Benchmarking COMSOL 3.5a - CFD problems

Darrell W. Pepper¹ and Xiuling Wang²

¹ UNLV, Nevada Center for Advanced Computational Methods, Las Vegas, NV, 89119
² Mechanical Engineering Department, Purdue University Calumet, Hammond, IN, 46323

ABSTRACT

Using COMSOL 3.5a, a set of benchmark problems requiring the use of the COMSOL Computational Fluid Dynamics (CFD) module has been simulated. Several of the problems include fluid-heat transfer interactions (Computational Heat Transfer - CHT). The four problems are: (1) flow over a 2-D circular cylinder; (2) compressible flow in a shock tube; (3) incompressible heated flow over a 2-D backward facing step for Re = 800 (laminar) and non-heated flow over a 2-D backward facing step for Re = 47,648 (turbulent); and (4) natural convective flow within an air-filled, articulated 3-D cubic enclosure with Rayleigh number Ra = 10⁵. Results compared with data in the literature show good agreement. The CPU times and memory costs for solving these problems are also reported.