
HIENASD ANALYSIS

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Aeroelastic Prediction Workshop

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FLOW SOLVER

- EZNSS (Elastic Zonal Navier-Stokes Solver) CFD Code by the Israeli CFD Center
 - Chimera overset grid
 - SA & $k-\omega$ TNT/SST turbulence models
 - HLLC 3rd order MUSCL Scheme
 - Full viscous scheme
 - 1st/2nd order in time



AEROELASTIC SOLVER

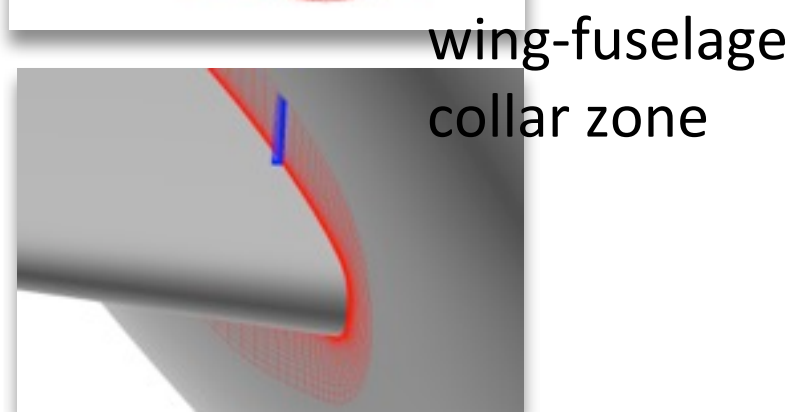
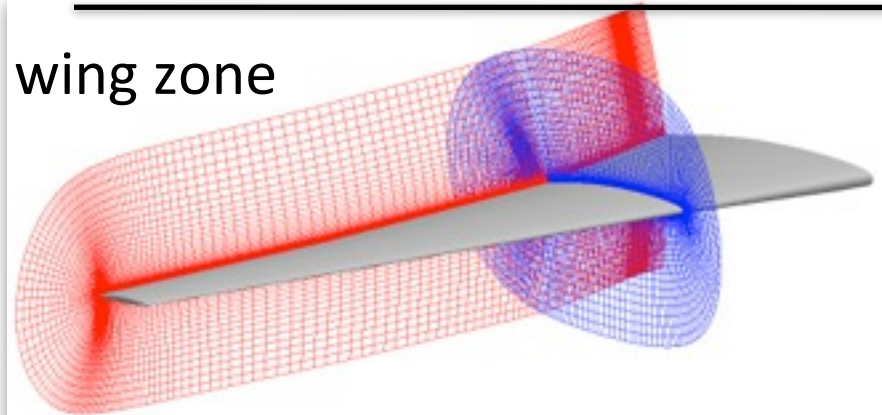
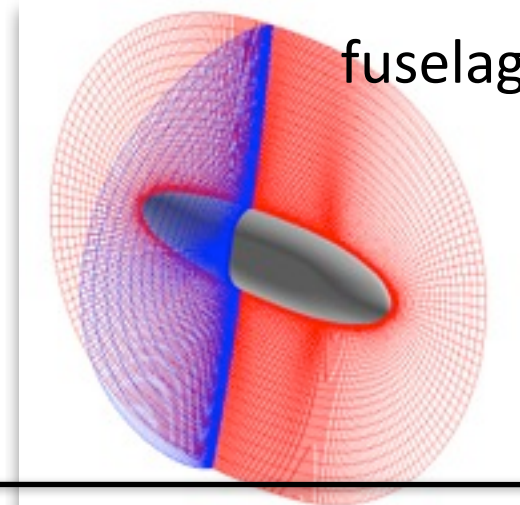
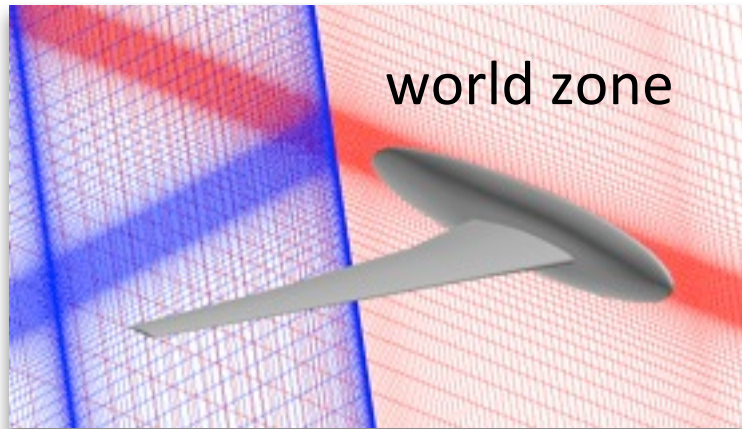
- Solution of static / dynamic aeroelastic equations of motion
- Closely-coupled
- Modal approach
- Aeroelastic analysis capabilities:
 - Static AE analysis / Maneuver load analysis
 - Dynamic response to initial conditions (flutter/LCO)
 - Response to prescribed motion (modal/flap)
 - Gust response

