

DPW-8/AePW-4 Scatter Working Group:

Summary



AIAA Aviation 2026
June 6

<https://www.aiaa-dpw.org>



Source of Scatter – Motivation

- Seek to identify deviations in DPW-7 CRM data
- Significant spread in solvers post pitchup (all submissions plotted)

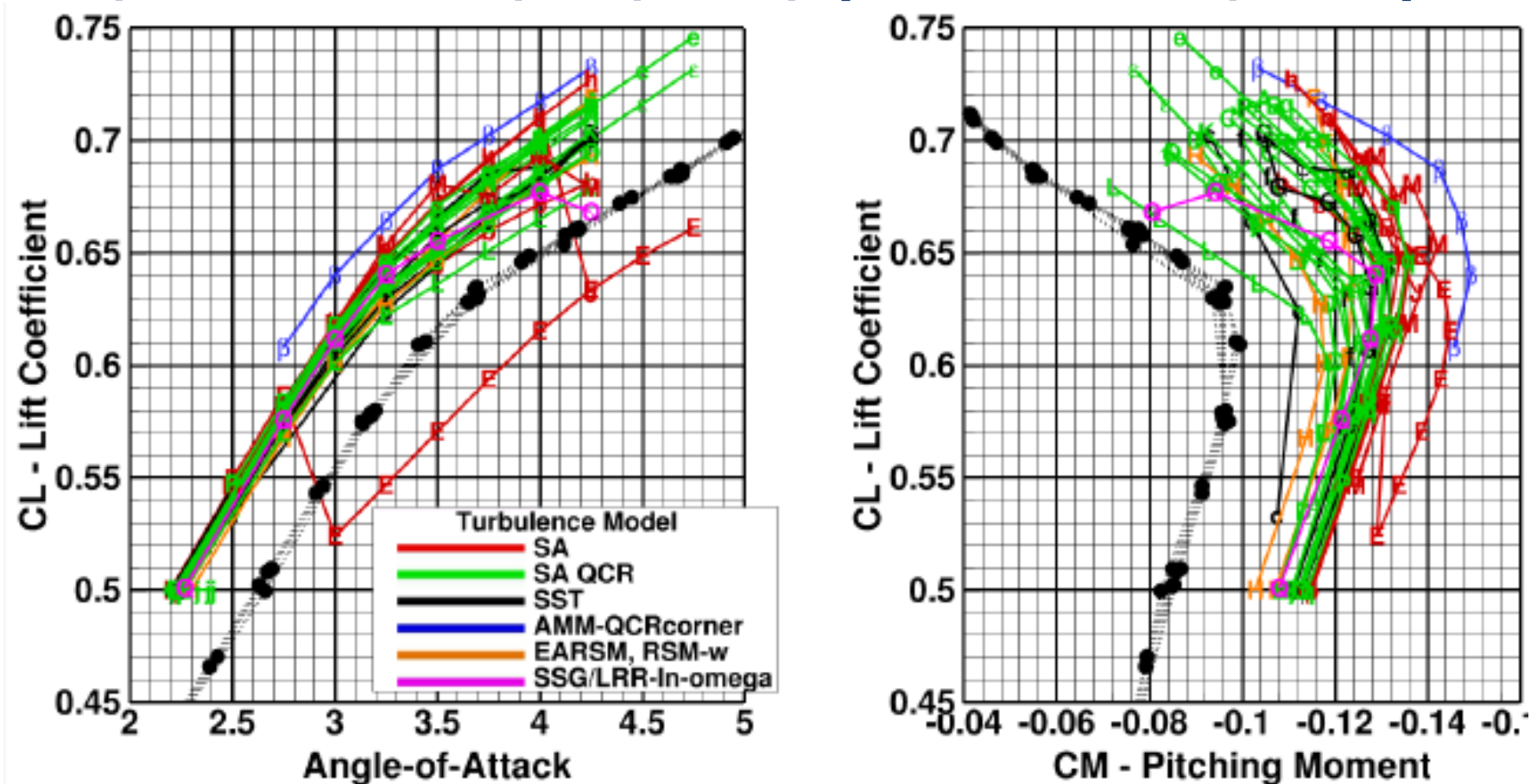
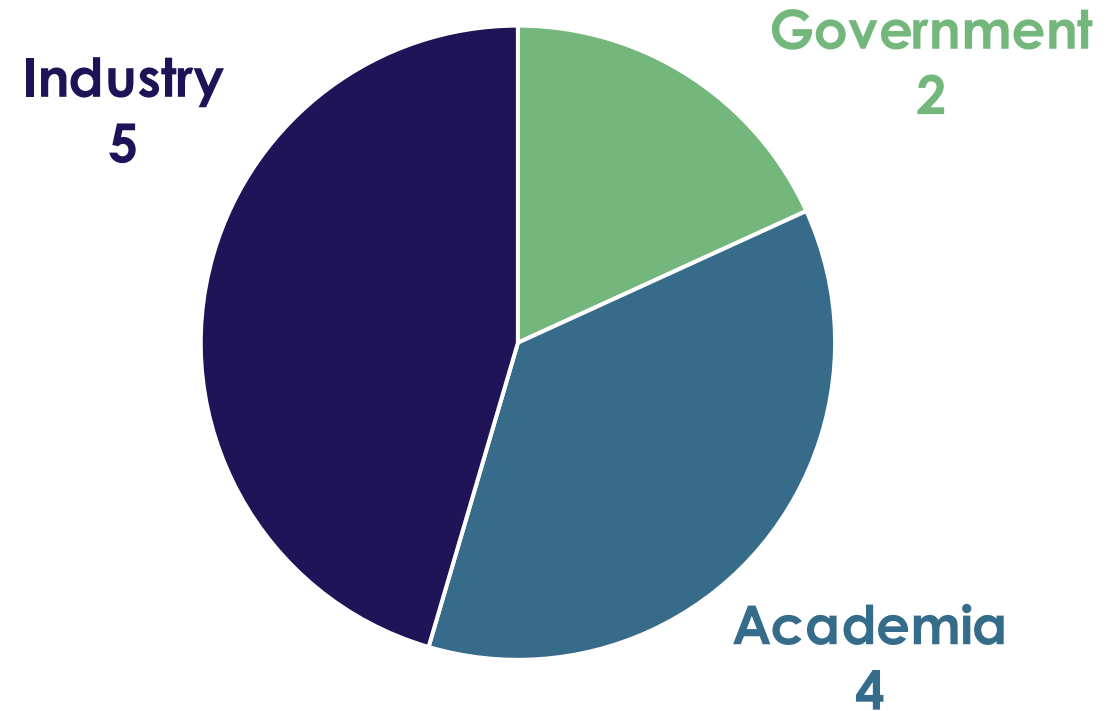


Image source:
Tinoco, E., et al., "Summary Data from the Seventh AIAA CFD Drag Prediction Workshop," AIAA 2023-3492

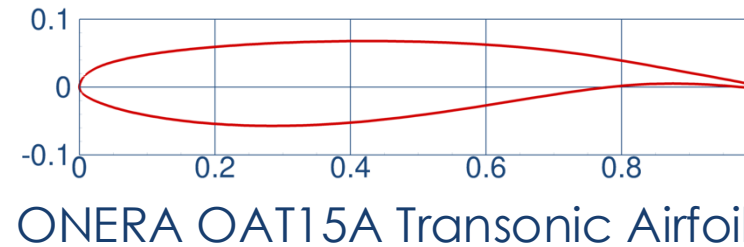
Scatter Group Participant Summary

- **11 teams from varied agency types**
 - Industry: 5
 - Government: 2
 - Academia: 4
- **Small group**
 - 44 on email distribution list
 - 5-10 participants per call
- **Tagups twice per month**
- **Contributions to all mini workshops**



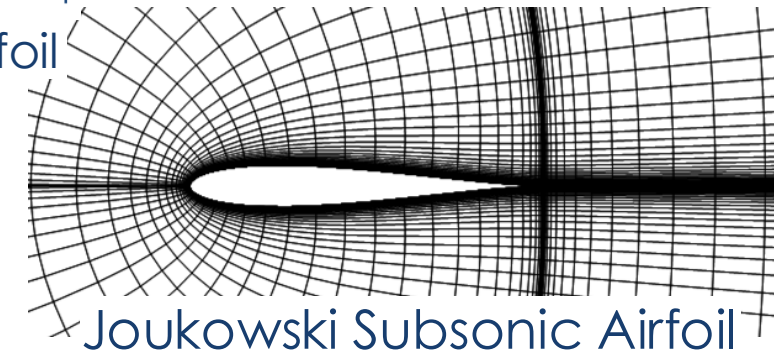
- **Test Case 1a/1c: ONERA OAT15A**

- Establish initial level of scatter
- Attempt reduction in scatter



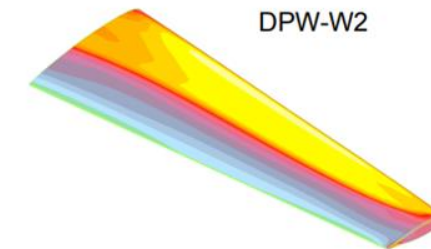
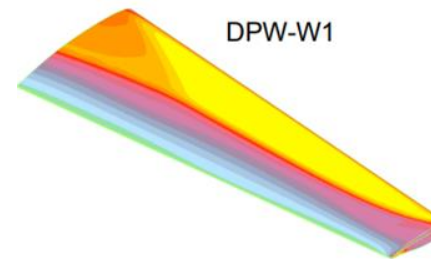
- **Test Case 1b: Joukowski Airfoil**

- Order of accuracy check



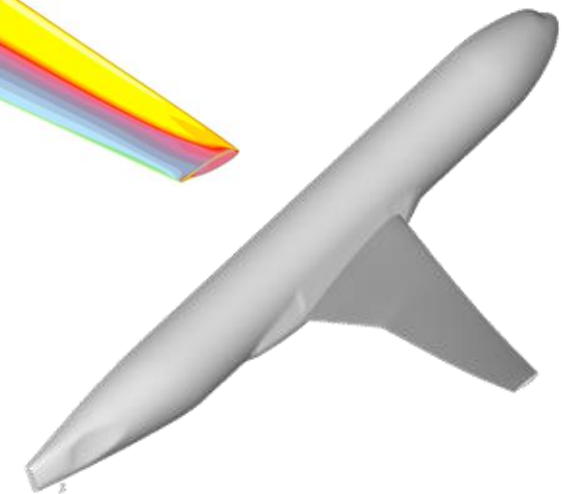
- **Test Case 1d/1e: W1/W2 from DPW3**

- 3D “simple” case
- Looking at geometry increments



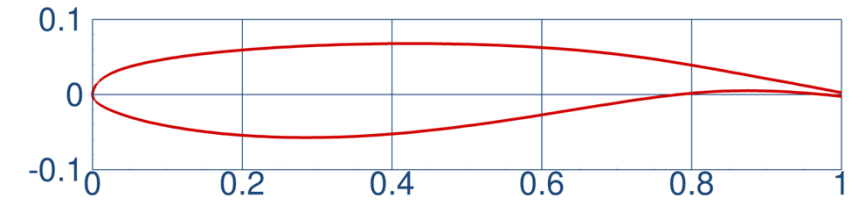
- **Test Case 2a/2b: CRM Wing/Body Cruise**

- Examine scatter for 3D and turbulence model



Test Case 1a: Workshop-Wide Validation

- Validation of steady CFD analysis, required
- Users are encouraged to employ best practices
- Settings
 - Steady CFD (e.g., RANS)
 - Prefer some version of SA, multiple turbulence models can be submitted
 - Purely 2D simulations (one cell wide)
- Grids
 - Six-member RANS grid family; four are required, six are desirable
 - Encourage use of committee-supplied grids; user-generated grids are acceptable
 - Committee-supplied grid is one cell wide with a 230mm chord (same as experiment) and follows RANS best practices
- Conditions
 - Mach 0.73, $Re_c = 3 \times 10^6$ (based on chord length), $T_{static} = 271$ K (487.8 R)
 - Alpha: 1.36, **1.50**, 2.50, 3.00, **3.10**



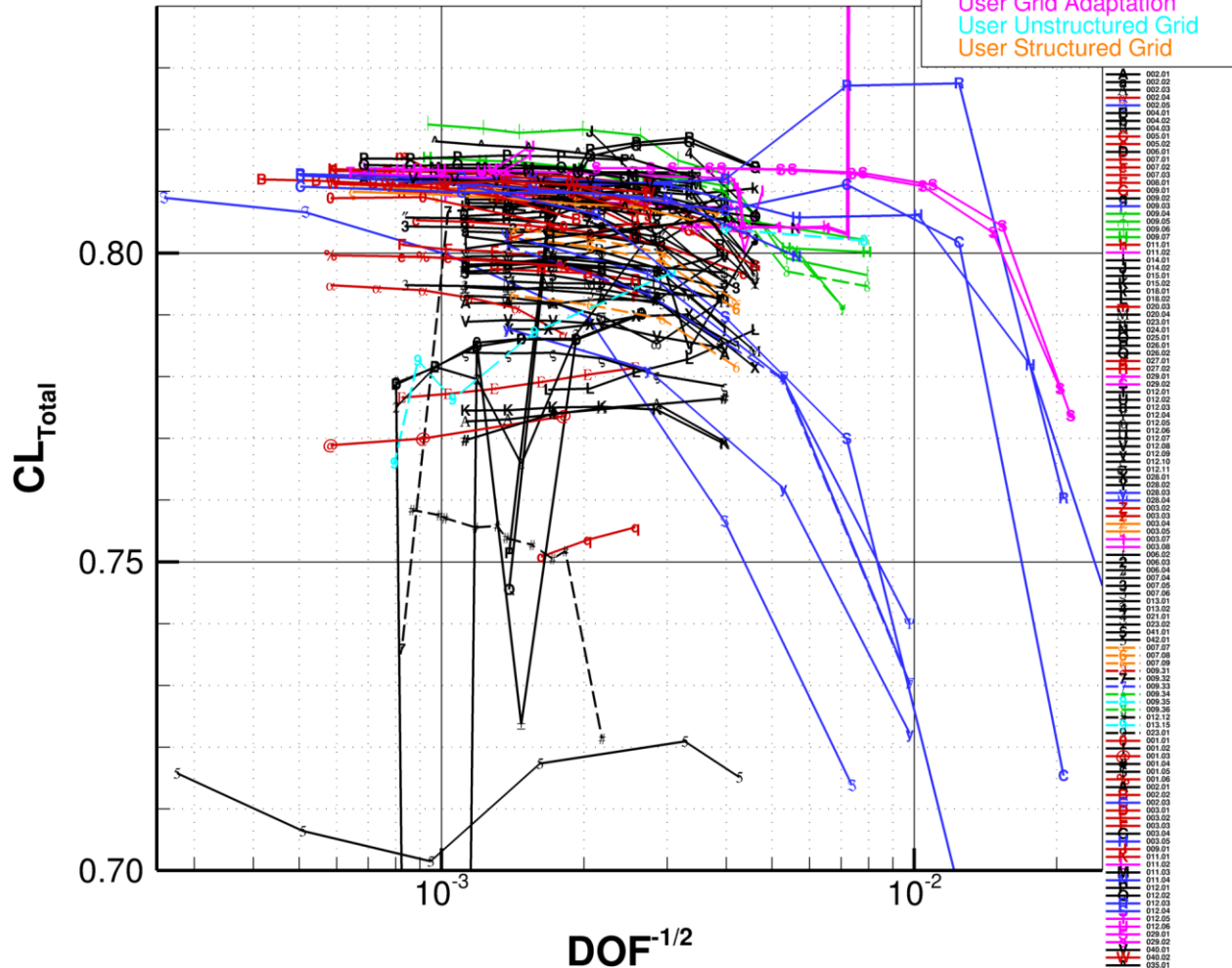
ONERA OAT15A Transonic Airfoil

Jaquin, et al. "Experimental Study of Shock Oscillation over a Transonic Supercritical Profiles." AIAA Journal, Vol. 47, No. 9, 2009. Pages 1985-1994.

