The 18th International Conference on Finite Elements in Flow Problems (FEF2015)
16-18 March 2015, Taipei, Taiwan

FEM prediction of particle erosion in turbomachinery cooling

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Key Words: V-SGS, YZ-Beta, URANS, Erosion

Gas turbine flows are turbulent, compressible and often laden by particles. In aeronautical applications, flows usually drag sand, dust, ash and soot from the combustors. Such particles may impact on external surface of the blades giving rise to deposit formation and erosion. Moreover, air coming from the compressor is spilled and send to the internal cooling channels, hence the particles entrained by the flow can results in problems also in the cooling channels.
We compute the compressible flow field in a turbine cooling system, using the YZβ shock capturing scheme proposed by Tezduyar and Senga [1] combined with the Variable Subgrid Scale (V-SGS) formulation proposed by Rispoli and Saavedra [2] and based on the Hughes Variational Multiscale method [3]. Turbulent flow is predicted by using a two-equations URANS closure. Solid particles are simulated using a lagrangian one-way coupling approach. Erosion is evaluated according to the Tabackoff model [4]. This model accounts for the main parameters affecting the erosion such as impact velocity and angle, as well as material properties of both particles and target surface.
The influence of particle size on erosion, and the detection of regions more exposed to the risk of erosion represent the targets of the present work.

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