the cavity showing smoke buildup with time.

Simulation of Aerosol Impaction using Lagrangian and Eulerian Methods



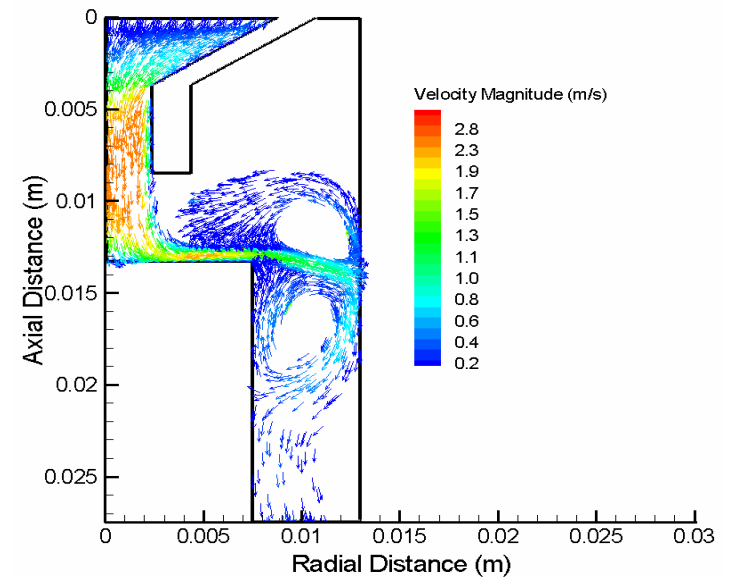
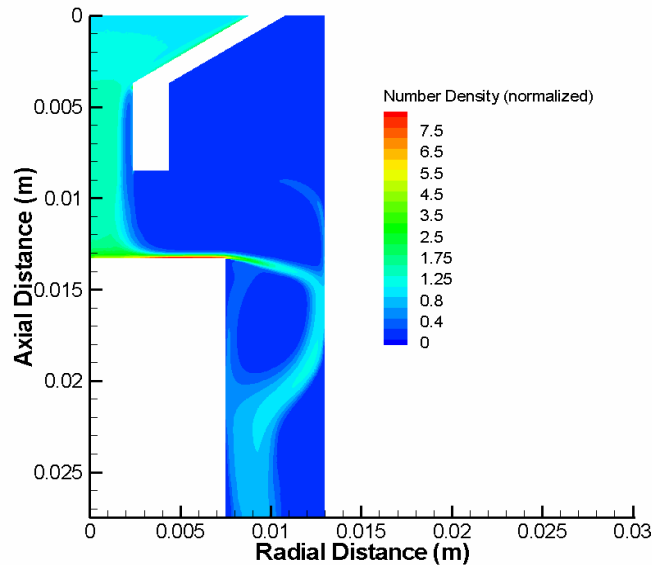
Aerodynamic diameter at 50 percent.