HIENASD ANALYSIS

- Medium-size mesh
- SA turbulence model
- 30 structural modes
- Cases analyzed:
 - All three static cases
 - Only one prescribed motion case (Mach 0.8, Re 7mil)



HIRENASD MEDIUM MESH

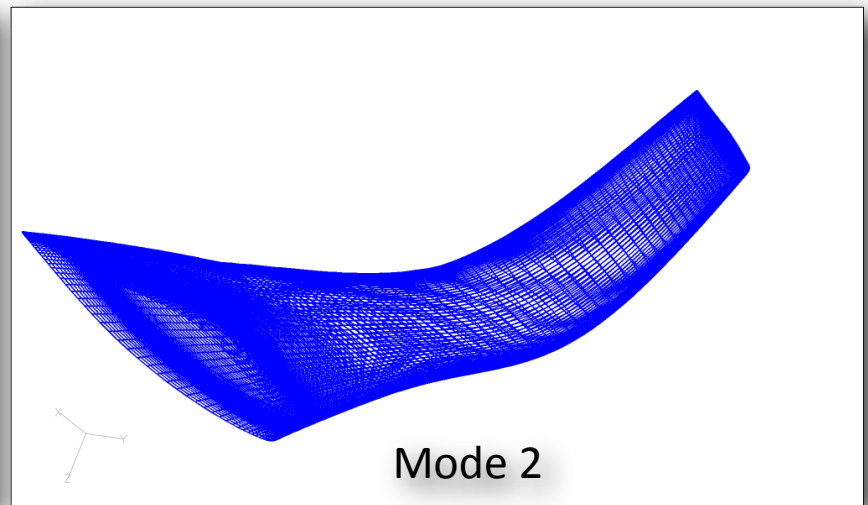
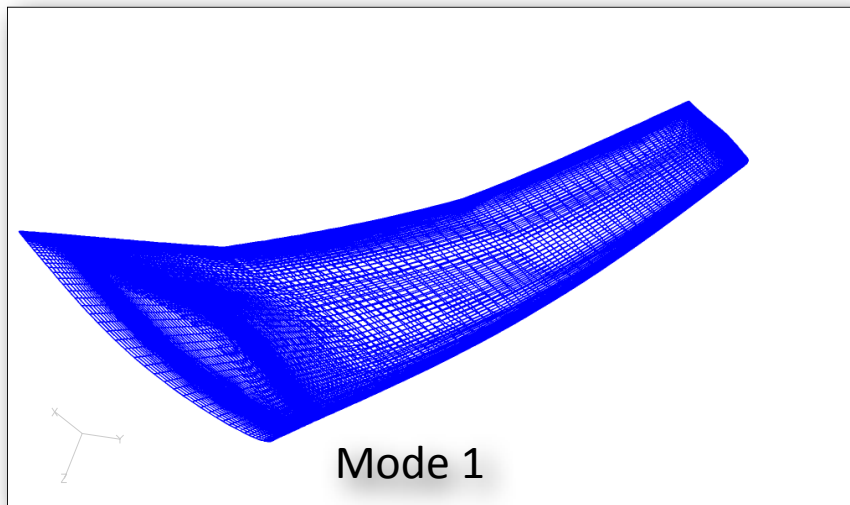


