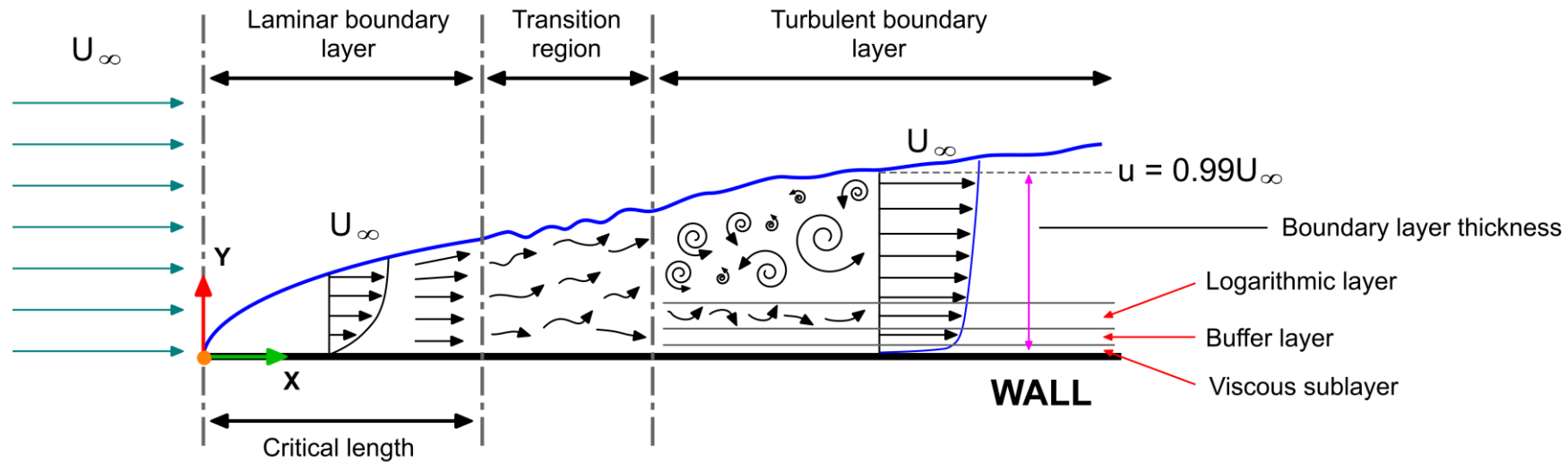


Problem definition

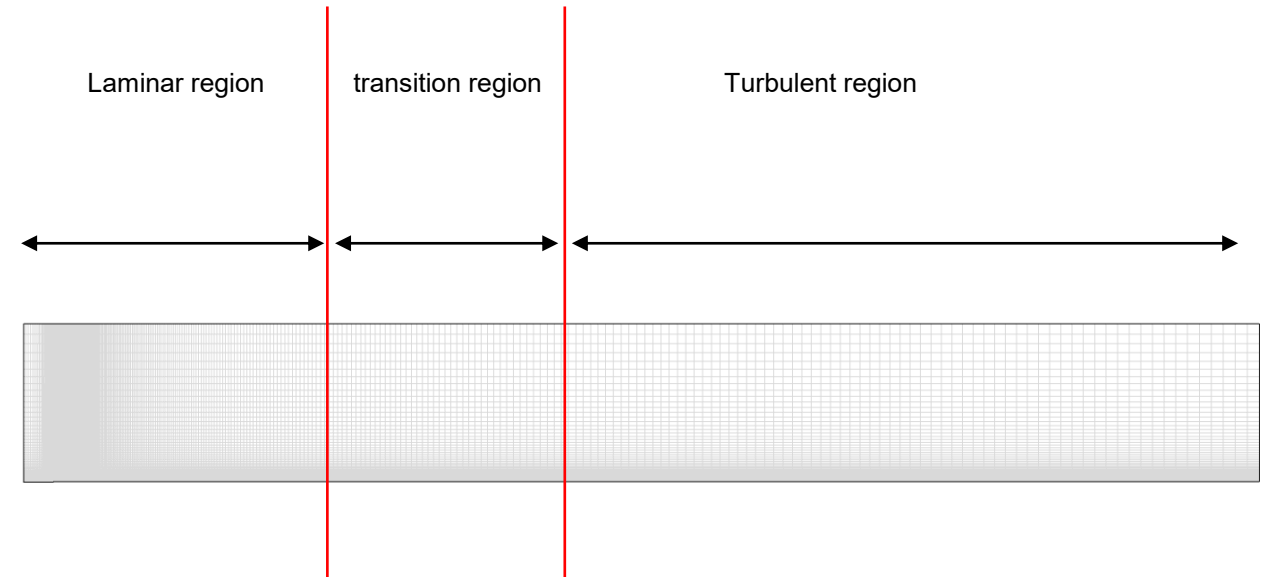
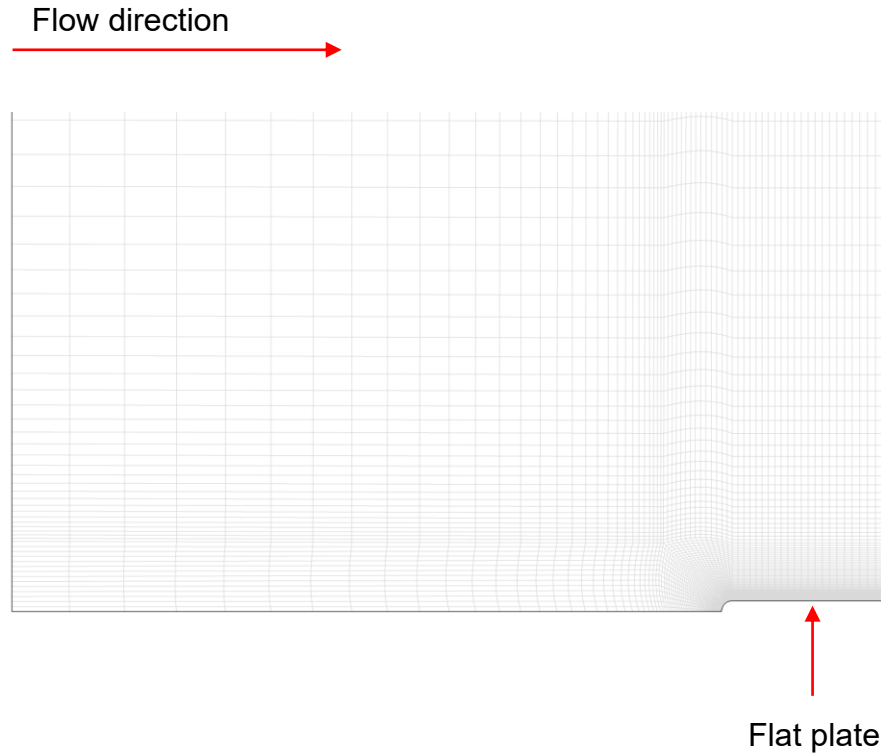
Laminar to turbulent transitional flow over a flat plate



- This is a classical validation case in transition to turbulence modeling.
- Capturing transition to turbulence is very challenging.
- There is plenty of experimental and numerical data available.
- **A few references:**
 - <https://turbmodels.larc.nasa.gov/index.html> (Transition models)
 - A. M. Savill. Some recent progress in the turbulence modeling of bypass transition. Near-Wall Turbulent Flows, 1993.
 - P.E. Roach, D.H. Brierley. The influence of a turbulent free stream on zero pressure gradient transitional boundary layer development. Part I: Test Cases T3A and T3B. Simulation of Unsteady and Transition to Turbulence. 1992.