ONERA OAT15A C_L Convergence: $\alpha = 1.5^\circ$

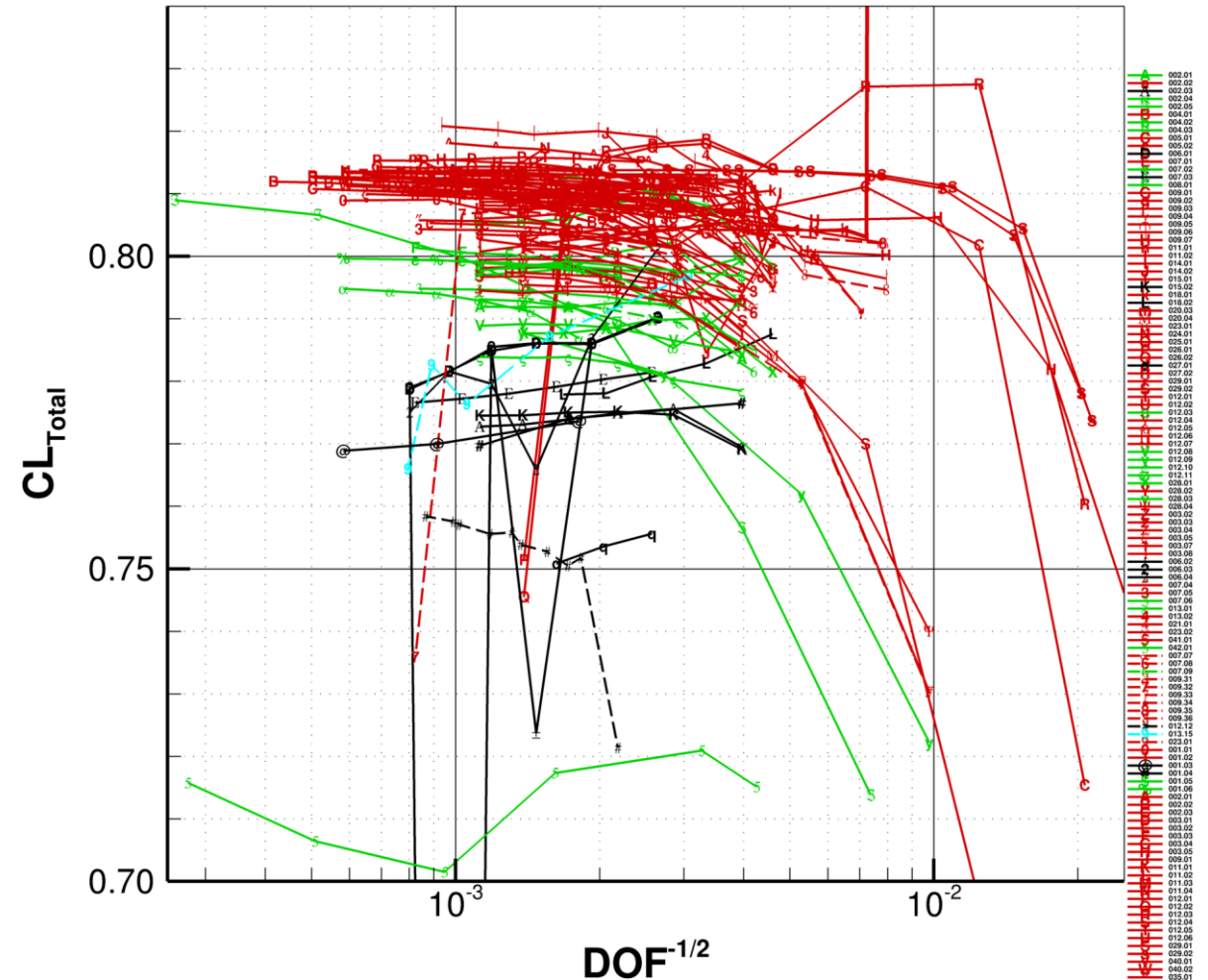
Test Case 1a: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid



Test Case 1a: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

Turbulence Model:
SA (+R/RC/CC)
SA + QCR
SST
WMLES

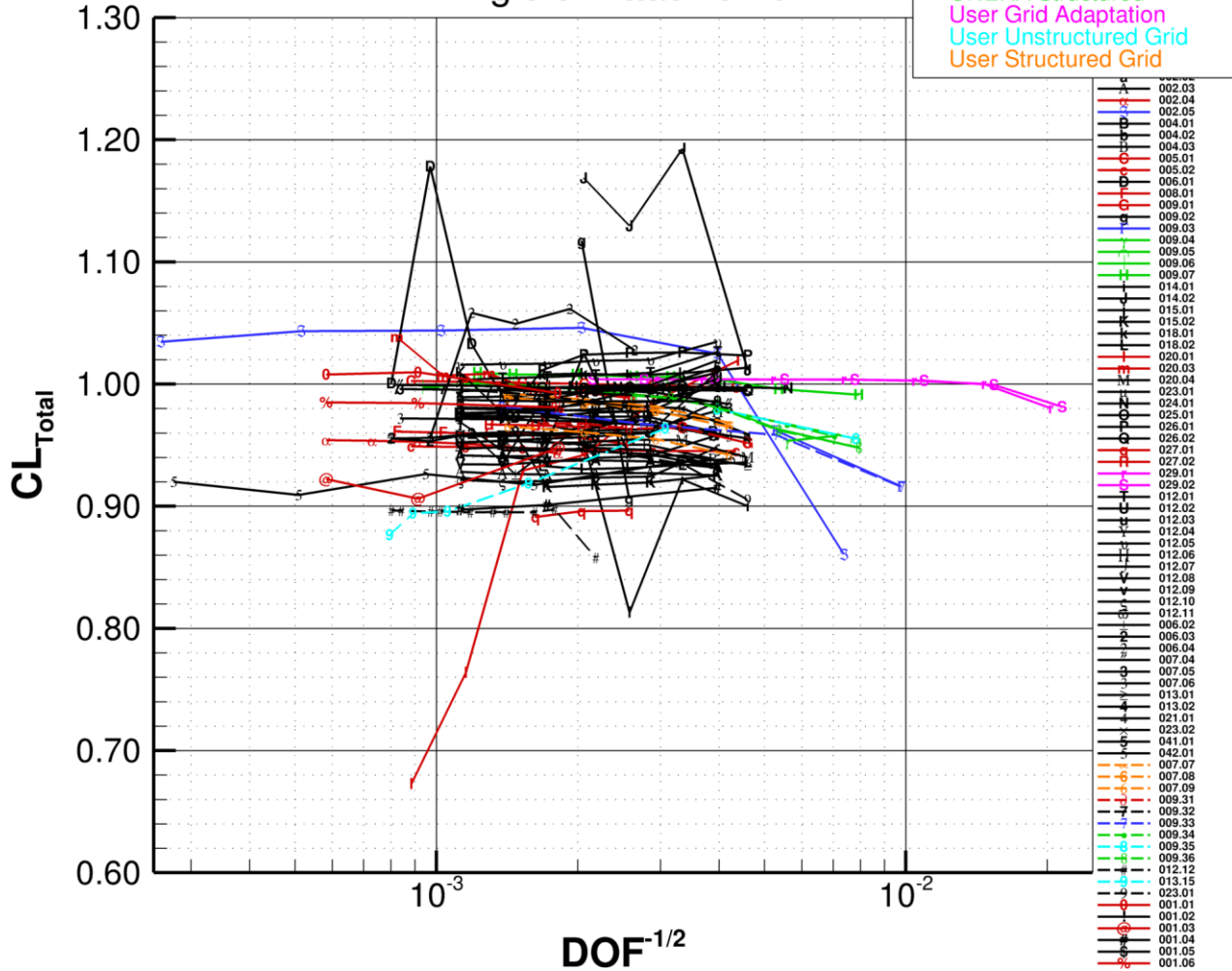


ONERA OAT15A C_L Convergence: $\alpha = 3.1^\circ$



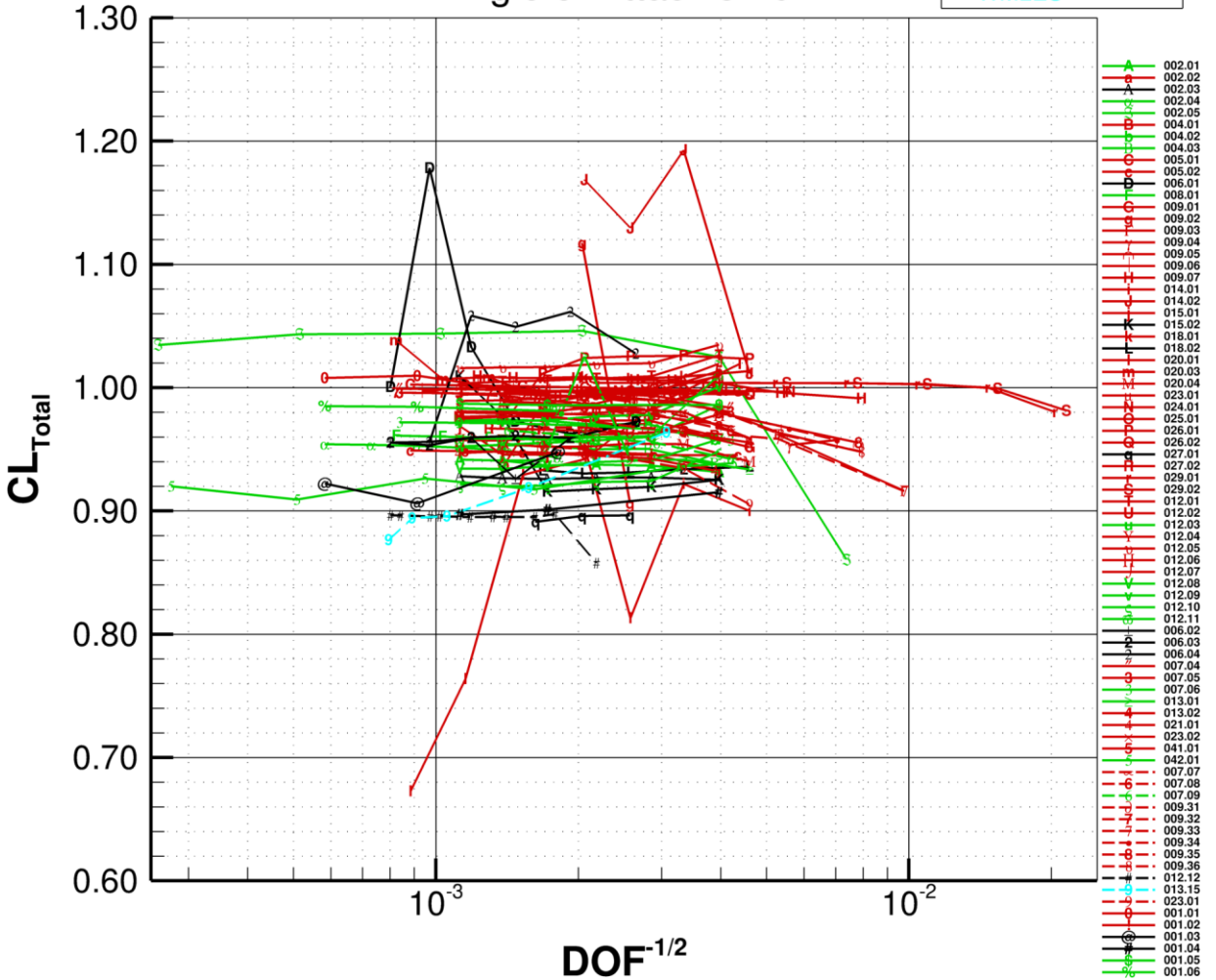
Test Case 1a: ONERA OAT15A
Grid Convergence Study
Angle of Attack 3.10

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid

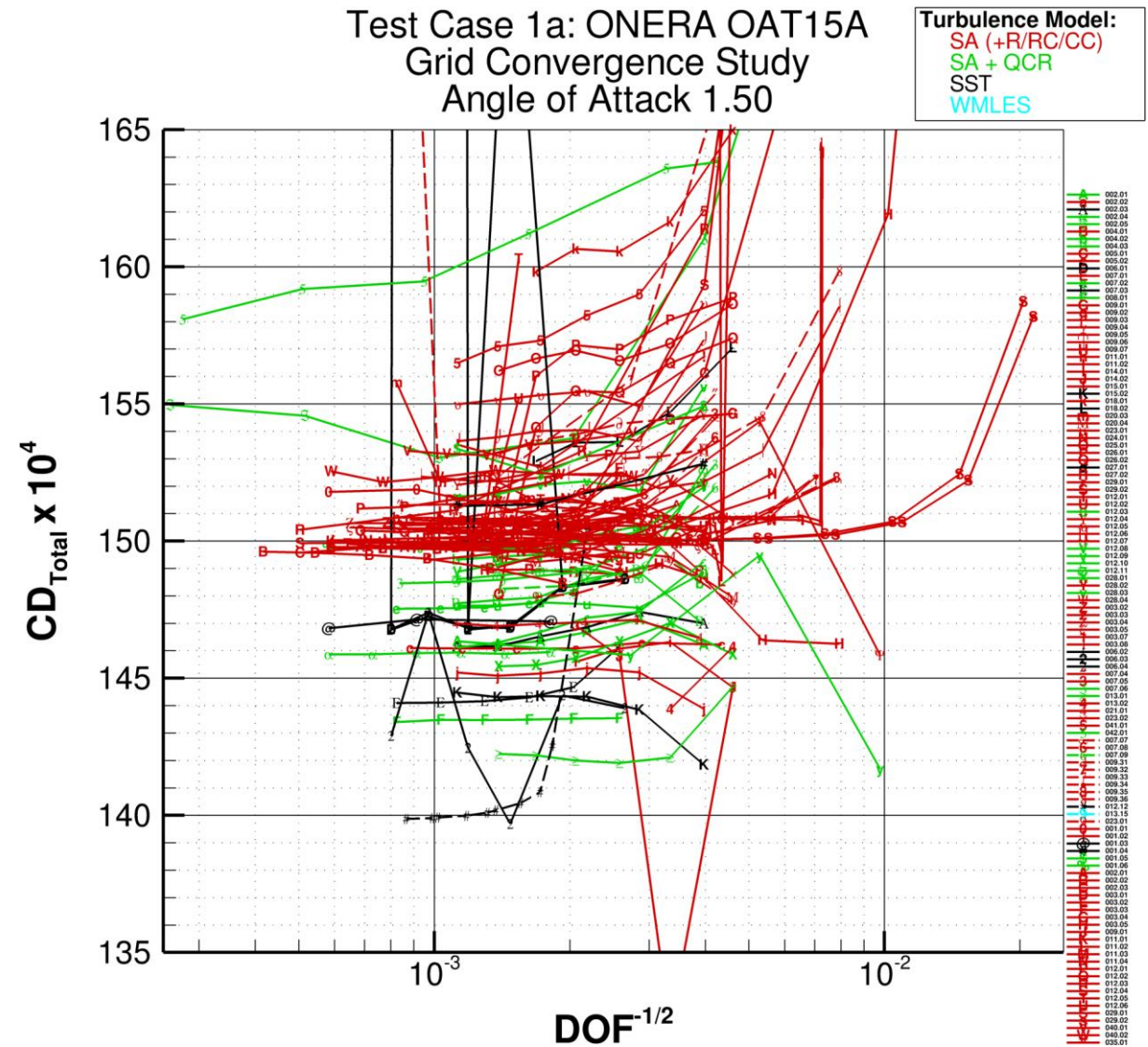
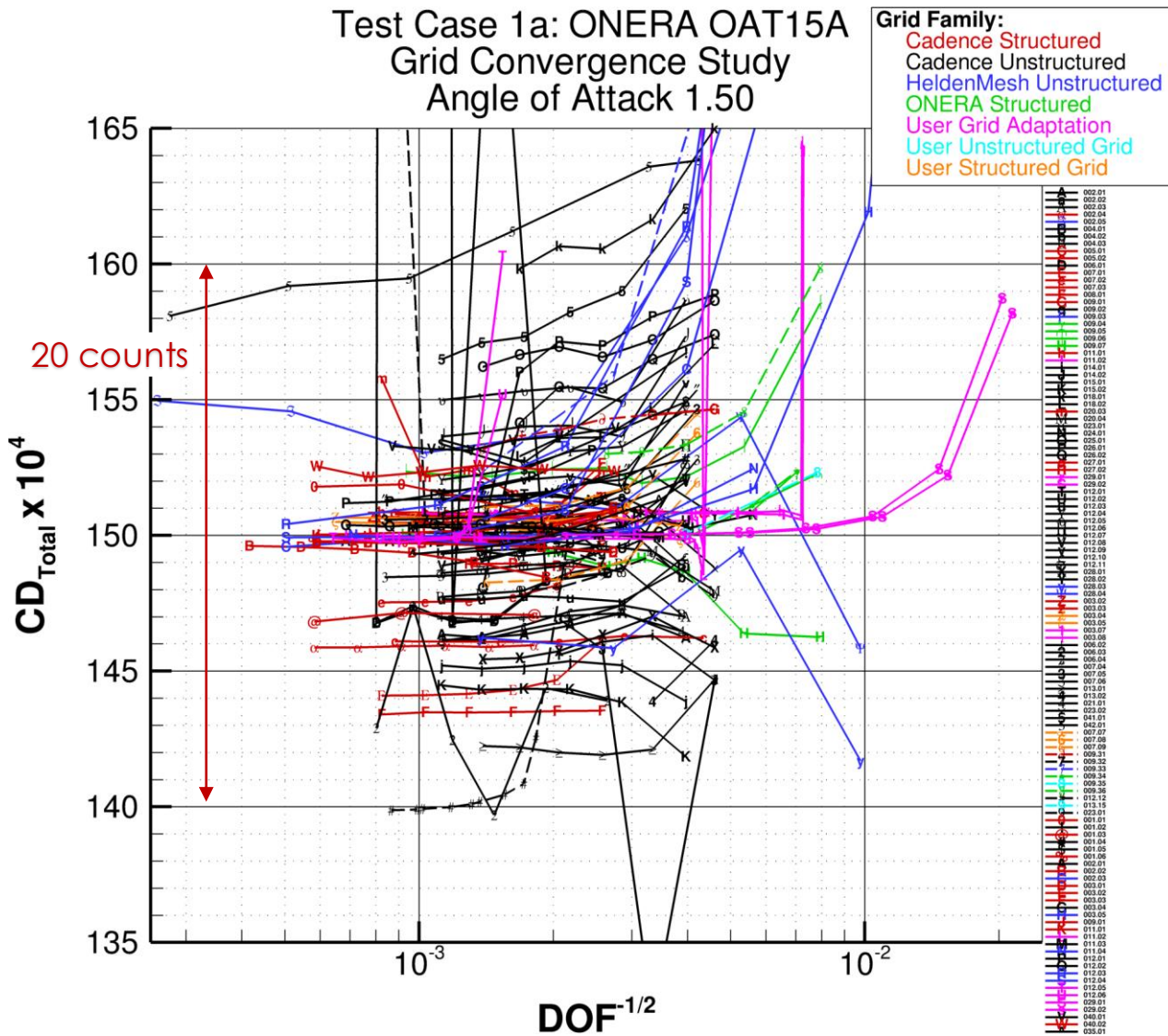