	Stage 1	Stage 2
Experimental *	9.0	5.5
Numerical *	9.3	6.1
This work	8.9	6.0

Lagrangian Trajectory Simulation

Collection Efficiency Curve

Comparison with Experiment



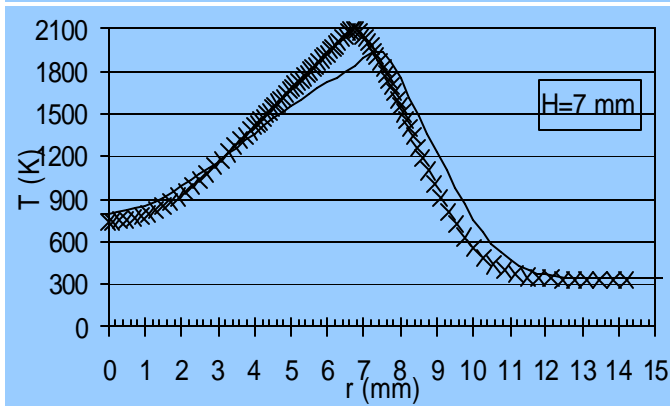
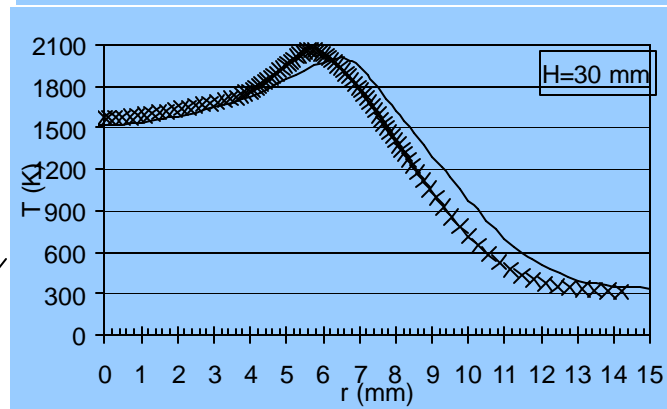
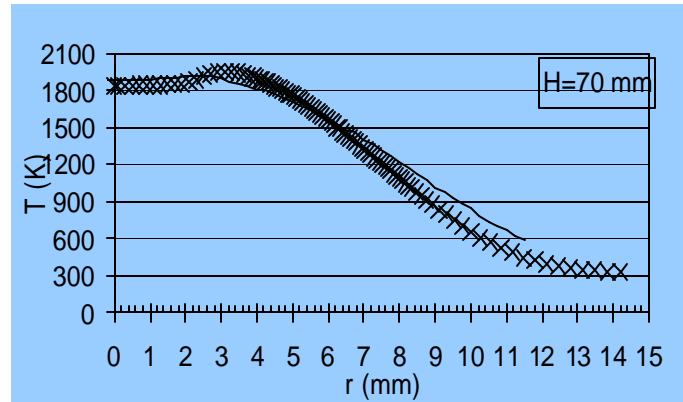
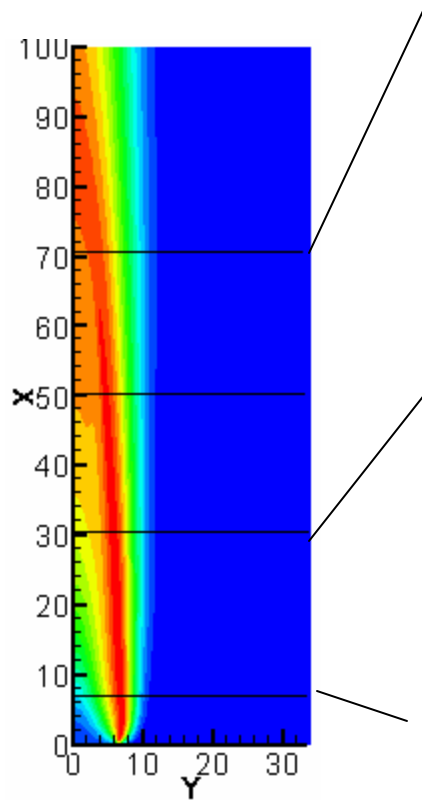
Eulerian Number Density Field.

Particle Velocity Vector Field.

Fluent

Results (Combustion Applications)

Simulation of sooting methane air flames



High order numerical techniques are used to simulate flame physics.

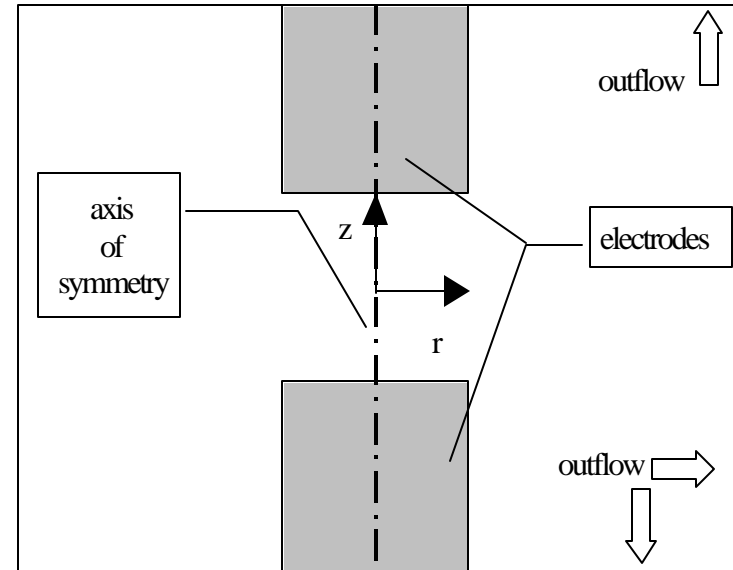
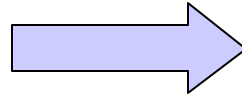
Complex submodels for soot chemistry and radiation are implemented.

