

## Benchmarking COMSOL 3.5a - CFD problems

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### 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  $Ra = 10^5$ . Results compared with data in the literature show good agreement. The CPU times and memory costs for solving these problems are also reported.