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Angle of Attack 3.10

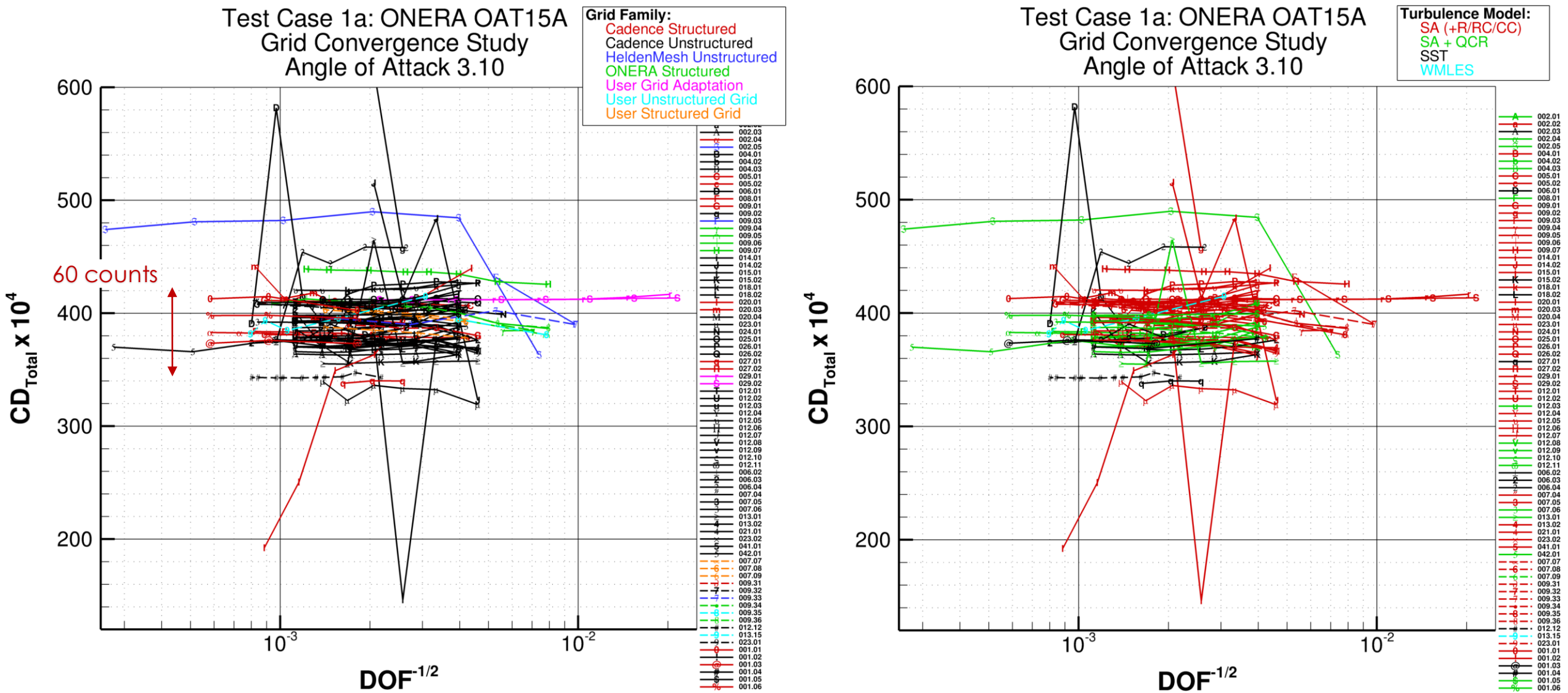
Turbulence Model:
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SA + QCR
SST
WMLES



ONERA OAT15A C_D Convergence: $\alpha = 1.5^\circ$



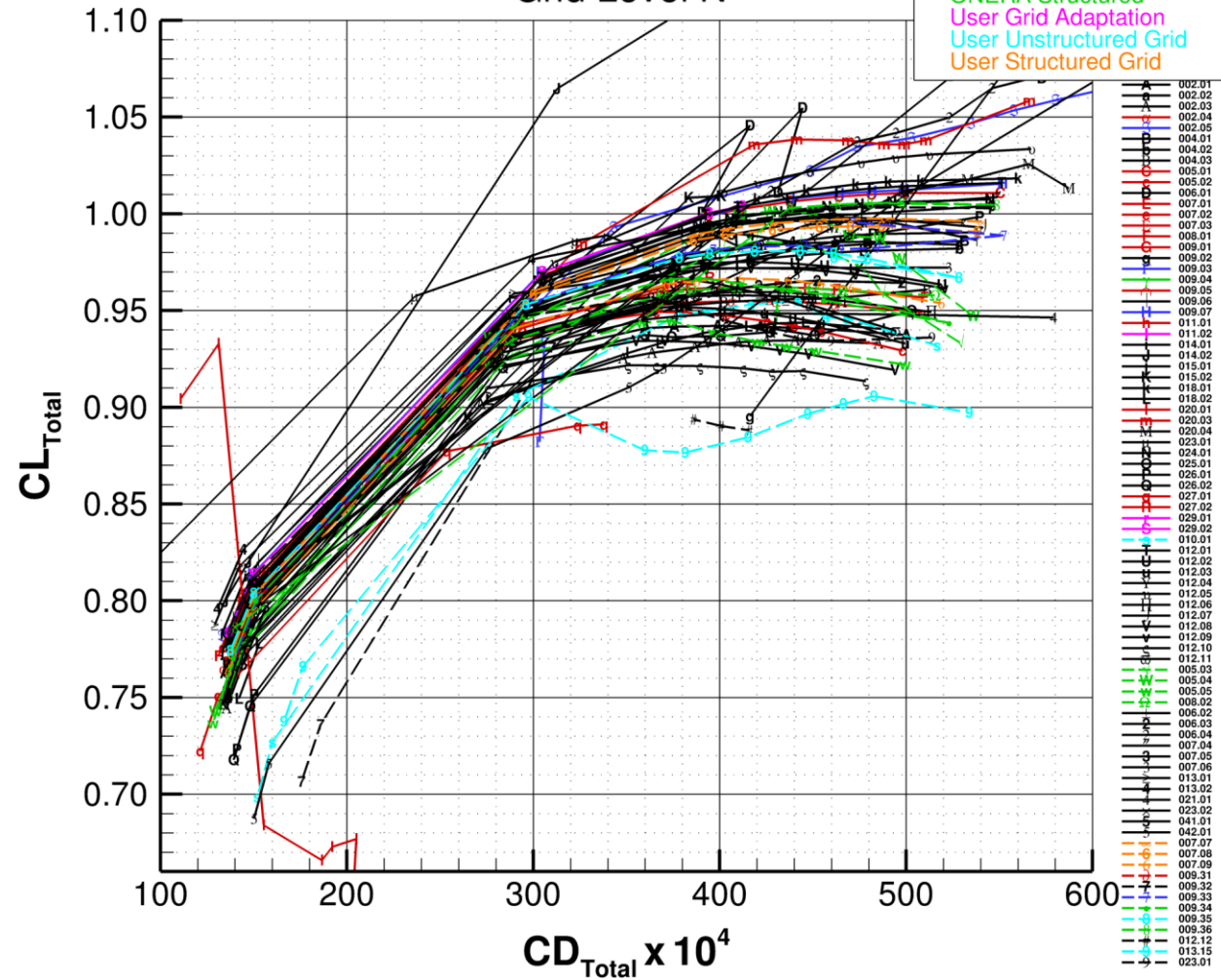
ONERA OAT15A C_D Convergence: $\alpha = 3.1^\circ$



ONERA OAT15A $C_L - C_D$ Polar: Finest Mesh

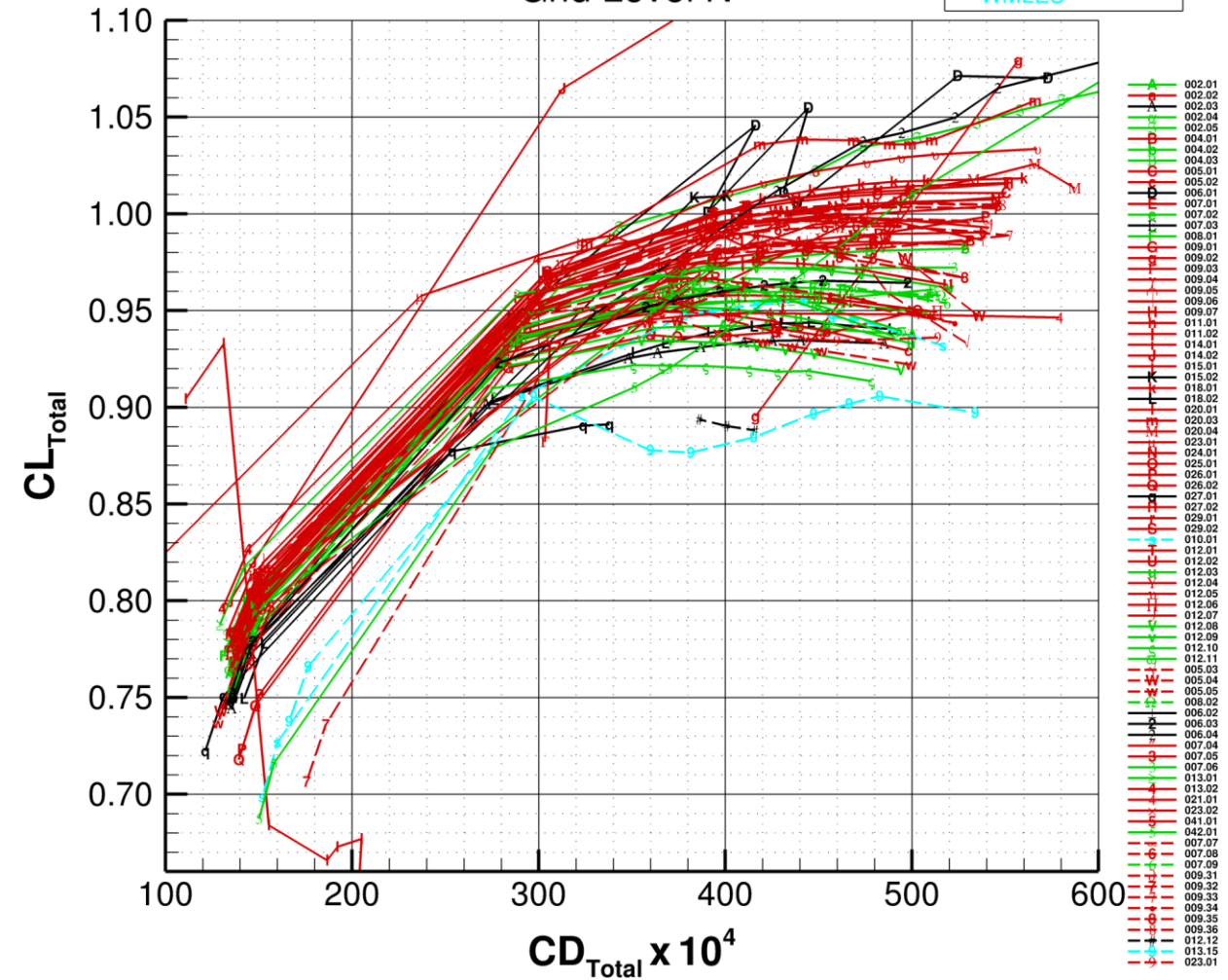
Test Case 1a: ONERA OAT15A
Polar Study
Grid Level N

