**High-Order Accurate Scale-Resolving Simulations of Low-Pressure Turbine Linear Cascades using Python at Petascale**Peter Vincent (Imperial College London), Arvind Iyer (Imperial College London), Freddie Witherden (Imperial College London), Brian Vermeire (Concordia University), Yoshiaki Abe (Imperial College London), Ralf-Dietmar Baier (MTU Aero Engines AG), Antony Jameson (Stanford University)
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**Abstract**

The turbine stages of a jet engine extract energy from exhaust gasses to drive the compressor, fan, and other auxiliary systems. Approximately half the weight of a turbine stage comes from the turbine blades. In order to reduce this contribution, modern turbines are designed to use as few blades as possible. However, this results in individual blades being under higher-loading, which can lead to fully-separated flow over the aft-portion of each blade; introducing complex, unsteady, three-dimensional phenomena, and thus reduced efficiency, which can have a significant negative effect on overall fuel consumption rate. Accurate simulation of unsteady turbulent flow in the vicinity of complex geometric configurations is critical for improved design of turbine stages, and hence 'greener' aircraft that are more fuel-efficient. In this poster we will demonstrate application of PyFR (www.pyfr.org), a high-order accurate Python based computational fluid dynamics solver, to petascale simulation of flow over low-pressure turbine linear cascades using Titan. We will also present preliminary performance and scaling results for PyFR on Summit.