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RANS/LES simulation of a separated flow in a 3D curved duct

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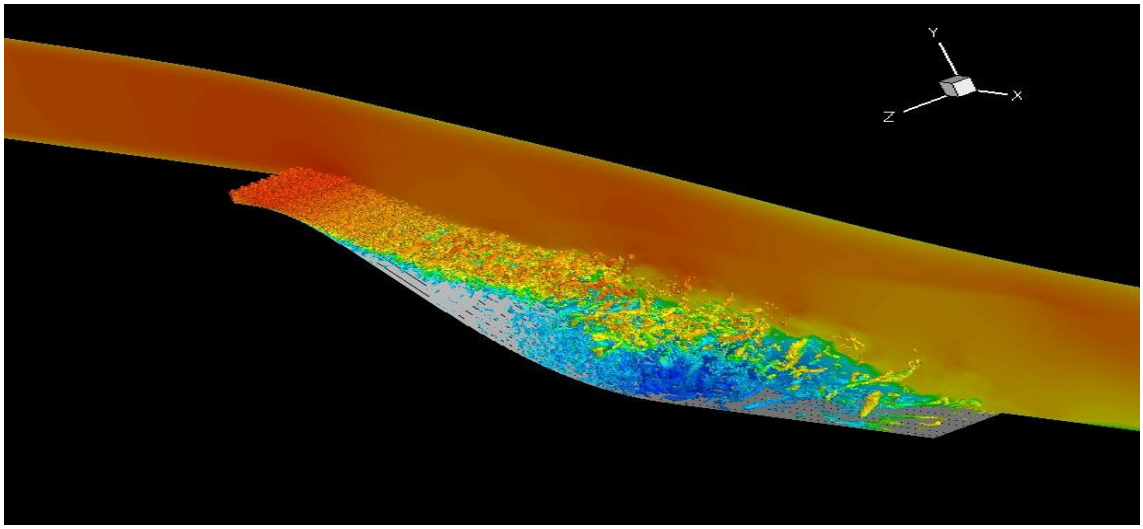
ABSTRACT

Prediction of internal flow over curved surface remains challenging like for air intake configuration. Indeed the boundary layers are subjected to curvature and pressure gradient effects, which often lead to a boundary layer separation. Despite the continuous improvement of modelisation, RANS can only predict the low frequency part of an unsteady signal, whereas it suffers from a lack of accuracy in case of separated flows. LES is relatively free of these problems, but it suffers from its computational cost. Therefore a zonal RANS/LES approach is retained for the simulation of an internal flow over a curved surface. Attached boundary layers are modelled with a Spalart-Almarras model, whereas the separation zones are taken into account by a LES model (see the figure). At the interfaces between RANS and LES zones, specific conditions are used to generate or filter turbulence. The solution will be compared to experimental measurements for the validation.



Zonal RANS/LES simulation of subsonic air intake configuration: Q criterium isosurface colored by the streamwise velocity component