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid



Test Case 1a: ONERA OAT15A
Polar Study
Grid Level N

Turbulence Model:
SA (+R/RC/CC)
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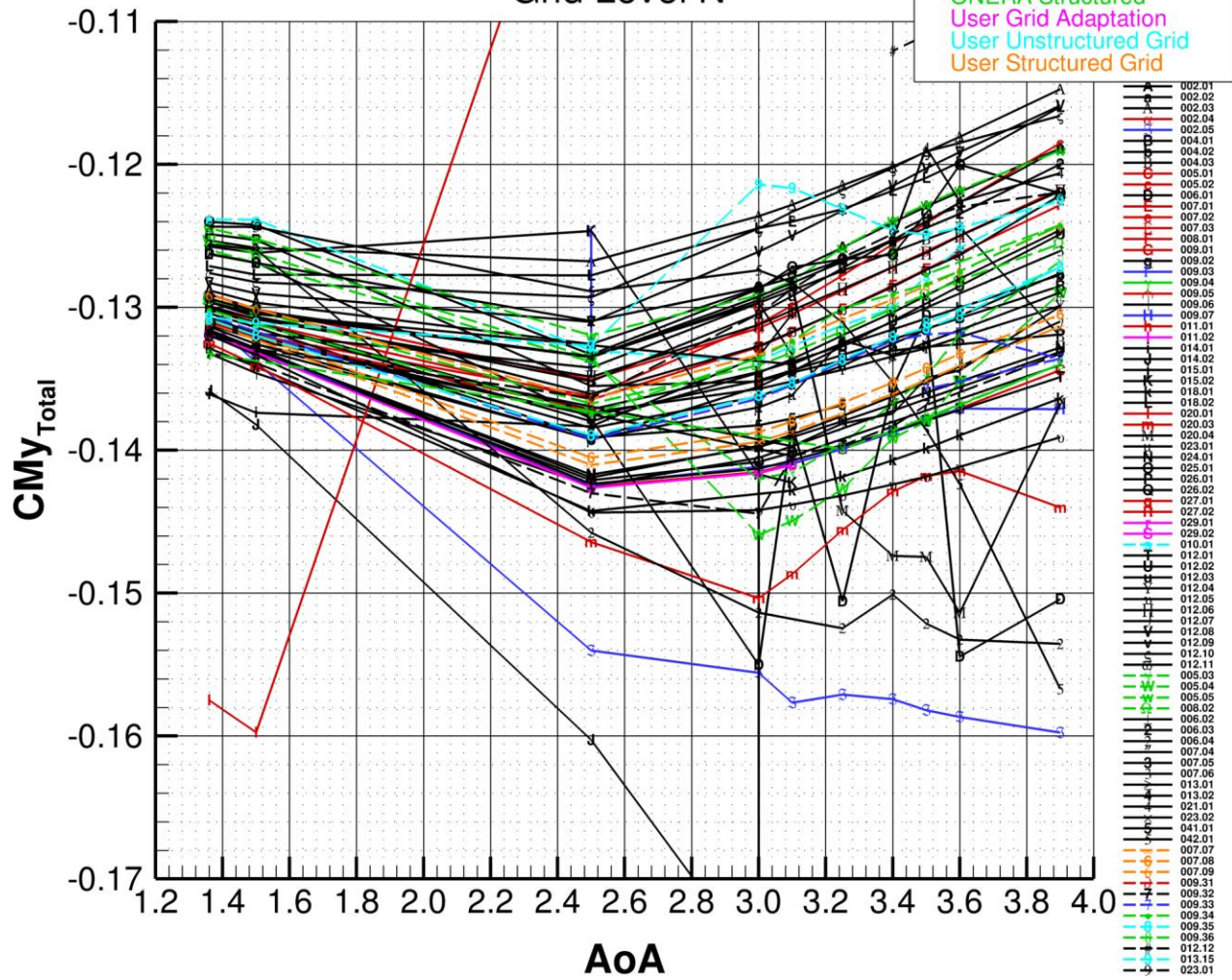


ONERA OAT15A $C_M - \alpha$ Polar: Finest Mesh



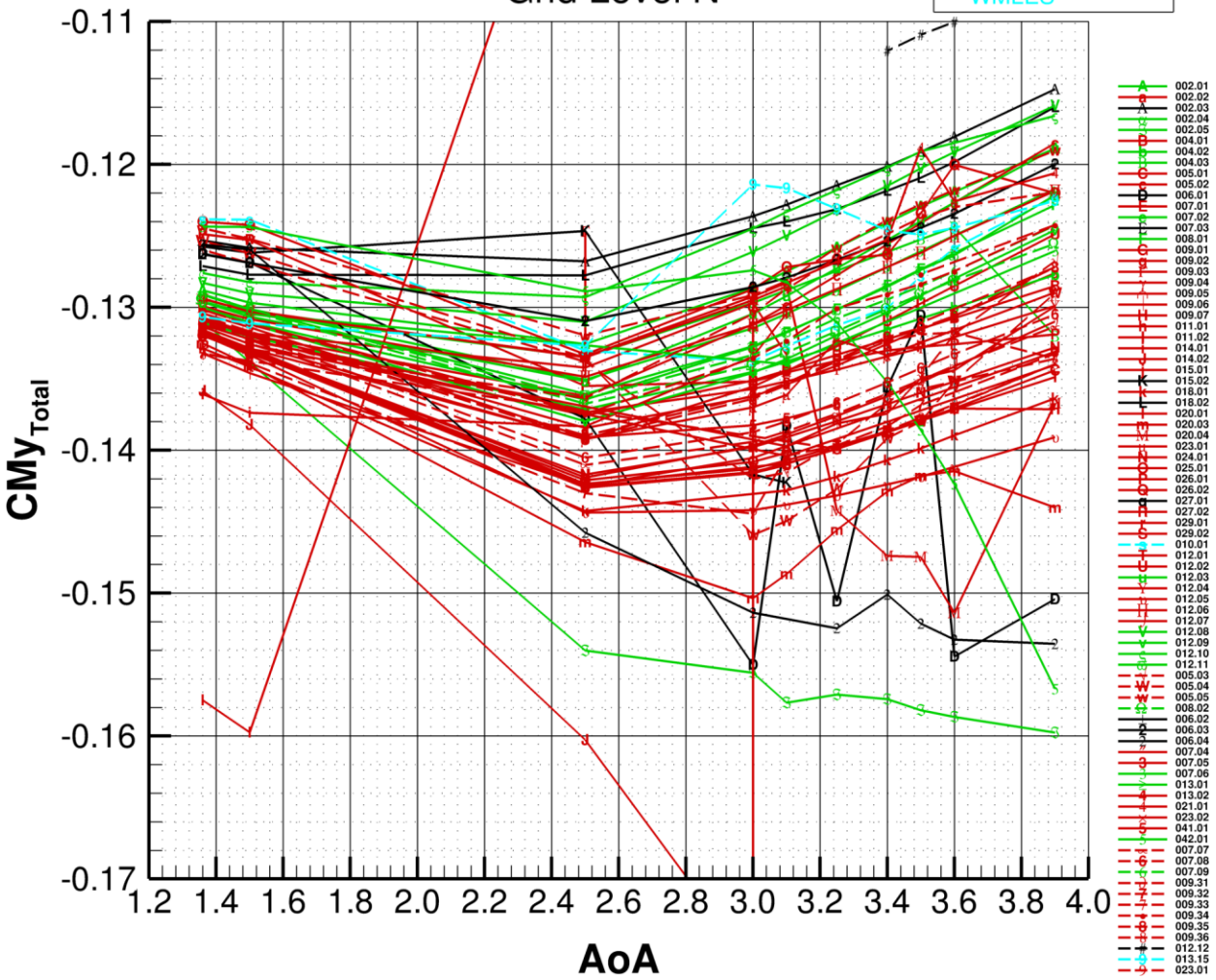
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Test Case 1a: ONERA OAT15A
Polar Study
Grid Level N

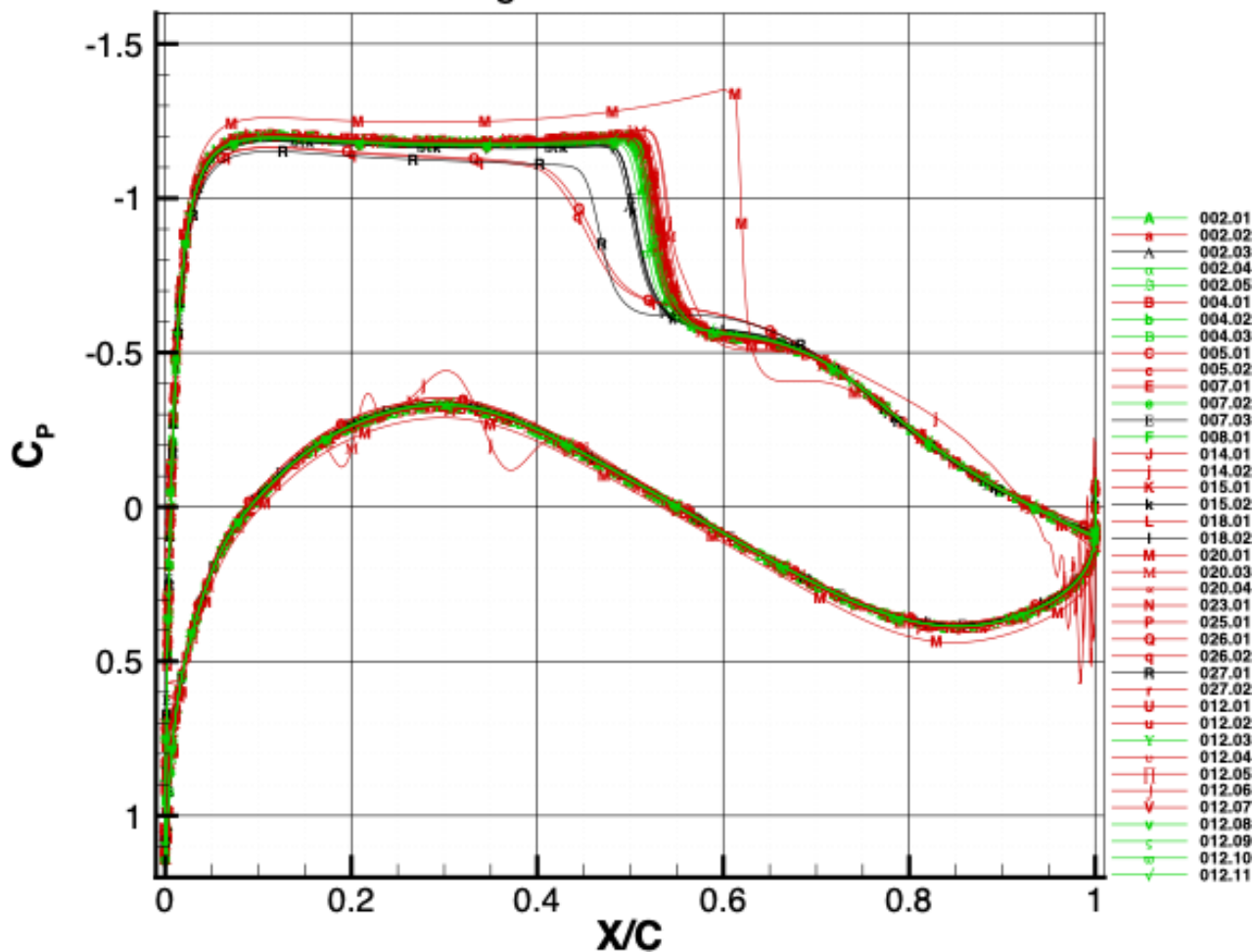
Turbulence Model:
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SA + QCR
SST
WMLES



ONERA OAT15A C_p and C_f : $\alpha = 1.5^\circ$

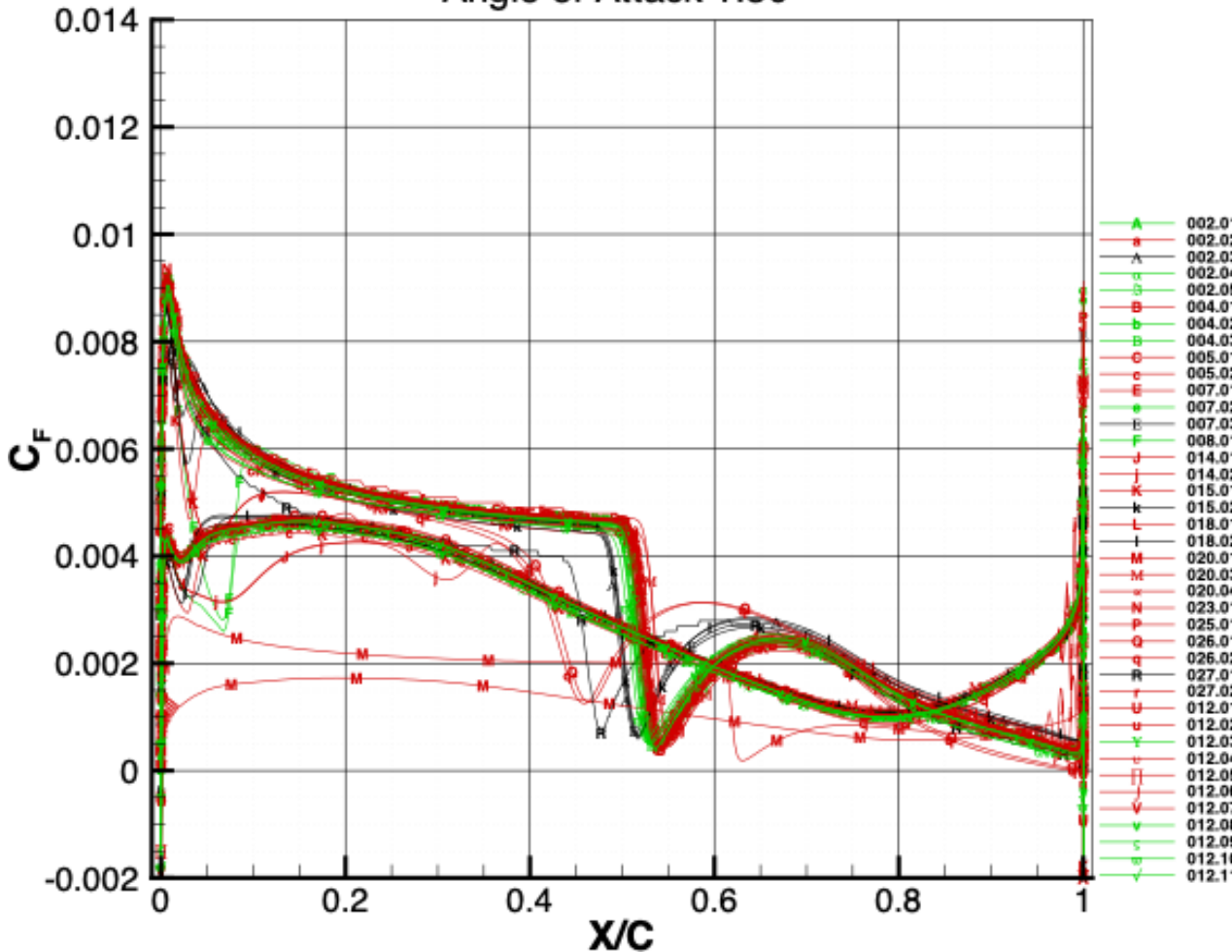
Test Case 1a: ONERA OAT15A
Sectional Cuts: Grid N
Angle of Attack 1.50

Turbulence Model:
SA (+R/RC/CC)
SA + QCR
SST



Test Case 1a: ONERA OAT15A
Sectional Cuts: Grid N
Angle of Attack 1.50

Turbulence Model:
SA (+R/RC/CC)
SA + QCR
SST



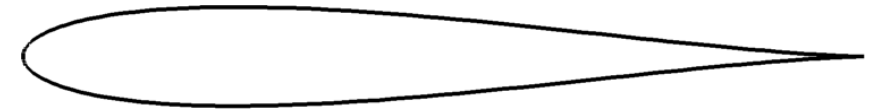
Test Case 1b: Joukowski Airfoil

- **Validation of steady CFD analysis, required**

- <https://github.com/Drag-Prediction-Workshop/DPW8-Scatter/blob/main/TestCase1b/Joukowski.pdf>

- **Settings**

- Steady CFD RANS **French Vanilla SA-[neg] (All terms!)**
 - Adiabatic Wall (not isothermal)
 - Characteristic Farfield (**100 chords away - no circulation**)
 - Use periodic boundary conditions for sidewall boundary conditions
 - Converge residuals to machine precision (**~1e-10**)



- **Grids**

- Committee-supplied grid family (High-Fidelity CFD Verification Workshop 2024)

- **Conditions**

Mach	Re _c	T _{static}	α	γ	Pr	Pr _t	Farfield $\chi = \tilde{v}/\nu$
0.15	6×10^6	520.0 R	0.0°	1.4	0.72	0.9	3