~12 million grid points



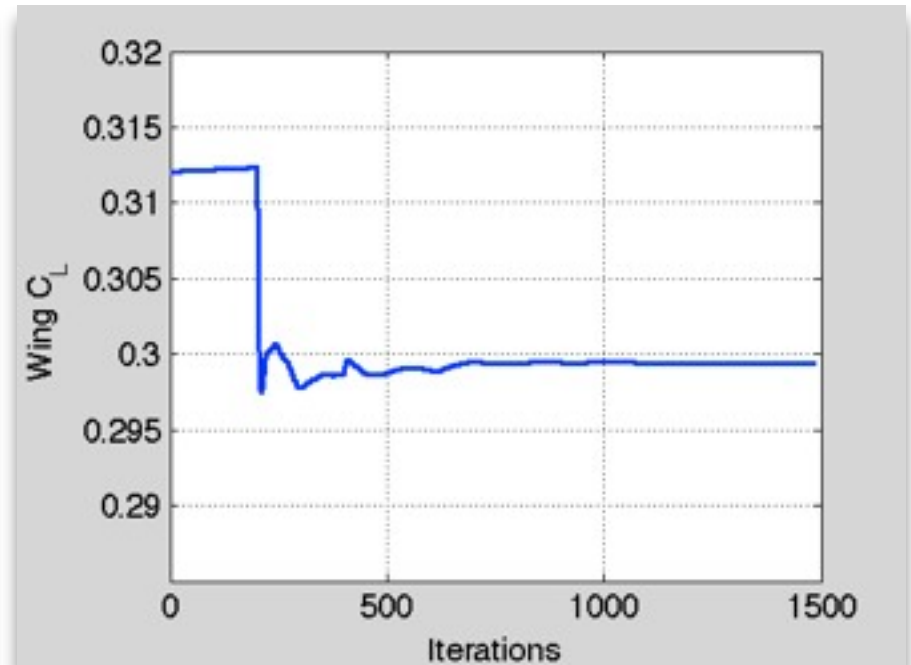
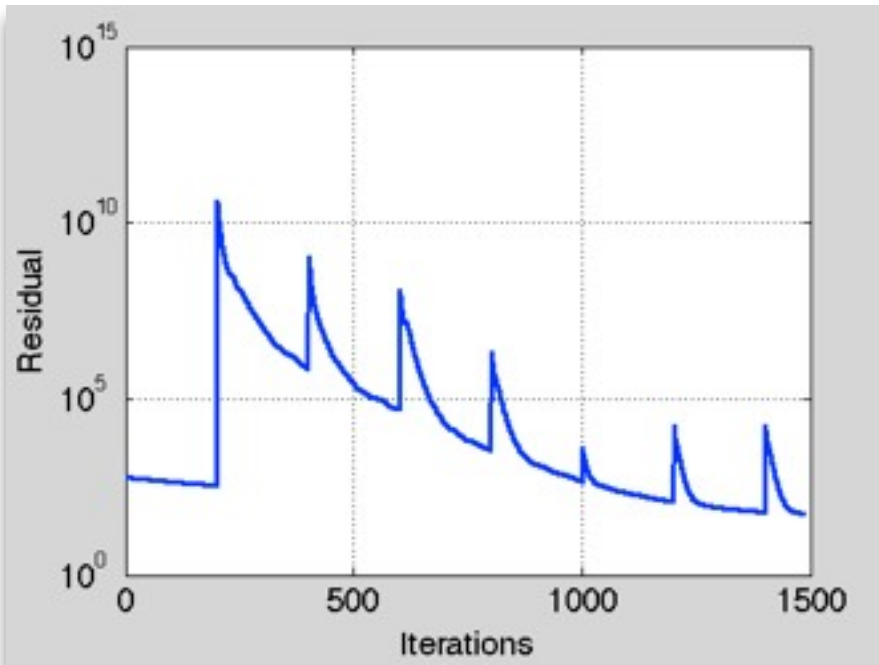
STRUCTURAL MODES

Structural modes are mapped from finite-element grid to the CFD surface grid within the code