Comparisons are made with experiments.

Simulation of spark discharge physics

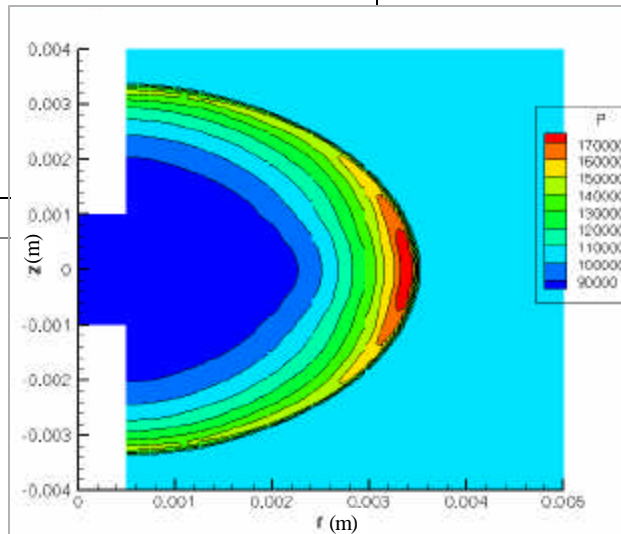
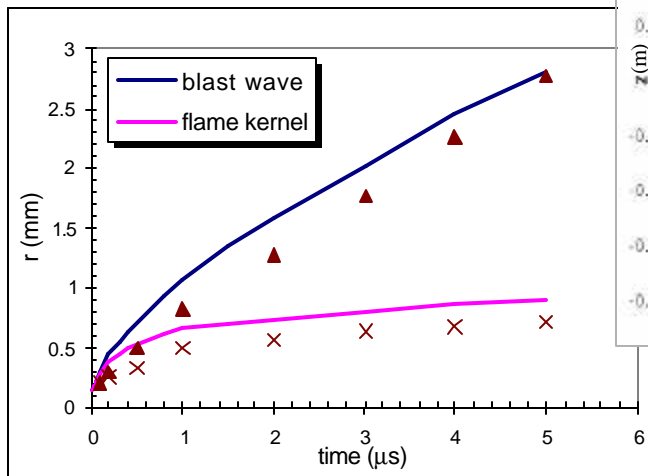


computational model of spark gap

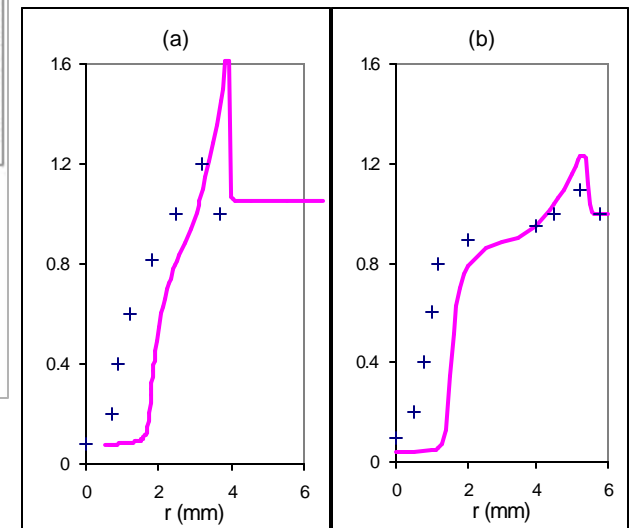


Simulated pressure field

Blast wave & flame kernel comparisons with experiments



Density field compared with experiments



Internal Code