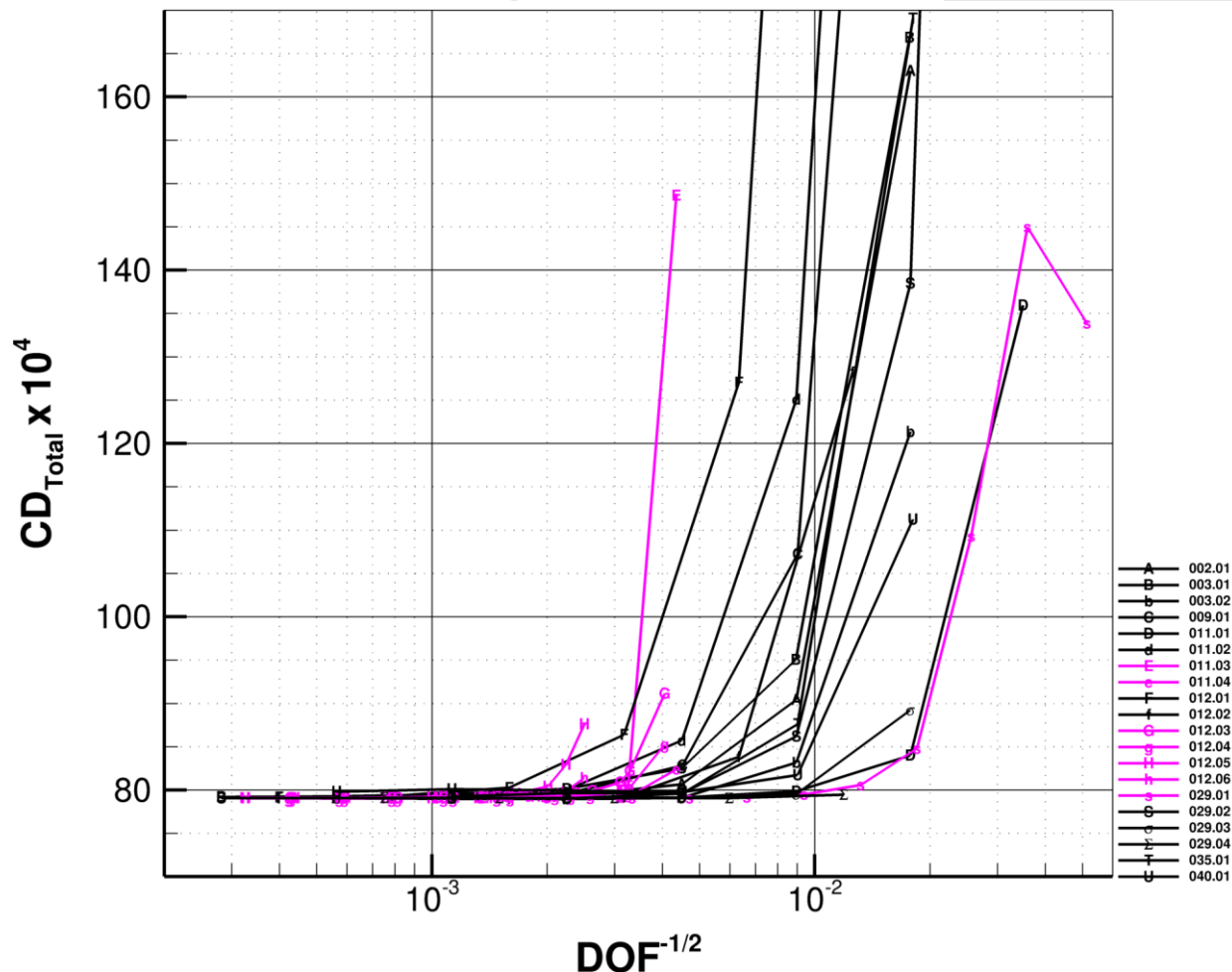
- **Sutherland's Law**

$$\mu(T) = \mu_0 \left(\frac{T}{T_0} \right)^{3/2} \left(\frac{T_0 + S}{T + S} \right) \quad \begin{matrix} \mu_0 = 1.716 \times 10^{-5} \frac{\text{kg}}{\text{m s}} \\ T_0 = 491.6^\circ \text{R} \\ S = 198.6^\circ \text{R} \end{matrix} \quad \frac{\mu(T)}{\mu_{ref}} = \left(\frac{T}{T_{ref}} \right)^{3/2} \left(\frac{1 + S/T_{fef}}{T/T_{fef} + S/T_{fef}} \right)$$

Joukowski C_D Convergence

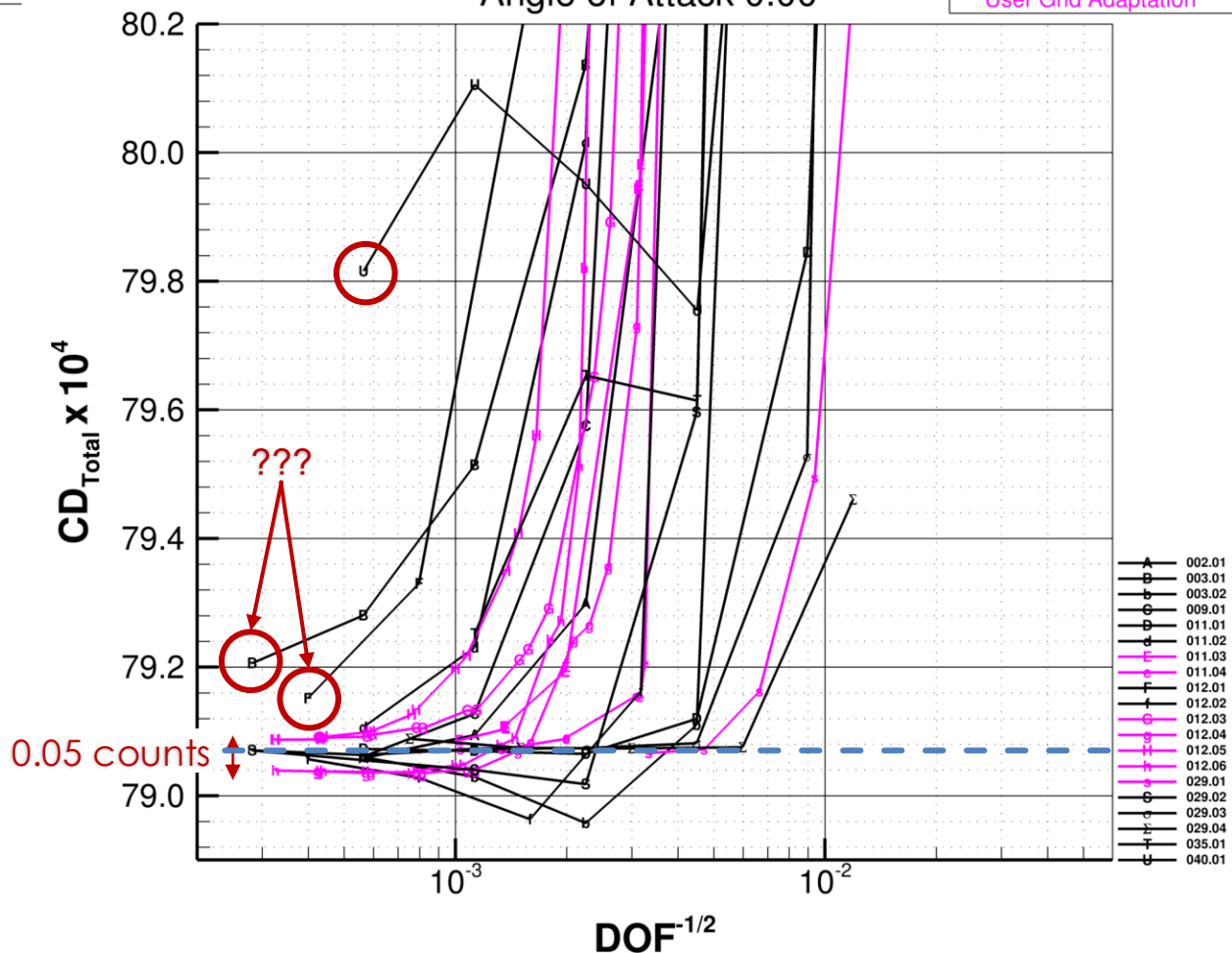
Test Case 1b: Joukowski Airfoil
Grid Convergence Study
Angle of Attack 0.00

Grid Family:
Python Mesh Family
User Grid Adaptation

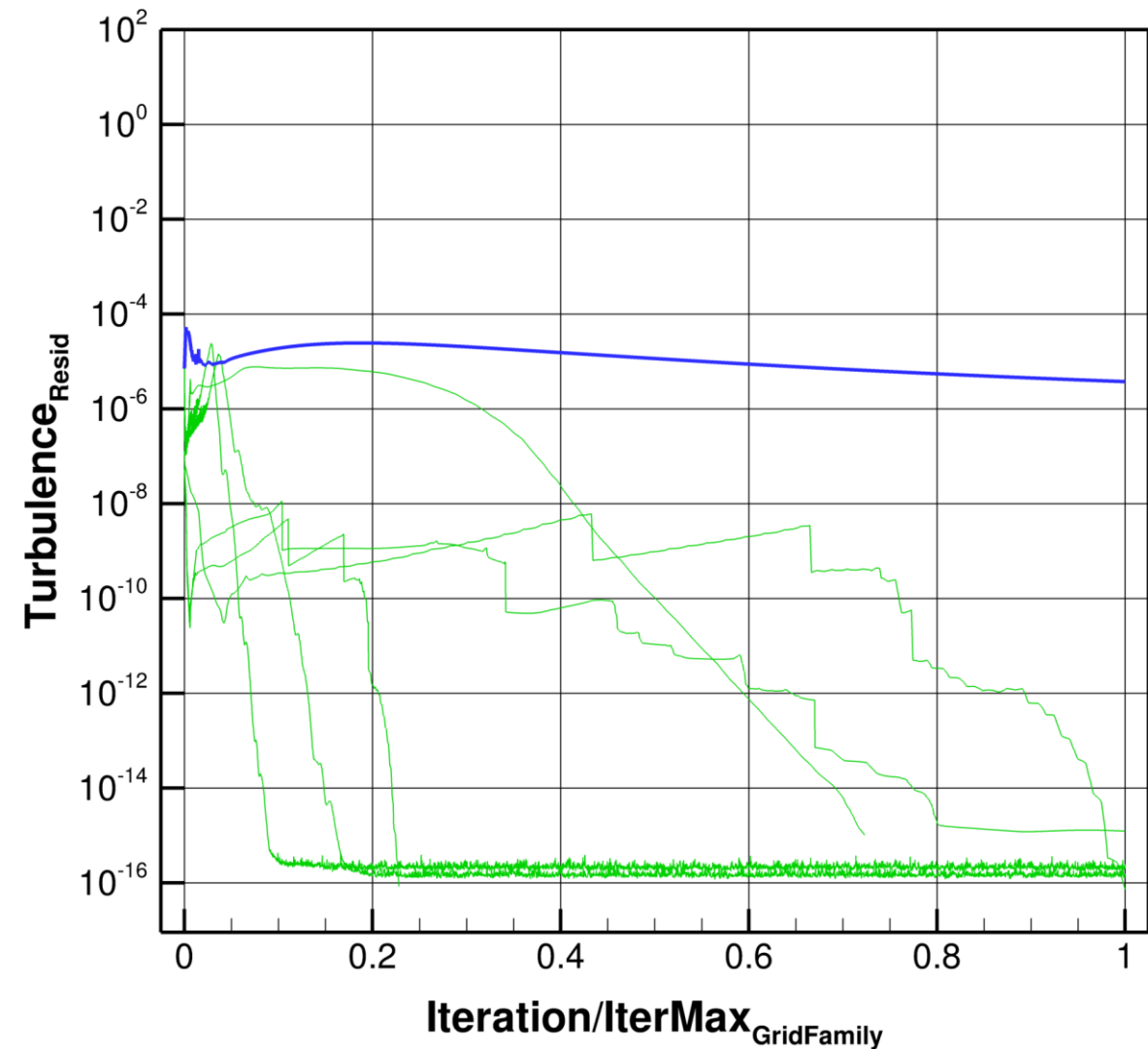
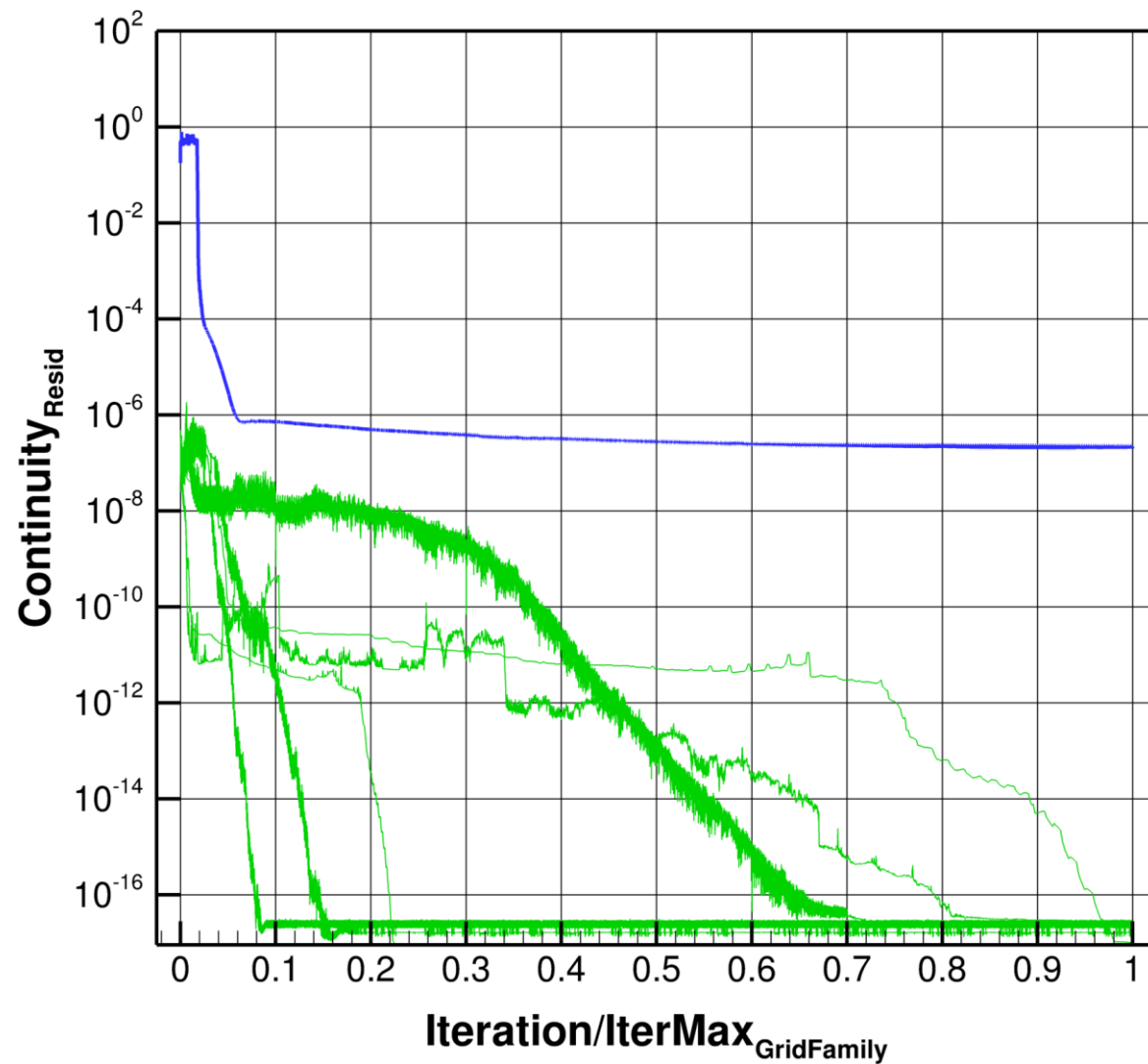