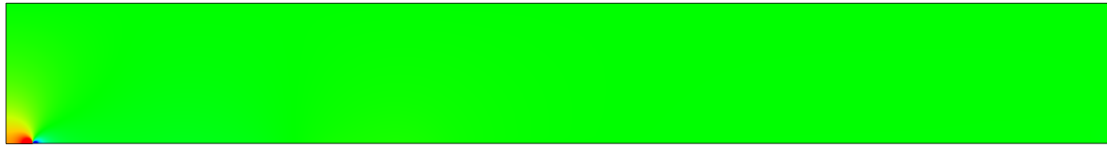
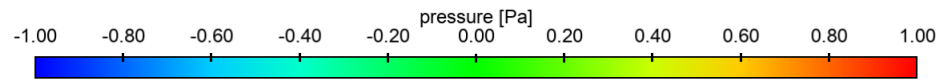
Problem definition

Geometry and mesh

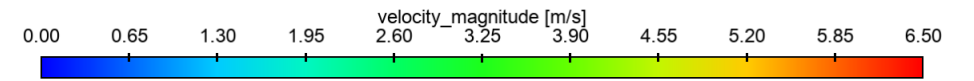


- Modeling transition to turbulence requires very fine meshes.
- The models used are designed to deal with transition to turbulence.
- These model are very well calibrated.

Qualitative and quantitative results

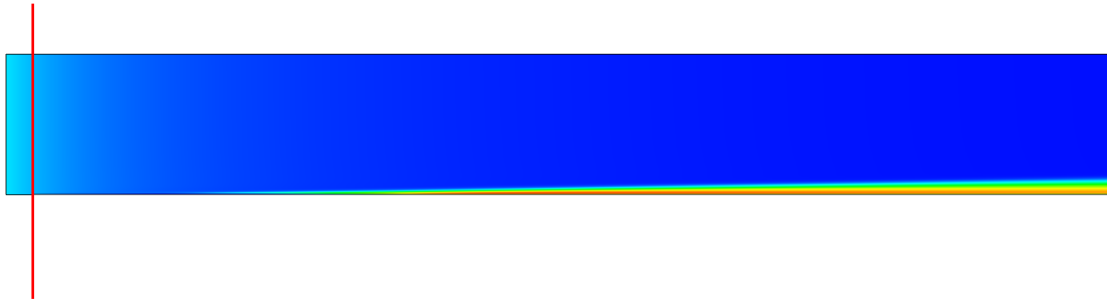
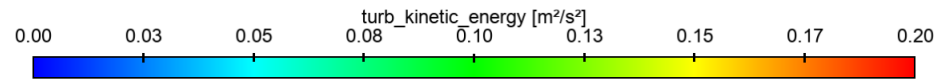


