Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Modelling the cut-off resolution parameter in the PANS method for turbulence simulation BRANISLAV BASARA, AVL List GmbH, KEMAL HANJALIC, Delft University of Technology — The Partially-Averaged Navier-Stokes (PANS) approach, designed to resolve a part of the turbulence spectrum, adjusts seamlessly from the Reynolds-Averaged Navier-Stokes (RANS) to the Direct Numerical Solution (DNS) of the Navier-Stokes equations. This turbulence closure, derived from a RANS model, supports any filter width or scale resolution. We choose the PANS model as the basis for the present analysis of options for the model resolution parameter, but the conclusions derived are applicable to other partially resolved closure methods. Namely, in the conventional well-established PANS, the resolution parameter is obtained from the grid spacing and the integral turbulence length scale. The latter is obtained usually by summing up the resolved turbulence, while the unresolved motion is computed from the modelled equation. Several formulations have been shown to provide reliable and accurate results for many test flows. However, serious impediments have been noted in some applications such as moving domains and transient boundaries because too long calculations of the average velocity make this approach impractical. We analysed some recent alternative approaches which use the turbulent-to-mean-strain-rate time scale aimed at avoiding the on-line calculations of the resolved kinetic energy required for calculations of the input resolution parameter. Comparisons of several approaches will be shown in detail and conclusions drawn on the merits of each method.

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Date submitted: 31 Jul 2014 Electronic form version 1.4