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Full Span Scale Resolving Simulations of Transitional Flow in an LP Turbine Cascade using a high order DGM solver

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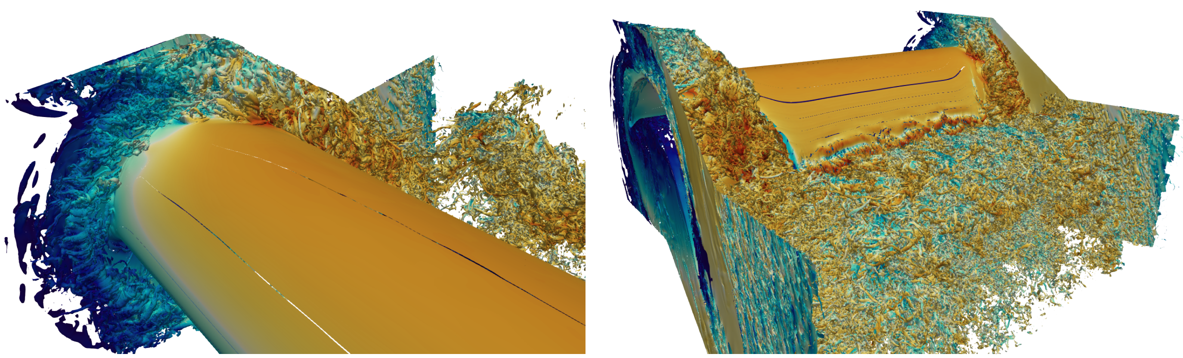

Figure 1: Preliminary results of the DNS of the MTU T161 cascade at $Re_{2s} = 90.000$. Q-criterion colored by velocity on the suction side upstream (left) and downstream (right) of the cascade.

It is now commonly accepted that if RANS can reliably predict performance of jet engines near the design point, the approach usually fails at off-design. Industry is investing in advancing simulation methods, first by improving RANS models and since shortly also DNS and LES, first for providing detailed statistical calibration data for turbulence models in relevant geometries, and in the longer run for simulation of full-scale machines for design verification, *e.g.* at off-design. Cenaero is heavily involved in this effort.

This project inscribes itself in this effort, by providing detailed data on the turbulence within secondary flow in the MTU T161 LP turbine blade cascade, including diverging end-walls. High-fidelity DNS and LES are undertaken at transitional conditions, namely resp. $Re_{2s} = 90.000$ and 200.000 using the high-order Discontinuous Galerkin code Argo, with the computational allocation FullSTuP, granted by PRACE during its 15th call on the MareNostrum cluster at the Barcelona SuperComputing Center.

Geometry and experimental data were provided graciously by MTU and the university of the Armed Forces at Münich. The computational project is a collaborative effort within the H2020 project *Tilda*, in collaboration with MTU, Numeca and the University of Bergamo. The aim is to use the comparison of the results in order to consolidate a reliable database. As computations will still be ongoing at the time of the conference, the presentation will discuss co-processing, instrumentation and preliminary results.