Test Case 1b: Joukowski Airfoil
Grid Convergence Study
Angle of Attack 0.00

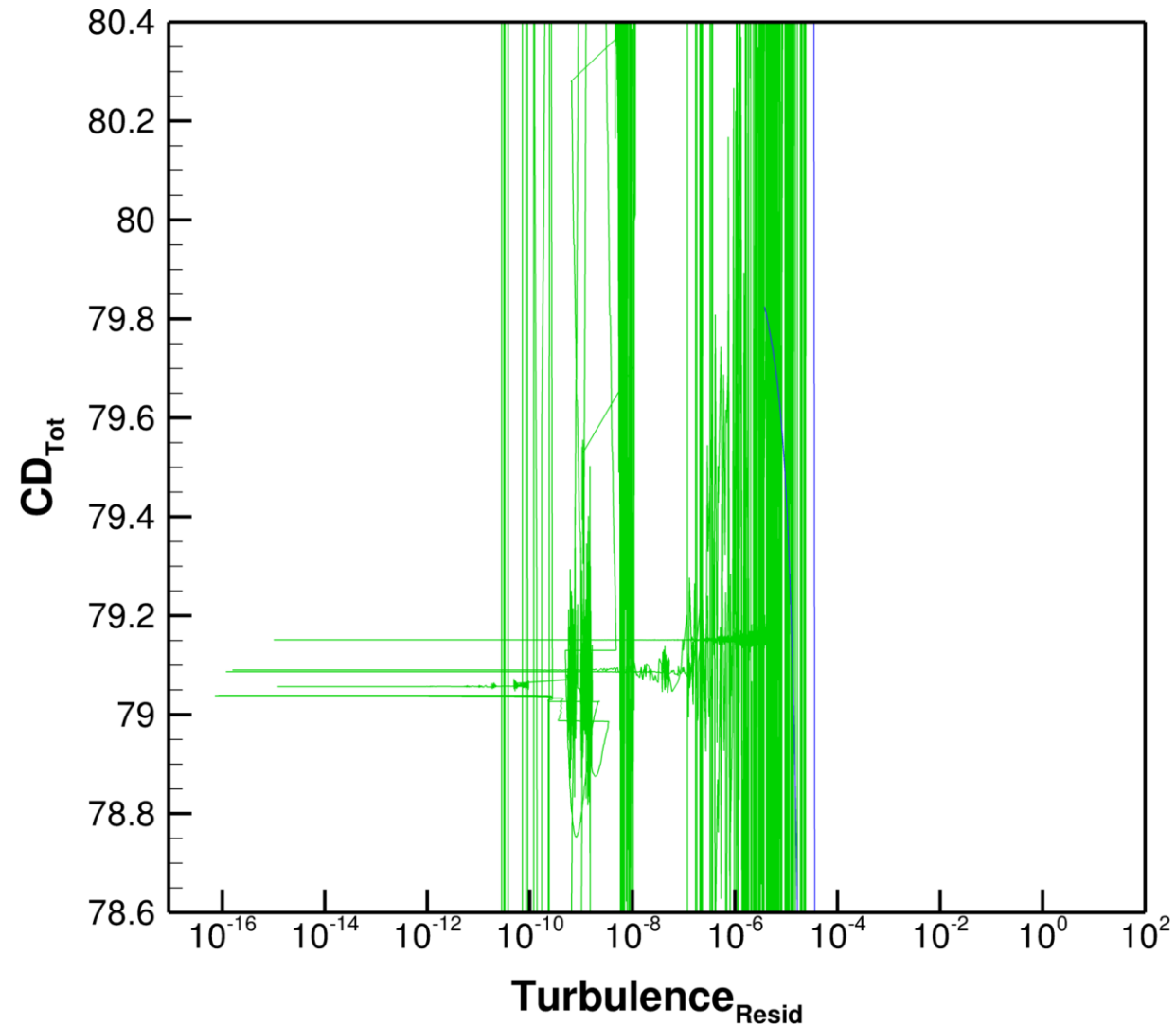
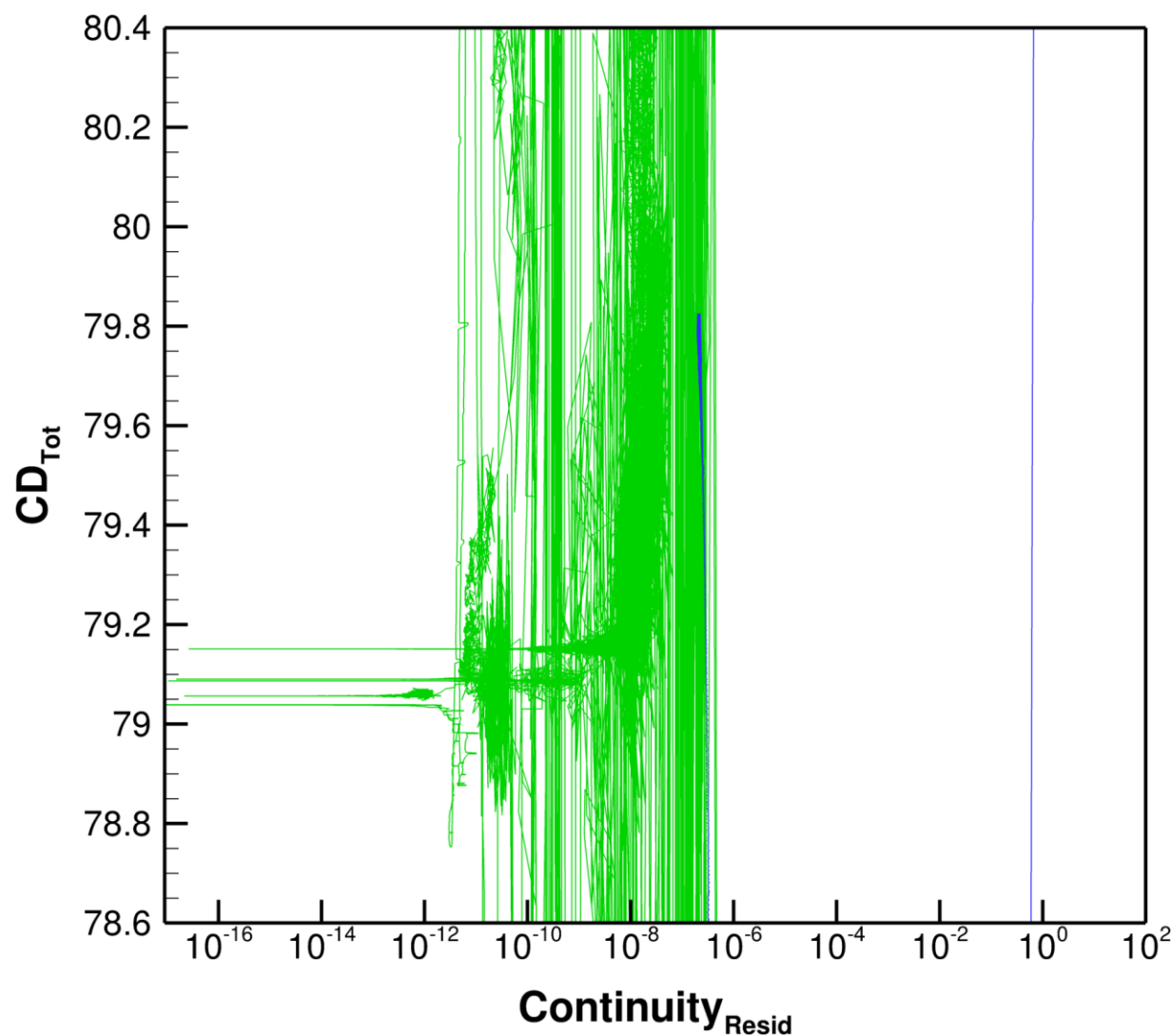
Grid Family:
Python Mesh Family
User Grid Adaptation



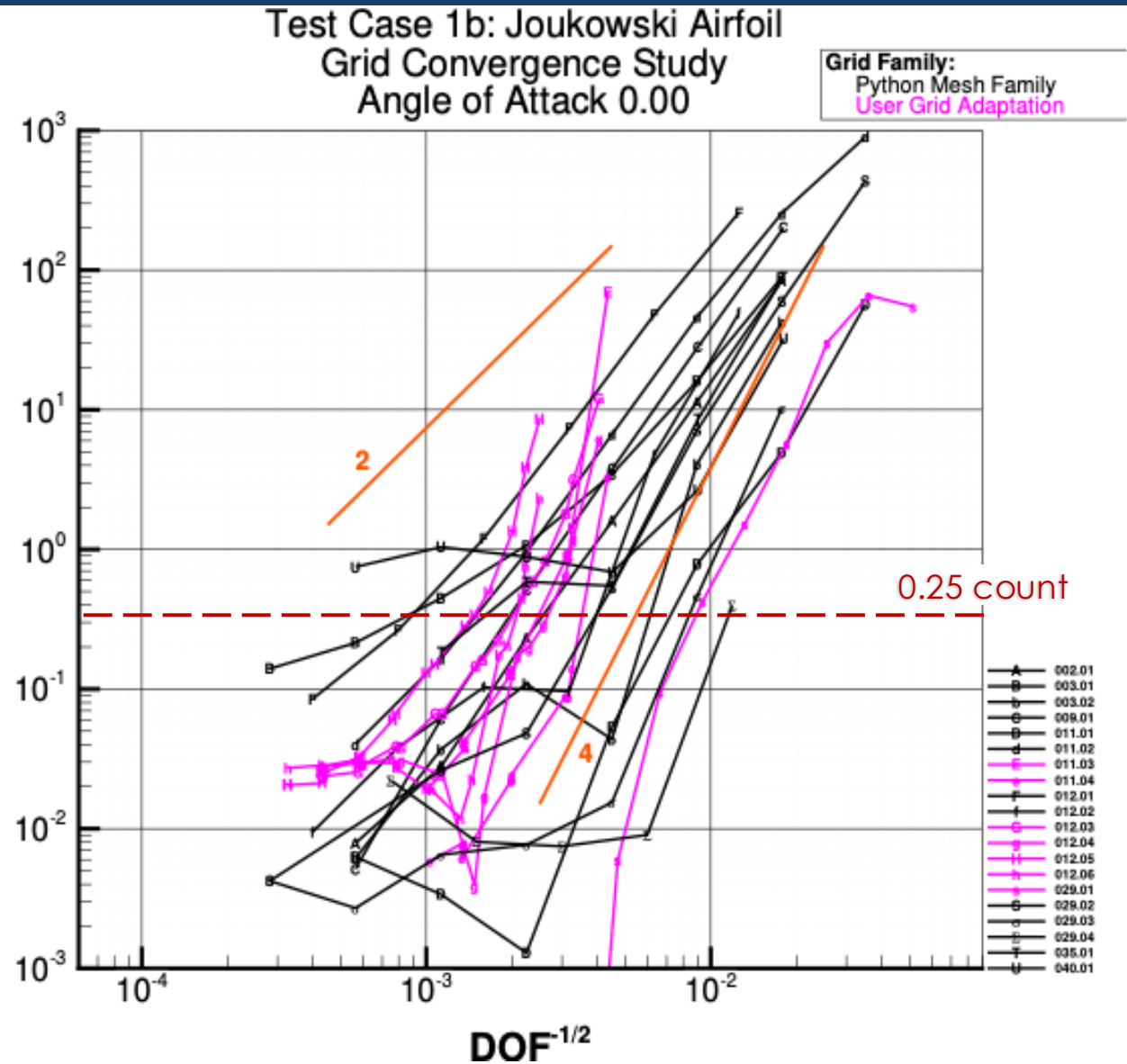
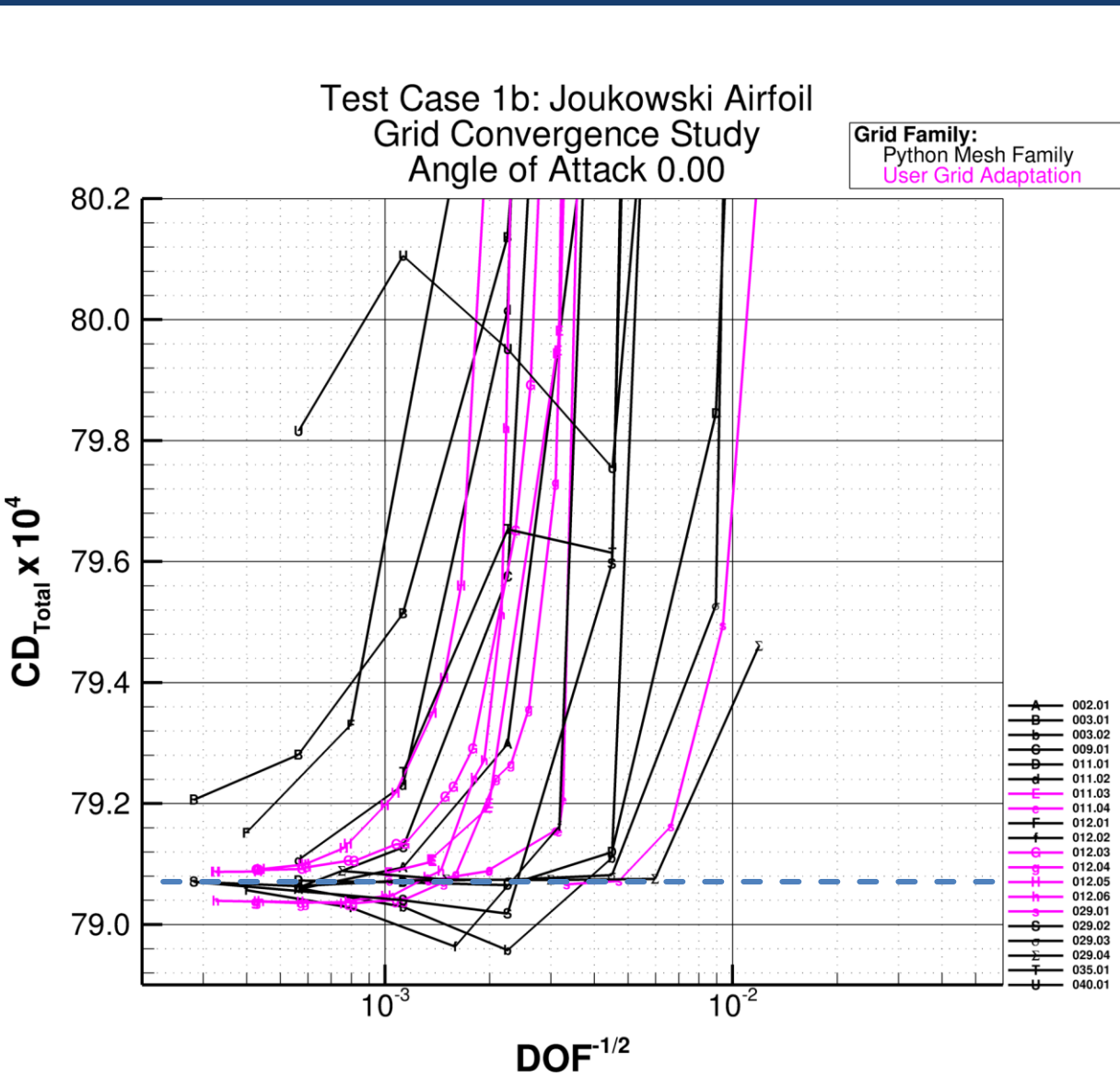
Joukowski N-Grid Residual



Joukowski Drag vs N-Grid Residual



Joukowski Airfoil – Order of Accuracy



Test Case 1c: ONERA OAT15A Airfoil



- **Verification of steady CFD analysis, required**

- **Settings**

- Steady CFD RANS **French Vanilla SA-[neg] (All terms!)**
 - Adiabatic Wall (not isothermal)
 - Characteristic Farfield (**1000 chords away**)
 - Use periodic boundary conditions for sidewall boundary conditions
- Converge residuals to machine precision (**~1e-10**)