Pressure contours

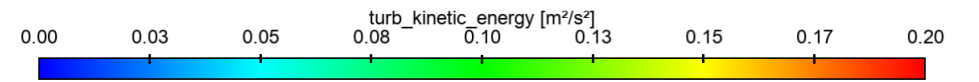


Velocity magnitude contours

Qualitative and quantitative results

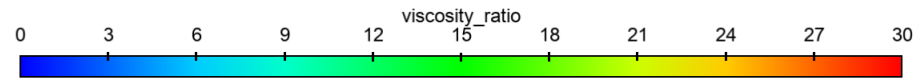


Flat plate starts here

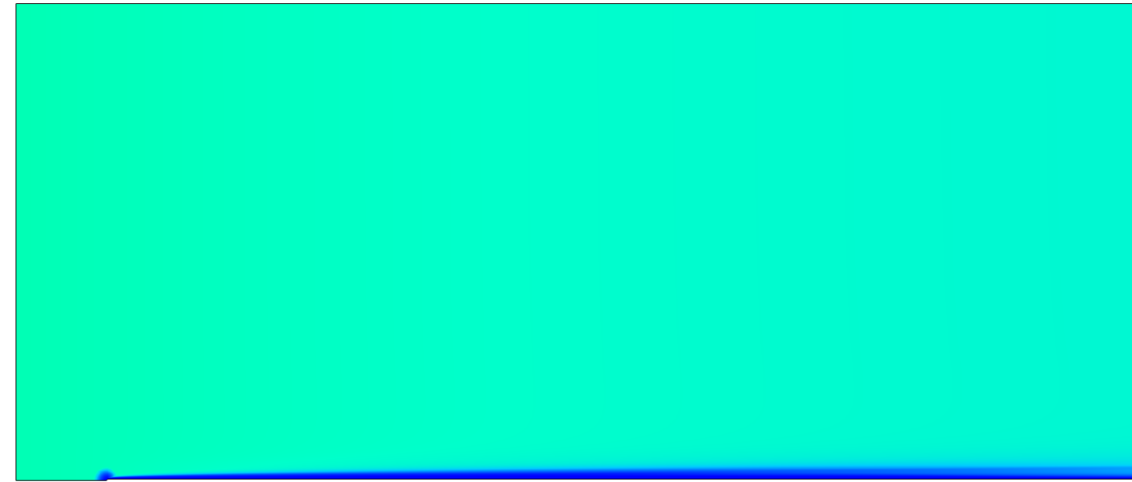
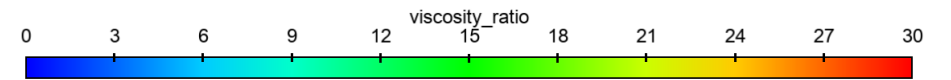


Turbulent kinetic energy contours

Qualitative and quantitative results

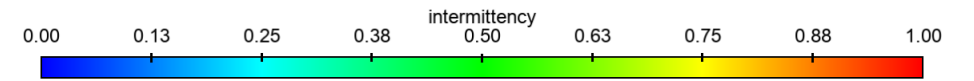
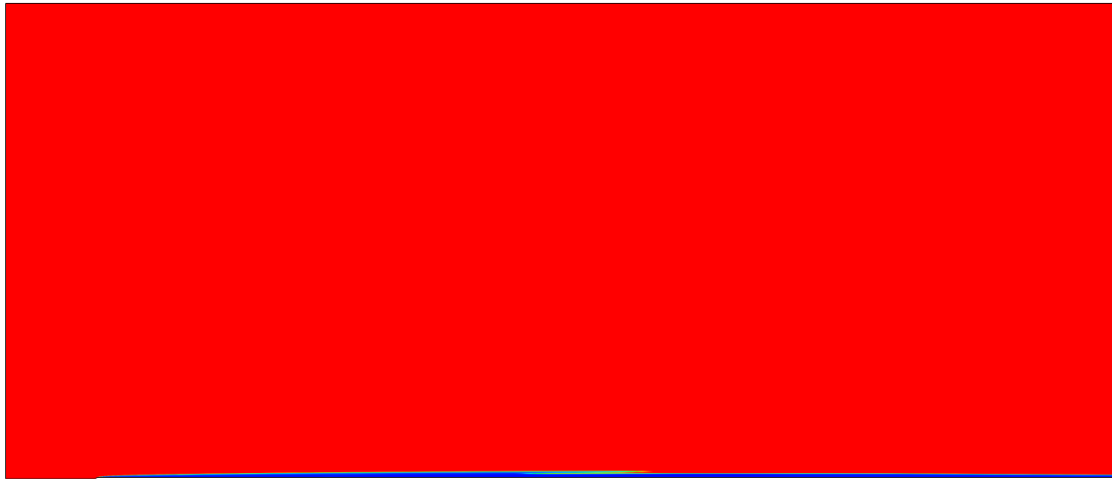
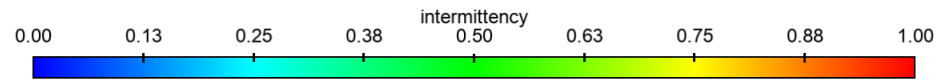


