Coupling of Algebraic Model of Bypass Transition With EARSM Model of Turbulence

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Abstract

The contribution deals with the numerical solution of laminar-turbulent transition. Mathematical model consists of the Reynolds averaged Navier-Stokes equations, which are completed by the explicit algebraic Reynolds stress model (EARSM) of turbulence. The algebraic model of laminar-turbulent transition, which is integrated to the EARSM model, is based on the work of Kubacki and Dick where turbulent kinetic energy is split to the small-scale and large-scale parts. The algebraic model is simple and doesn't requires geometry data such as wall-normal distance and all formulas are calculated using local variables. Numerical solution is obtained by the finite volume method based on the HLLC scheme with piecewise linear MUSCL reconstruction and explicit two-stage TVD Runge-Kutta method with point implicit treatment of the source terms. The proposed method is validated on the ERCOFTAC T3 test cases. The T3A case has moderate inlet turbulence intensity, the T3A- has low inlet turbulence intensity, while the T3B case is characterized by high inlet turbulence level.

References

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