- **Grids**

- Six-member grid family; four are required, six are desirable
- Encourage use of committee-supplied grids; user-generated grids are acceptable
 - Cadence **Structured**/Unstructured, **Helden Mesh** Unstructured

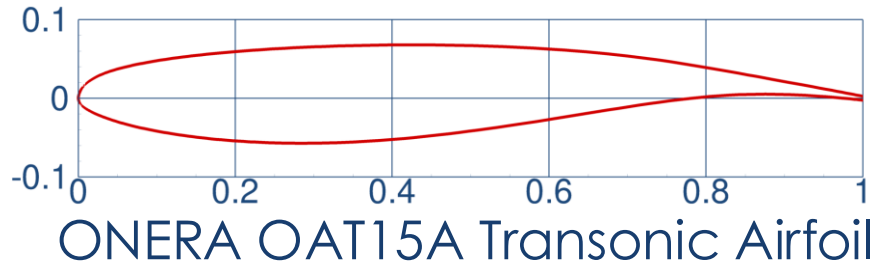
- **Conditions**

Mach	Re _c	T _{static}	α	γ	Pr	Pr _t	Farfield $\chi = \tilde{v}/v$
0.73	3×10^6	271 K (487.8 R)	1.5°	1.4	0.72	0.9	3

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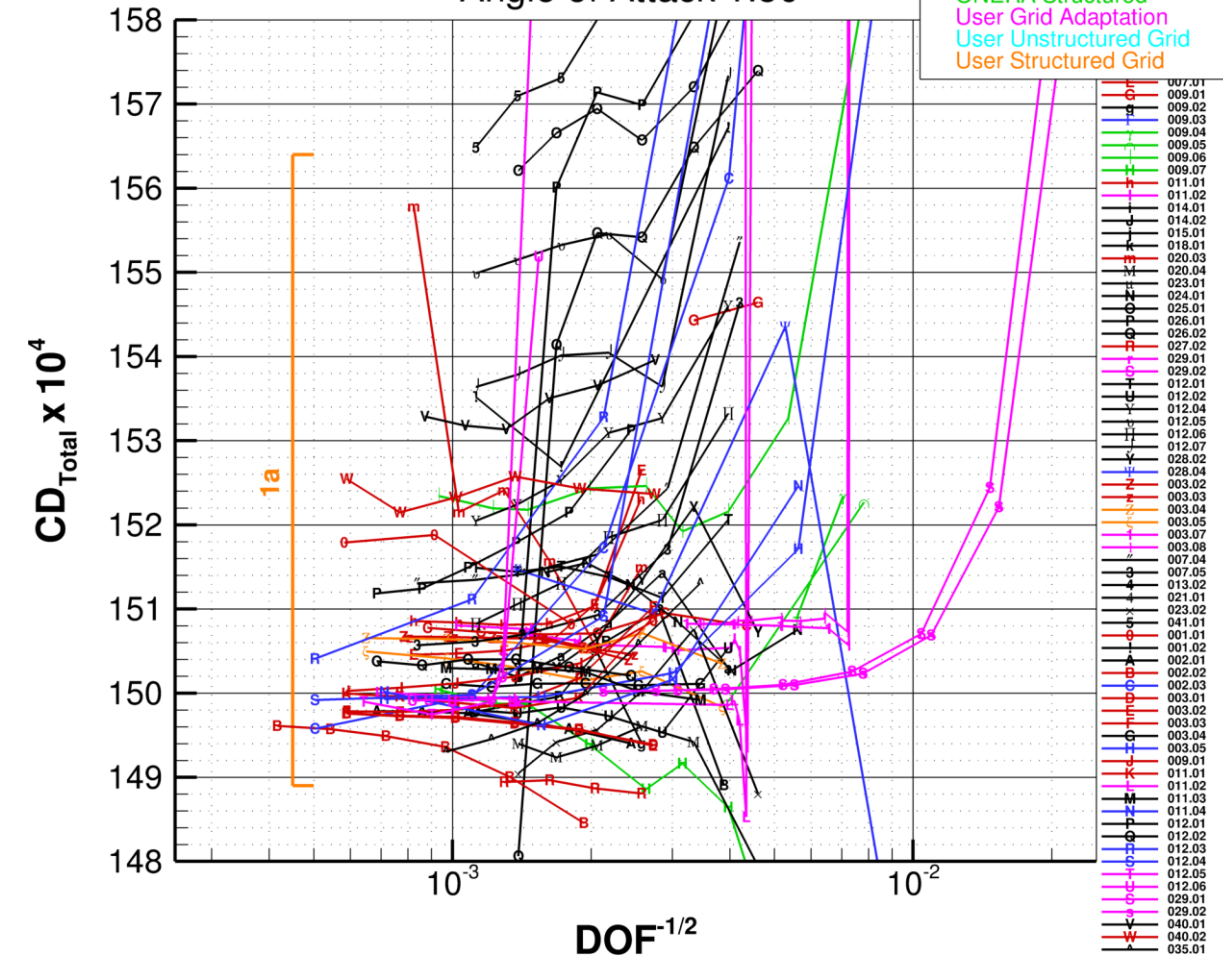
ONERA OAT15A Transonic Airfoil

ONERA OAT15A C_D Convergence: $\alpha = 1.5^\circ$

Only SA-[neg]

Test Case 1c: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

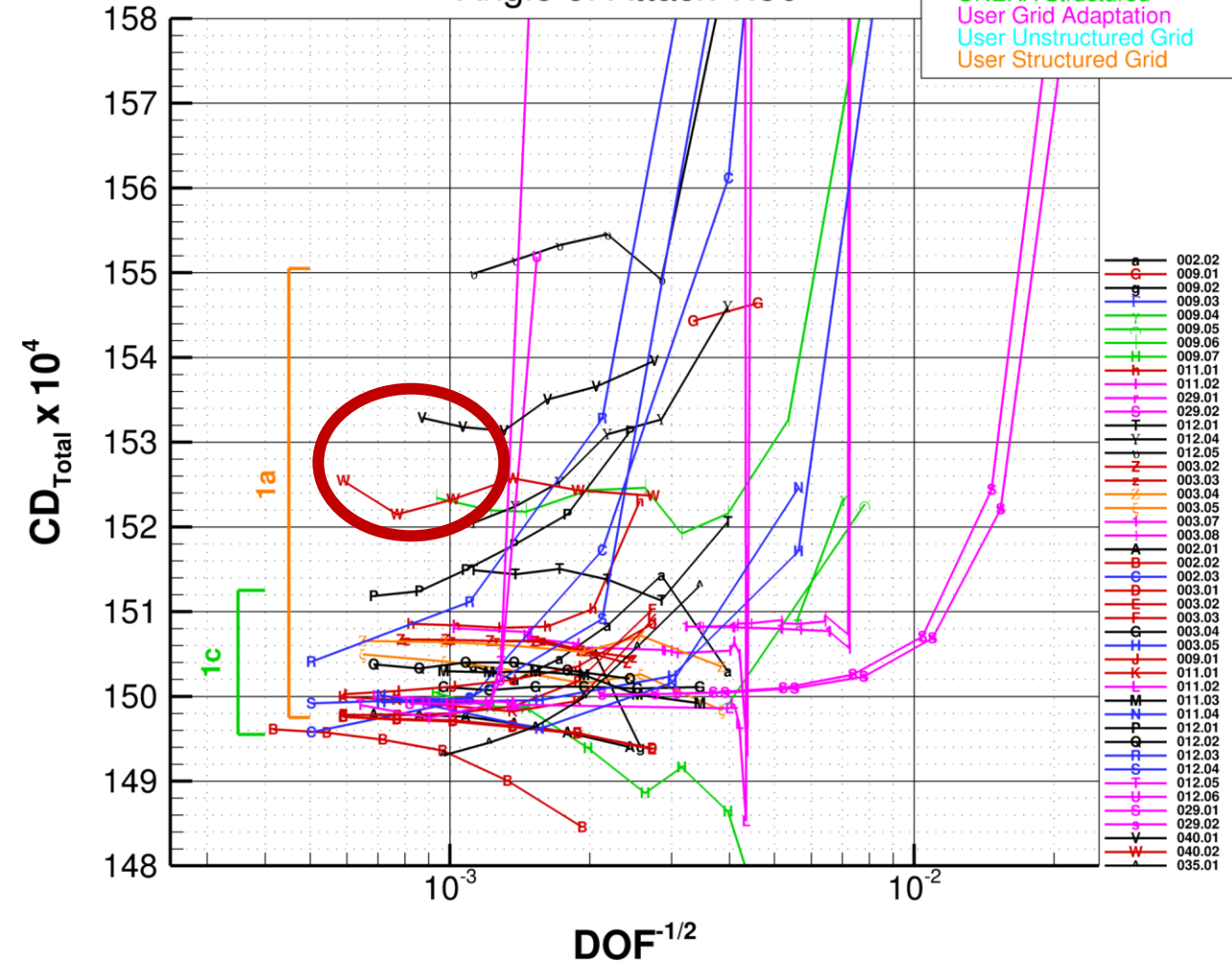
Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid



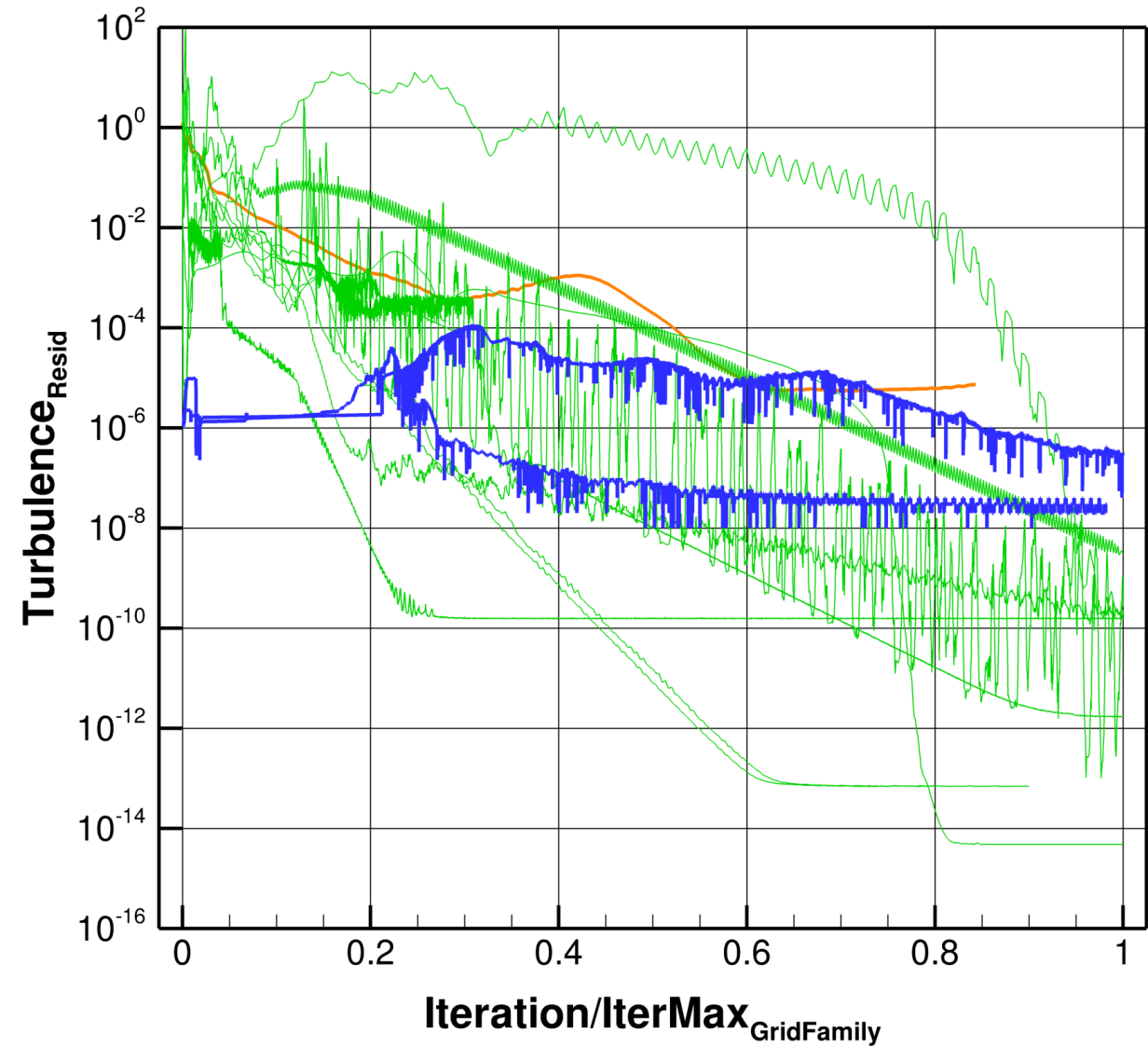
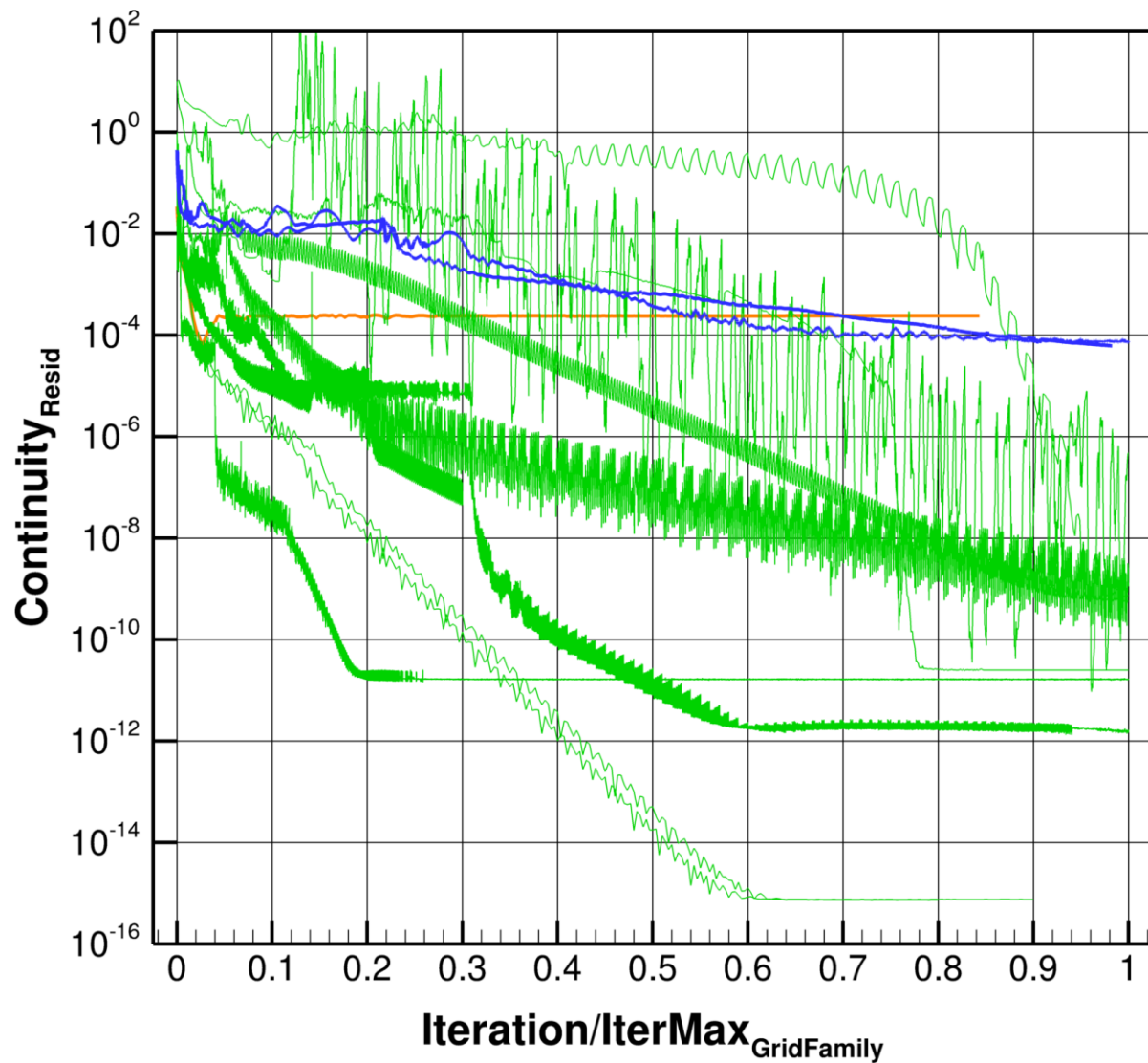
Scatter WG