Flat plate starts here



Turbulent eddy viscosity ratio contours

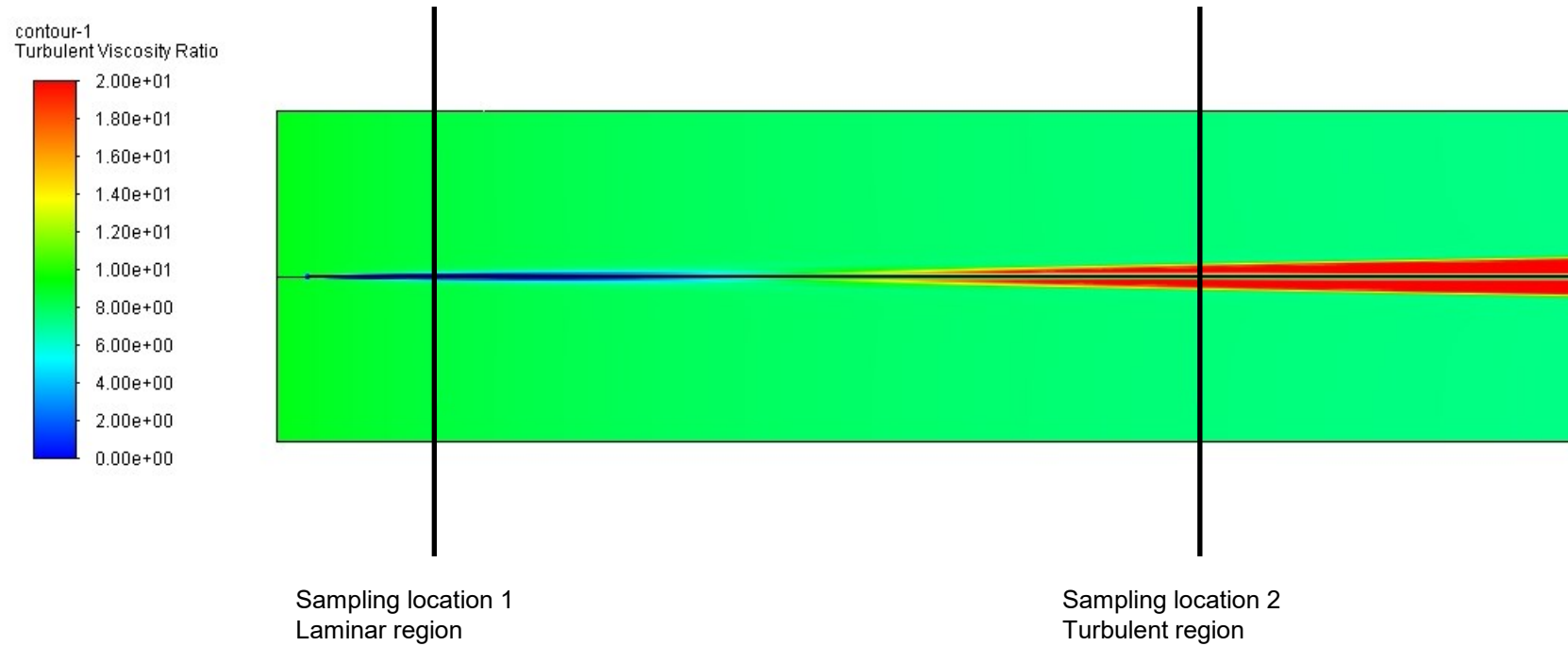
Qualitative and quantitative results



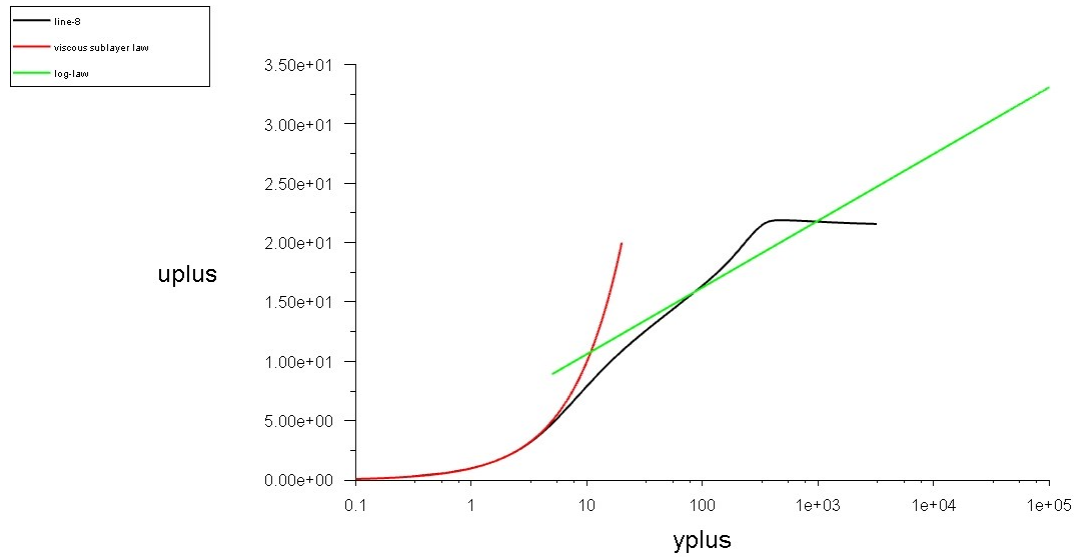
Flat plate starts here

