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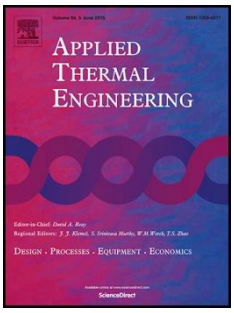

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Application of a discontinuous Galerkin method on the compressible flow in the transonic axial compressor

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Highlights

- DG method is extended to simulate the transonic flow in the transonic compressor.
- A compact vertex-based limiter is proposed to prevent the spurious oscillation.
- The grid-independence of the method is verified.
- The method has low numerical dissipation to produce more reliable results.

Abstract

The discontinuous Galerkin method (DGM) has been extended to simulate the compressible flow in the transonic axial compressor in a rotating coordinate system. The equations are solved in the physical space instead of being in the computational space to avoid the Jacobian transformation. A compact vertex-based limiter is proposed to prevent the spurious oscillations of the numerical results. The grid independence of the method is investigated and the results show it is weakly dependent on the mesh type. The in-house code based on the method has been applied to simulations of two transonic axial compressors. The results show that the predicted flow field, including overall performance, spanwise distributions of several parameters, shock structures and wakes, are in better agreement with the measurement. It indicates that the DGM has low numerical dissipation and could produce more reliable results.

Keywords

Discontinuous Galerkin Method (DGM), compact scheme, transonic flow, axial compressor

1. Introduction

Real flow in a transonic axial compressor (a critical component of the gas turbine) is quite complex, being viscous,

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