HIRENASD - CONVERGENCE

Mach 0.8, Re 7 mil., AoA 1.5°, $q_D=40000$ Pa

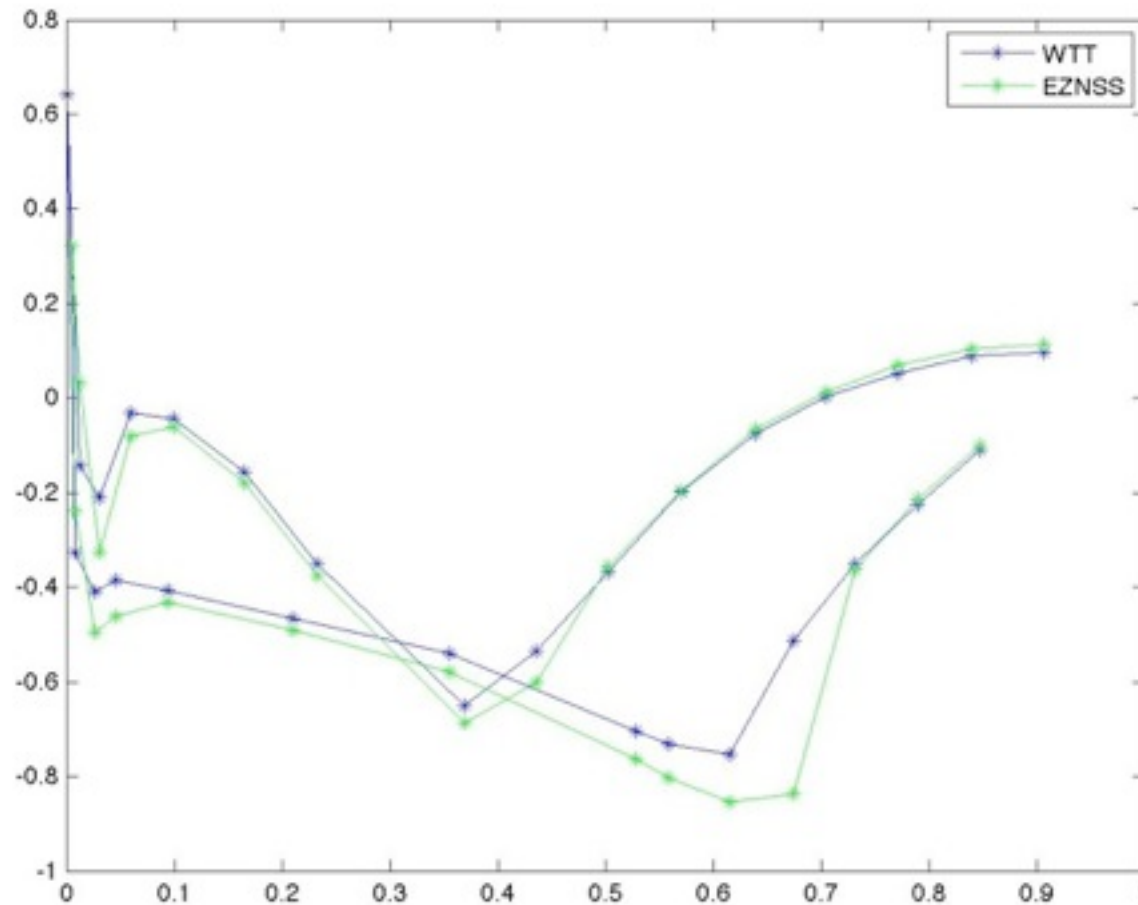


HIRENASD - C_p

Mach 0.8, Re 7 mil., AoA 1.5°, $q_D=40000$ Pa

