

# Visitor Research Report

**Visitor Name:** Mr. Syed Rehman  
University of California, Los Angeles

**Area of Research:** Modeling of Unsteady Flow Phenomena

**Period of Visit:** July 7, 2008 through July 18, 2008

## **Goal:**

The goal of the project is to assess the accuracy, efficiency and robustness of current shock capturing methods when studying supersonic and hypersonic boundary layer receptivity problems. Due to their high dissipative nature, shock capturing methods may not be the most efficient for studying the interaction between low amplitude freestream waves and the boundary layer modes. However, their ease of implementation and capacity of studying general flow fields make them ideal for studying flow fields where completed geometries or complicated shock structures maybe present.

## **Strategy:**

Shock capturing methods will be applied on a previously studied receptivity problem (Ma & Zhong 2003a, b). Differences between the algorithm previously used and the shock capturing method will be noted. Also, the differences between individual shock capturing schemes will be examined. The possibility of any algorithm enhancement will also be considered.

## **Accomplishments:**

Have a MPI implementation of a few shock capturing methods which are being tested on the problem of receptivity of a leading edge flat plate at the Mach no. of 4.5.

## **Future Work:**

Continue the implementation of shock capturing schemes of interests. Validate schemes for the problem of flat plate supersonic receptivity and search for algorithm improvement possibilities. Study slightly more complicated geometries, for example, a 3D roughness element present on the flat plate.

## **Pending Publications:**

### **Conference Paper:**

“An evaluation of shock-capturing methods on a hypersonic boundary layer receptivity problem” - Syed F. Rehman, Jeff D. Eldredge, Xiaolin Zhong and John Kim (Submitted for consideration for the 47th AIAA Aerospace Sciences Meeting)

## **Seminar Presented:**