Intermittency contours

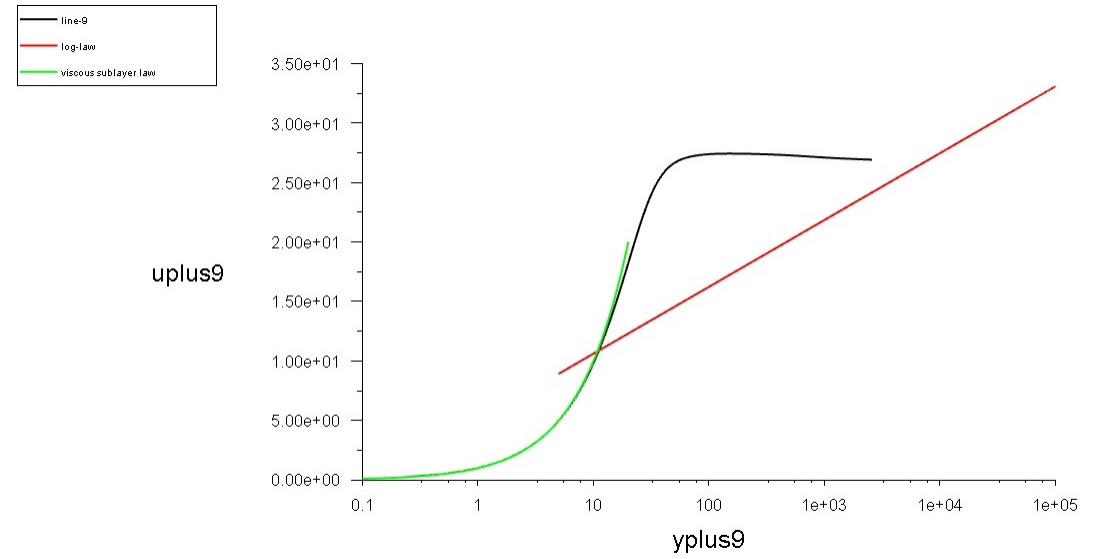
Qualitative and quantitative results



Qualitative and quantitative results

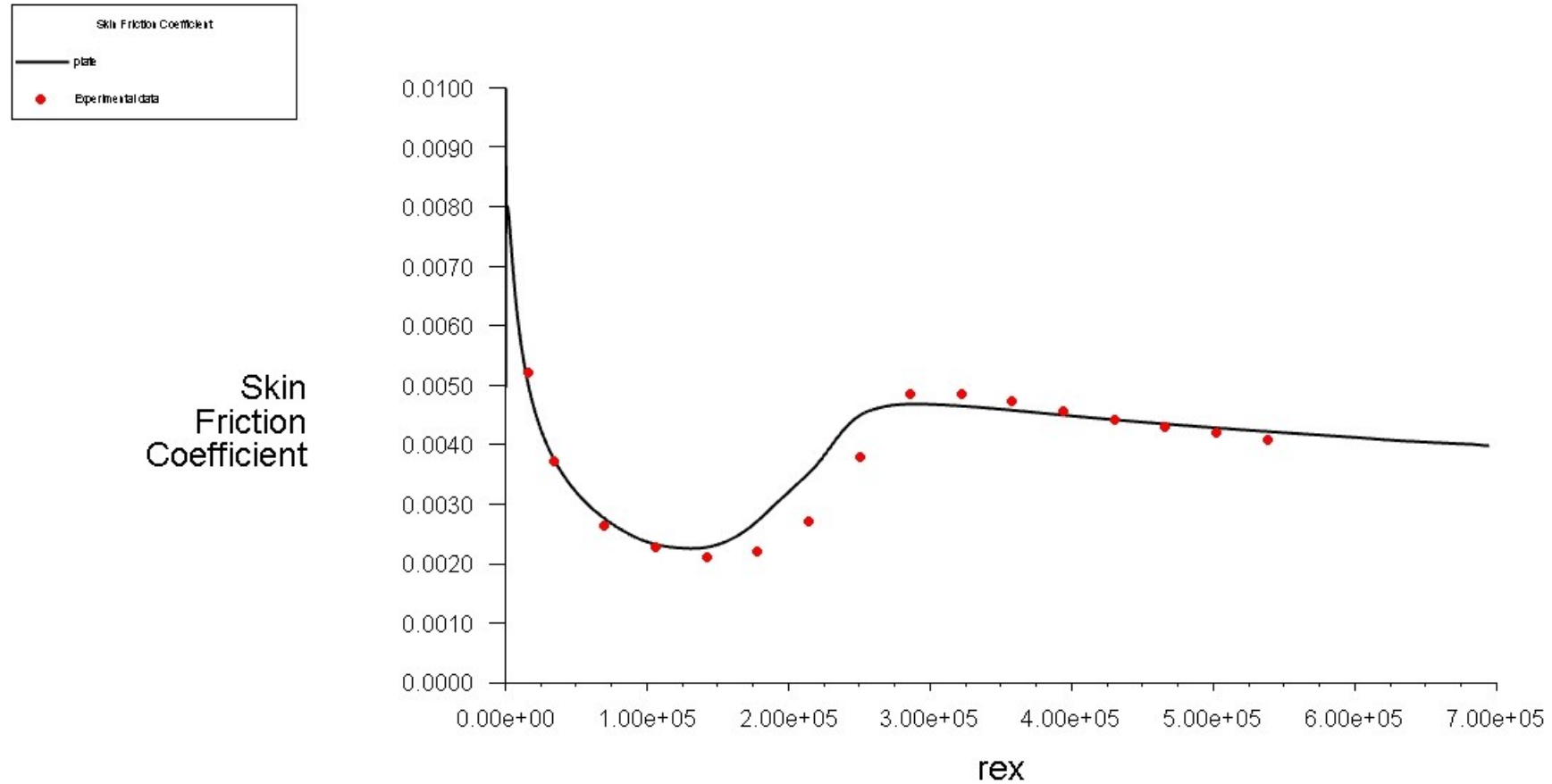


Non-dimensional velocity profile at sampling location 2



Non-dimensional velocity profile at sampling location 1

Qualitative and quantitative results



Skin friction coefficient – Numerical results and experimental results