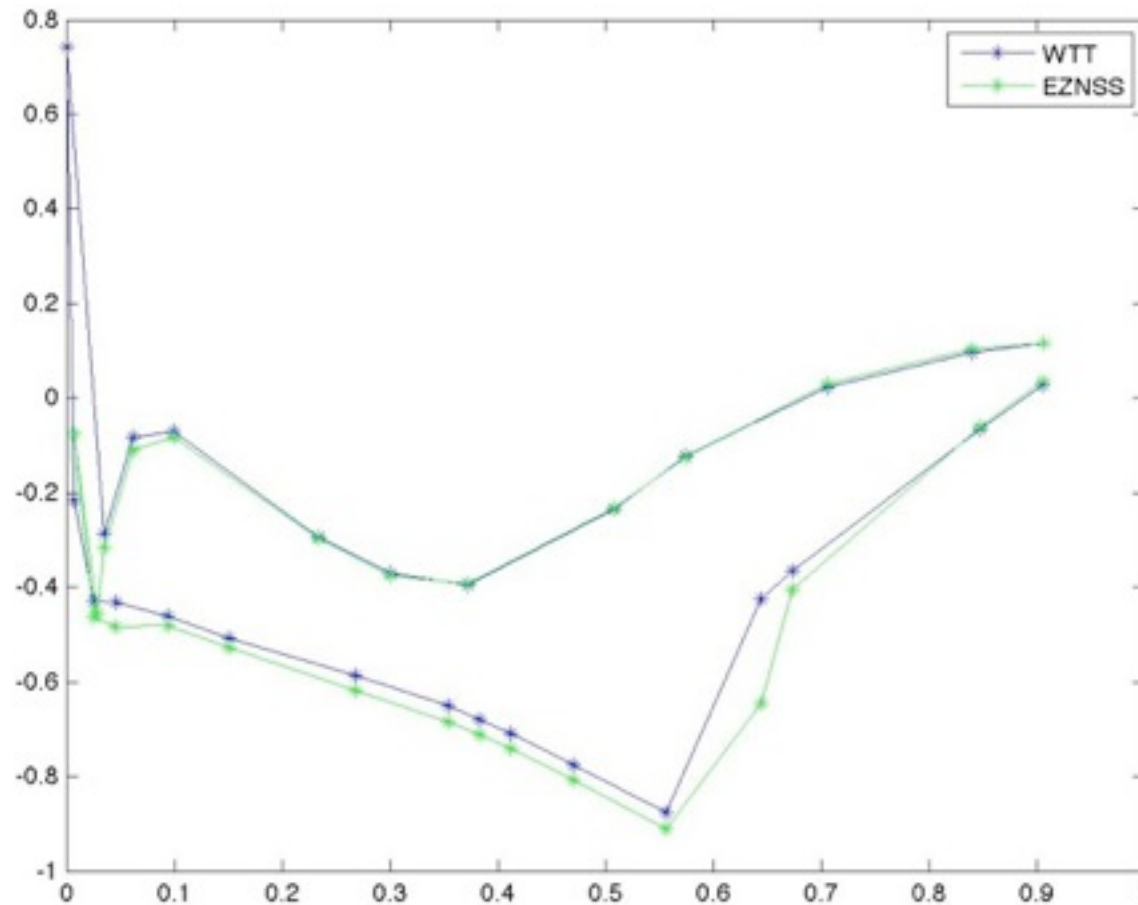
HIRENASD - C_p

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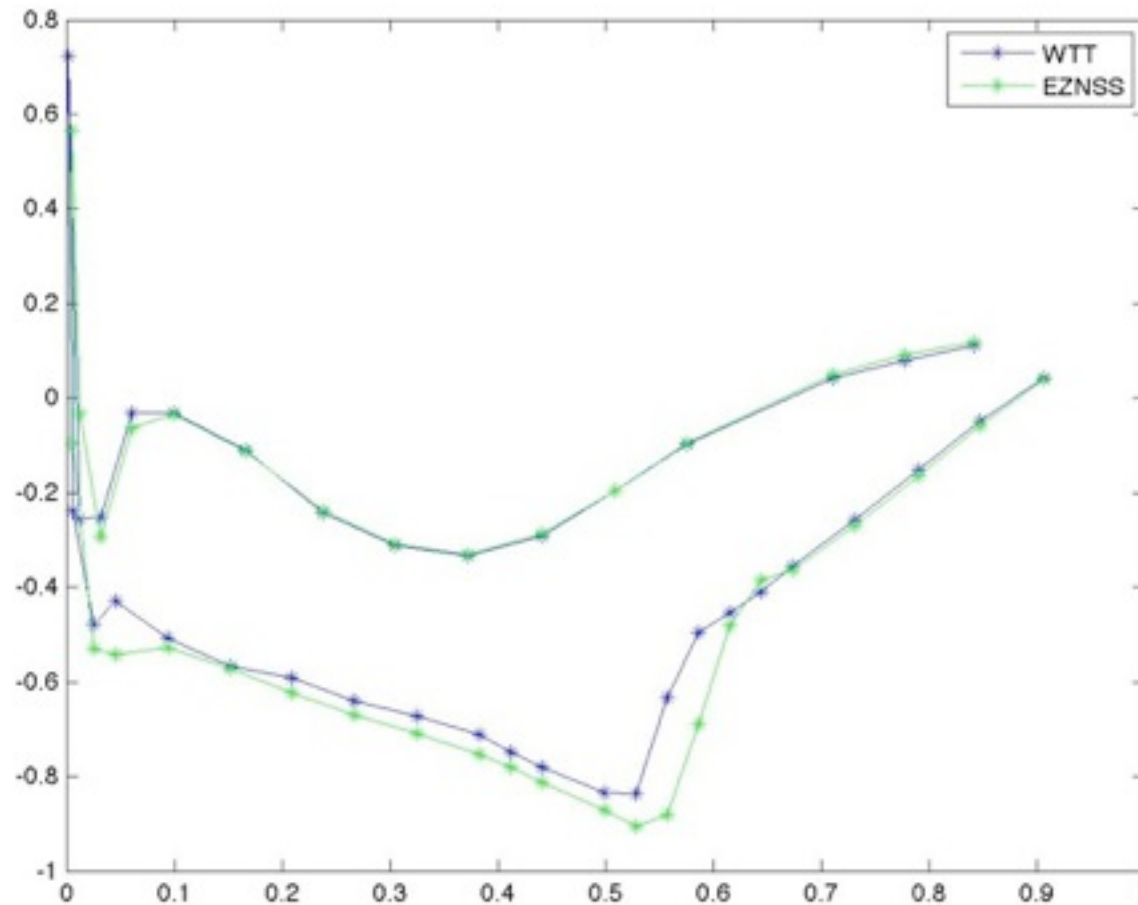
HIRENASD - C_p

