Abstract Submitted
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Large-Eddy Simulations of turbomachinery flows: from wall-resolved academic configurations to wall-modeled industrial geometries. FLORENT DUCHAINE, LUIS SEGUI, JEROME DE LABORDERIE, NICOLAS ODIER, JEROME DOMBARD, LAURENT GICQUEL, Cerfacs, CFD TEAM — LES has been shown to be a promising tool to tackle turbomachinery challenges induced by high Reynolds and Mach numbers and complex flow physics. The CPU cost is however identified as the reason why existing LES of turbomachinery flows concern simplified configurations. CERFACS has extended the capability of the reactive LES solver AVBP for turbomachinery applications. The developments and validations have concerned the application of accurate boundary conditions at inlets and outlets as well as the numerical treatment of the rotor/stator interface compliant with LES requirements. After a brief description of the flow solver, the presentation will focus on the results and insights obtained on two configurations. The first one is the high-pressure turbine cascade LS89 for which the MUR239 operating point is still today a challenge to simulate accurately. To address this academic aerothermal case, a wall-resolved approach is used with a high-order numerical scheme. The second configuration of interest is the 3.5 stages high-pressure axial compressor CREATE. This simulation, corresponding to one of the first wall-modeled LES of such a complex machine, has shown very promising results by comparison with experimental data.

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