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Αθήνα, 24/6/2019

ΚΟΣΜΗΤΟΡΑΣ

Ορθή Επανάληψη του Εγγράφου
με ΑΠ33293/20.6.2019

Προς τα Μέλη ΔΕΠ της
Σχολής Μηχ/γων
Μηχ/κών

ΠΡΟΣΚΛΗΣΗ

Σας προσκαλούμε στην παρουσίαση της Διδακτορικής Διατριβής του **Υ.Δ. κ. Διακάκης Κωνσταντίνος**, διπλωματούχος Μηχανολόγος Μηχανικός του ΕΜΠ, την οποία εκπόνησε στον Τομέα **Ρευστών**. Η παρουσίαση θα πραγματοποιηθεί την Τρίτη 9 Ιουλίου, ώρα 9:30π.μ. στην αίθουσα διδασκαλίας του 2^{ου} ορόφου στο κτίριο ANYM της Σχολής Μηχανολόγων Μηχανικών - Πολυτεχνειούπολη Ζωγράφου. Ο ελληνικός τίτλος της Διδακτορικής Διατριβής είναι ο εξής :

«ΥΠΟΛΟΓΙΣΤΙΚΗ ΠΡΟΣΟΜΟΙΩΣΗ ΜΕΤΑΒΑΤΙΝΩΝ ΚΑΙ ΕΝΤΟΝΑ ΑΠΟΚΟΛΛΗΜΕΝΩΝ ΡΟΩΝ ΚΑΙ ΕΦΑΡΜΟΓΗ ΣΕ ΑΝΕΜΟΓΕΝΝΗΤΡΙΕΣ»

Και ο Αγγλικός ως εξής:

« COMPUTATIONAL SIMULATION OF TRANSITIONAL AND MASSIVELY SEPARATED FLOWS WITH APPLICATIONS TO WIND TURBINES »

Ο Κοσμήτορας της Σχολής



N. Μάρμαρας
Καθηγητής Ε.Μ.Π

Summary

Laminar to turbulent transition and higher fidelity turbulence modeling have been implemented in the parallelized, unstructured, compressible Navier-Stokes solver MaPFlow.

In the case of laminar to turbulent transition, both boundary layer and transport equation approaches were assessed. These include the e^N method and the transport equation models γ - Re_θ , γ and AFT. All approaches were validated against a wide range of cases concerning airfoils, wings/blades and generic fuselage, stemming from both the wind energy and the aeronautics sectors. The focus was on integrated loads and transition locations. In the context of two-dimensional simulations, the boundary layer e^N method and the AFT transport equation model exhibit better performance than the other alternatives. The γ - Re_θ model is also a viable option if Reynolds numbers not higher than 6×10^6 are considered. For Reynolds numbers higher than this limit, the accuracy of the model was found to deteriorate. However, both the e^N method and the AFT model cannot be used to predict crossflow transition in the context of three-dimensional simulations. In such scenarios, the γ - Re_θ model can give accurate results, provided that Re numbers fall within the aforementioned limit.

In the case of higher fidelity turbulence modeling, both Large Eddy Simulation (LES) and Detached Eddy Simulation (DES) approaches were implemented. LES utilized the Smagorinsky subgrid model. Regarding DES, both Delayed DES (DDES) and Improved Delayed DES (IDDES) variants were considered. The focus was on flow cases with massive separation. Both LES and DES provided more accurate results than the baseline Unsteady Reynolds Averaged Navier Stokes (URANS) simulations when compared to experiments and reference results. Neither LES nor DES were pushed to their limits. DES is considered computationally less demanding, due to wall modeling inside the boundary layer region. Therefore, it is a more viable option than LES for industrial applications. However, due to wall modeling, DES is not expected to perform well in flows where the presence and development of small turbulent scales inside the boundary layer are important. In those cases, LES using fine meshes should be considered.