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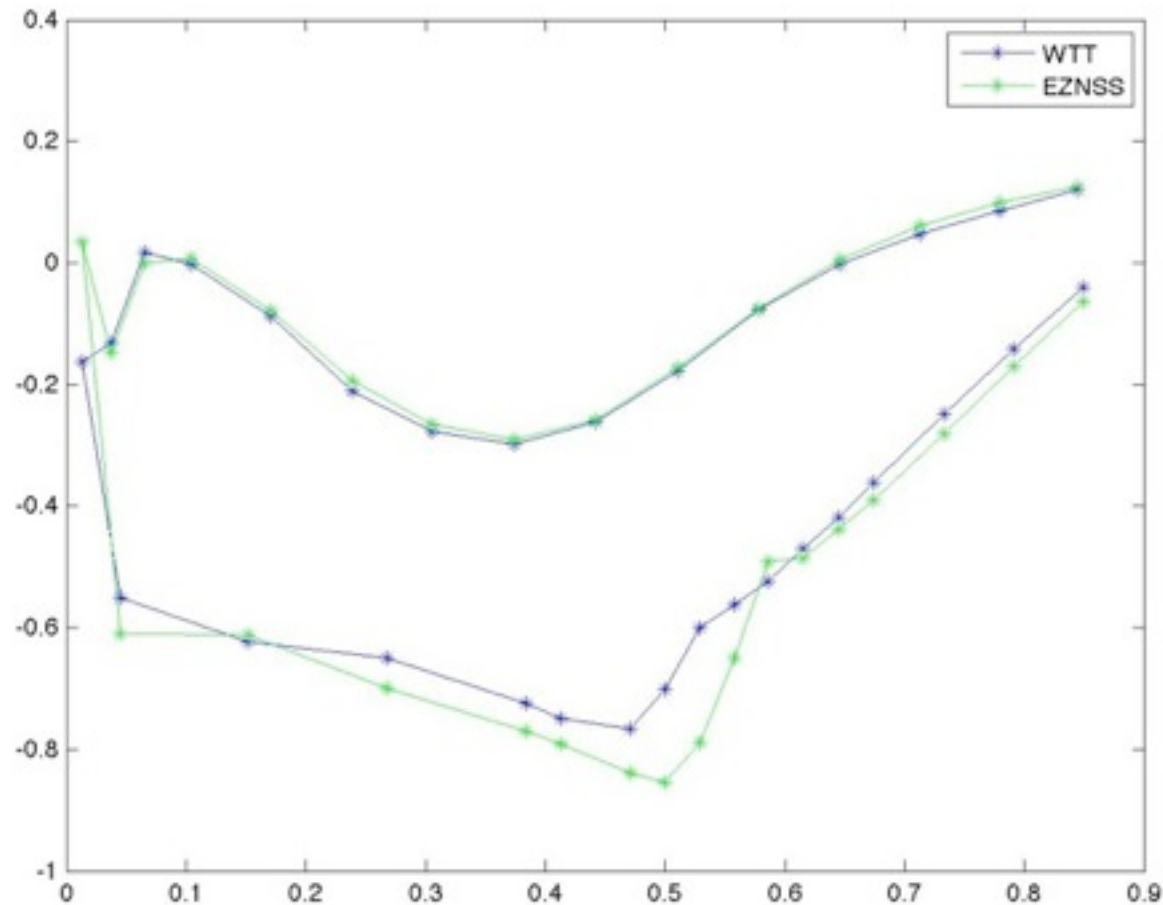
HIRENASD - C_p

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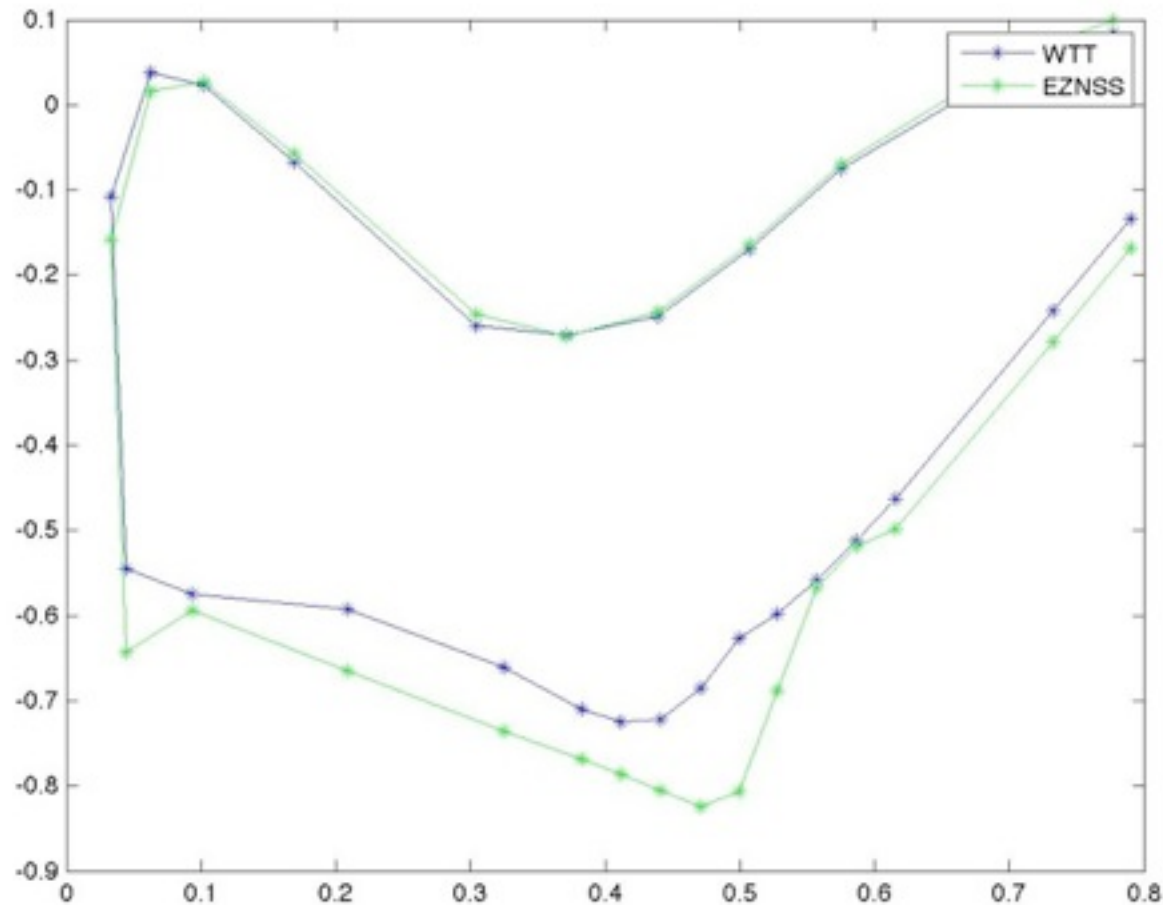
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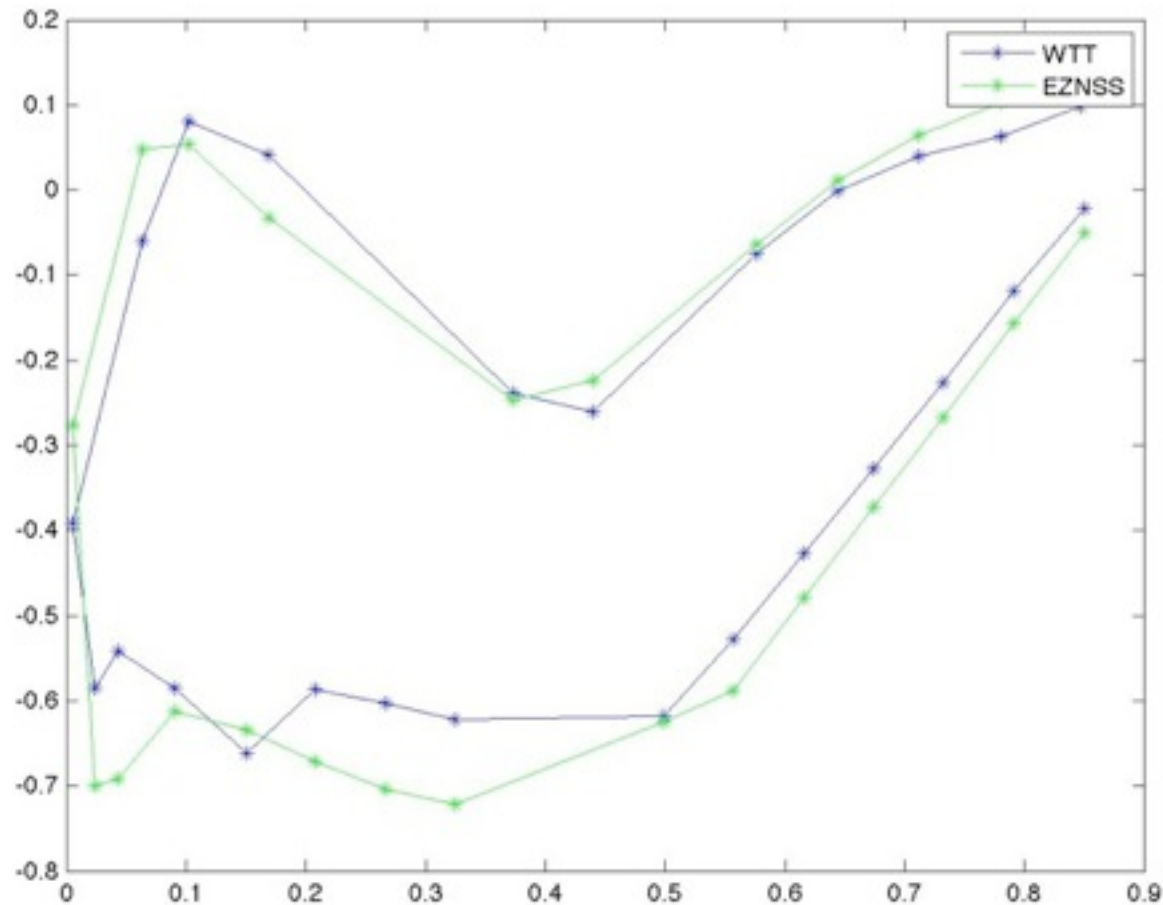
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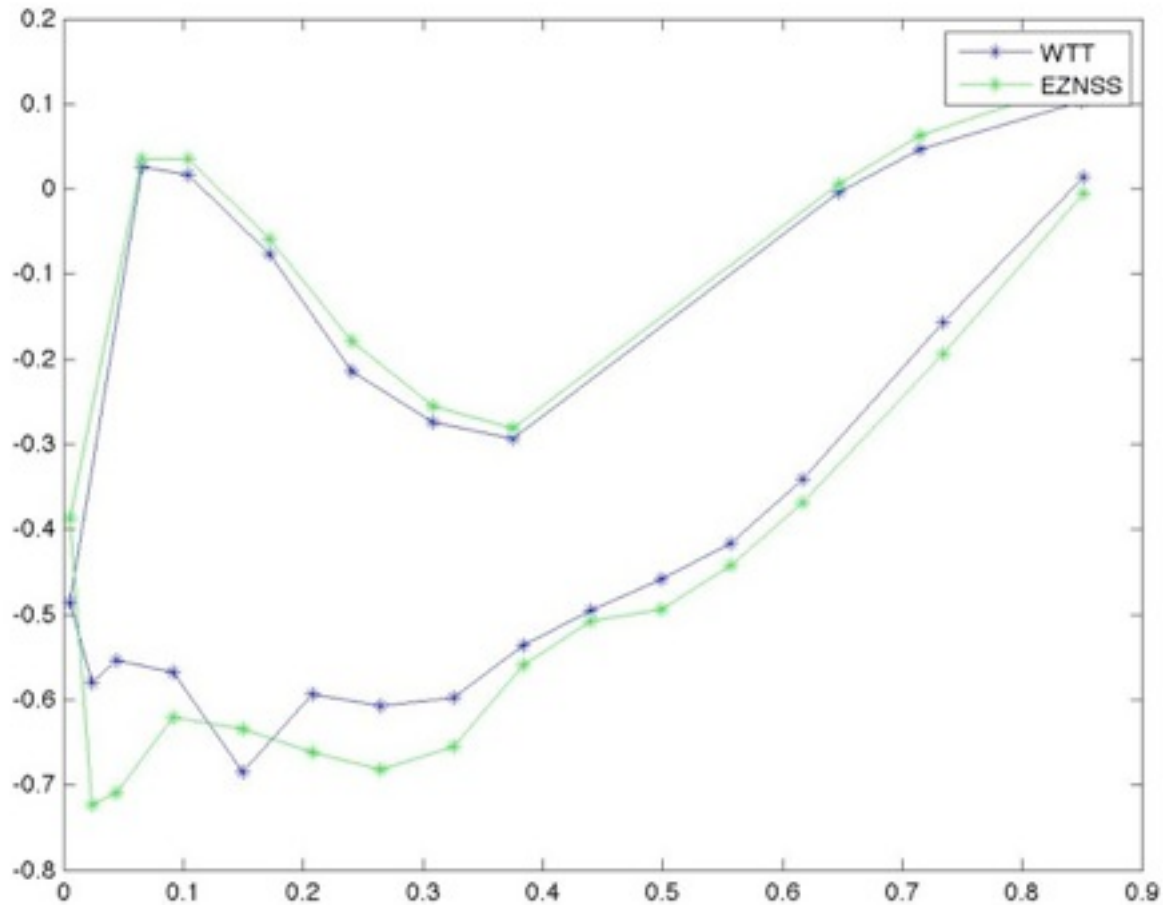
HIRENASD - C_p

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HIRENASD - C_p

Mach 0.8, Re 7 mil., AoA 1.5°, $q_D=40000$ Pa



PRESCRIBED MOTION

- Mach 0.8, Re 7 mil., AoA 1.5°, $q_D=40000$ Pa
- 2nd bending mode, 78.9 Hz, modal amplitude 0.006
- ~250 steps per cycle
- Dual time-stepping 3 OOM / N sub-iterations

HIRENASD - PRESCRIBED MOTION

Mach 0.8, Re 7 mil., AoA 1.5°, $q_D=40000$ Pa

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Mach 0.8, Re 7 mil., AoA 1.5°, $q_D=40000$ Pa