Test Case 1c: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

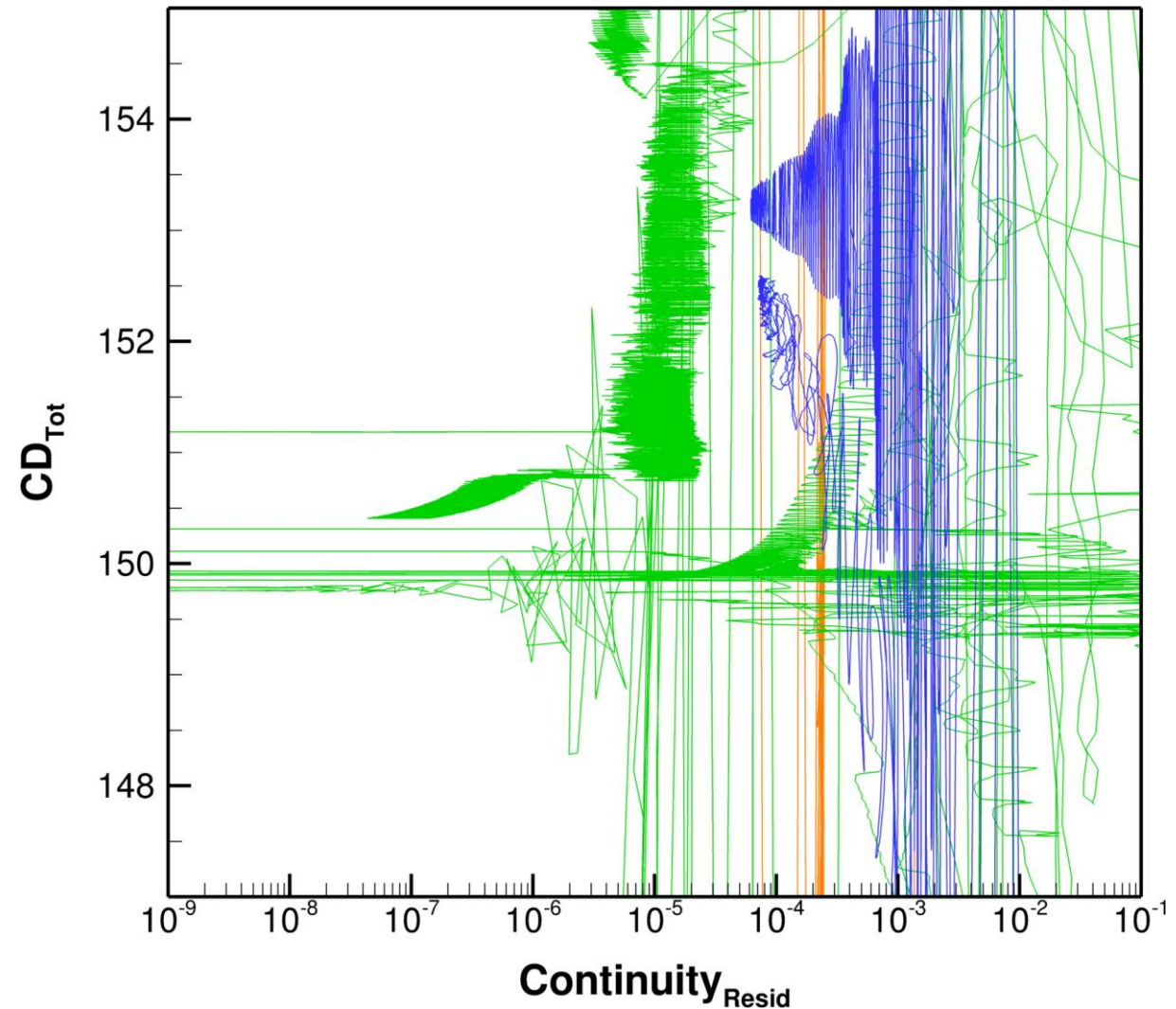
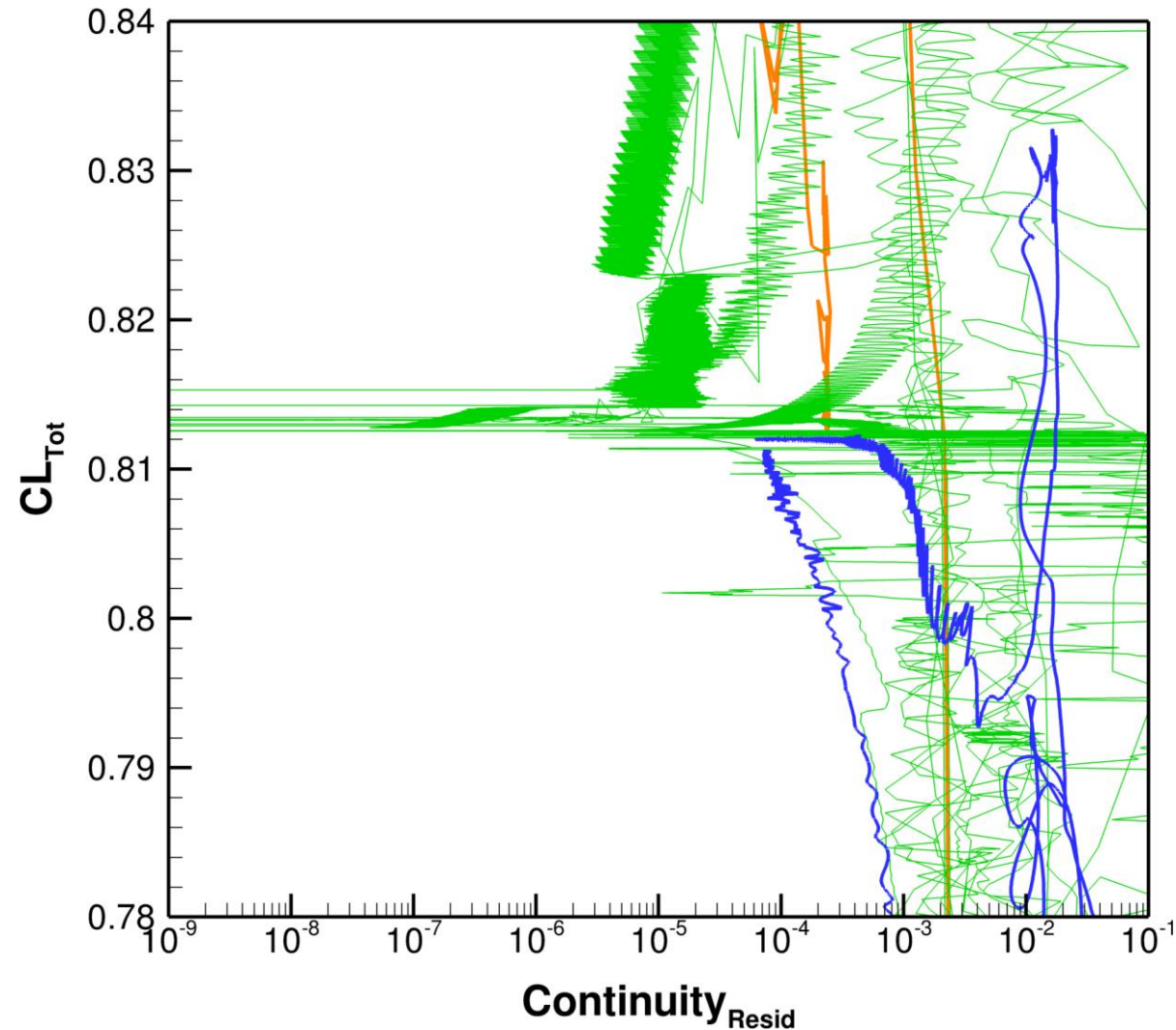
Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid



The Cursed Residuals



ONERA OAT15A C_L and C_D vs. Residuals

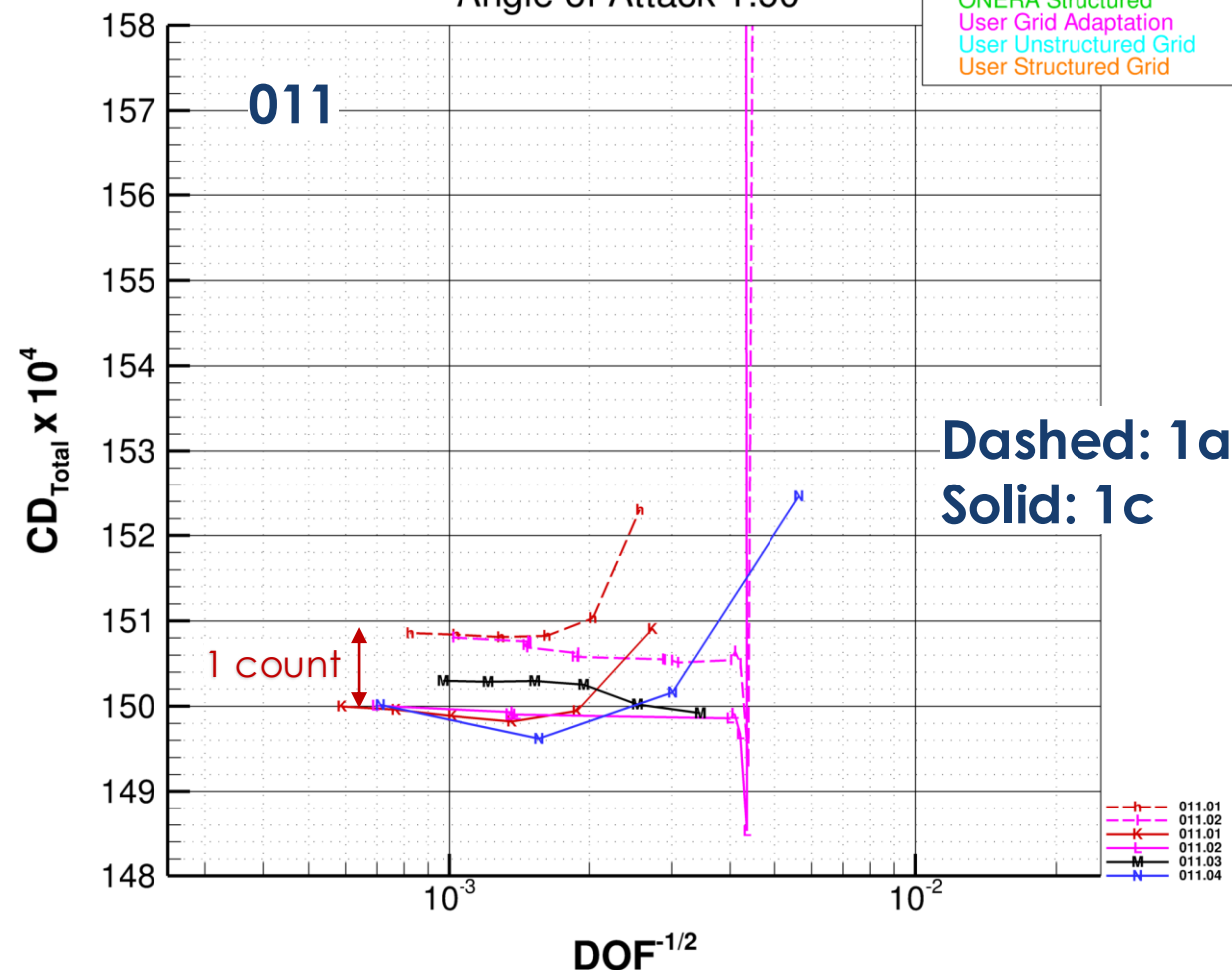


ONERA OAT15A C_D Participant Improvements



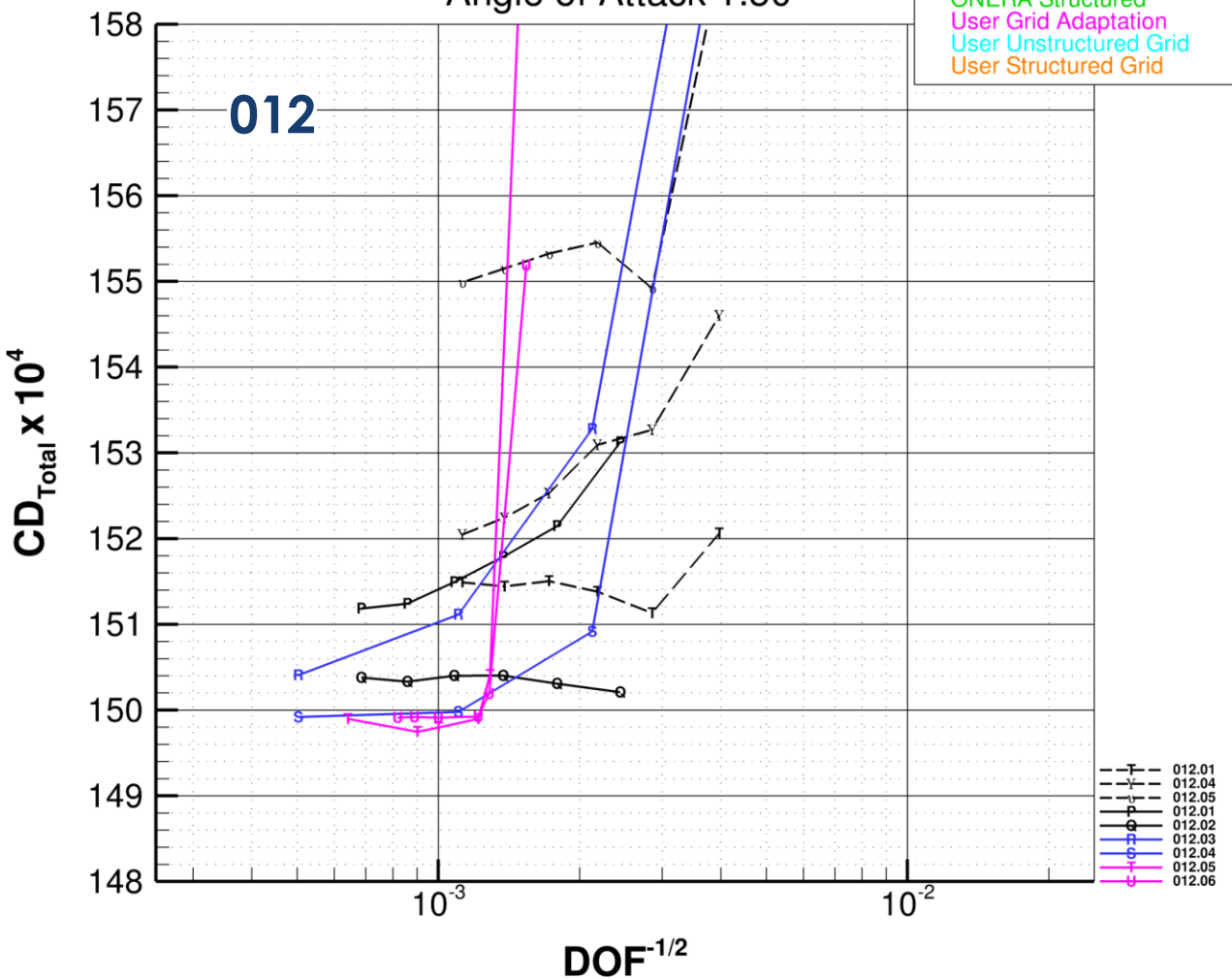
Test Case 1c: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid

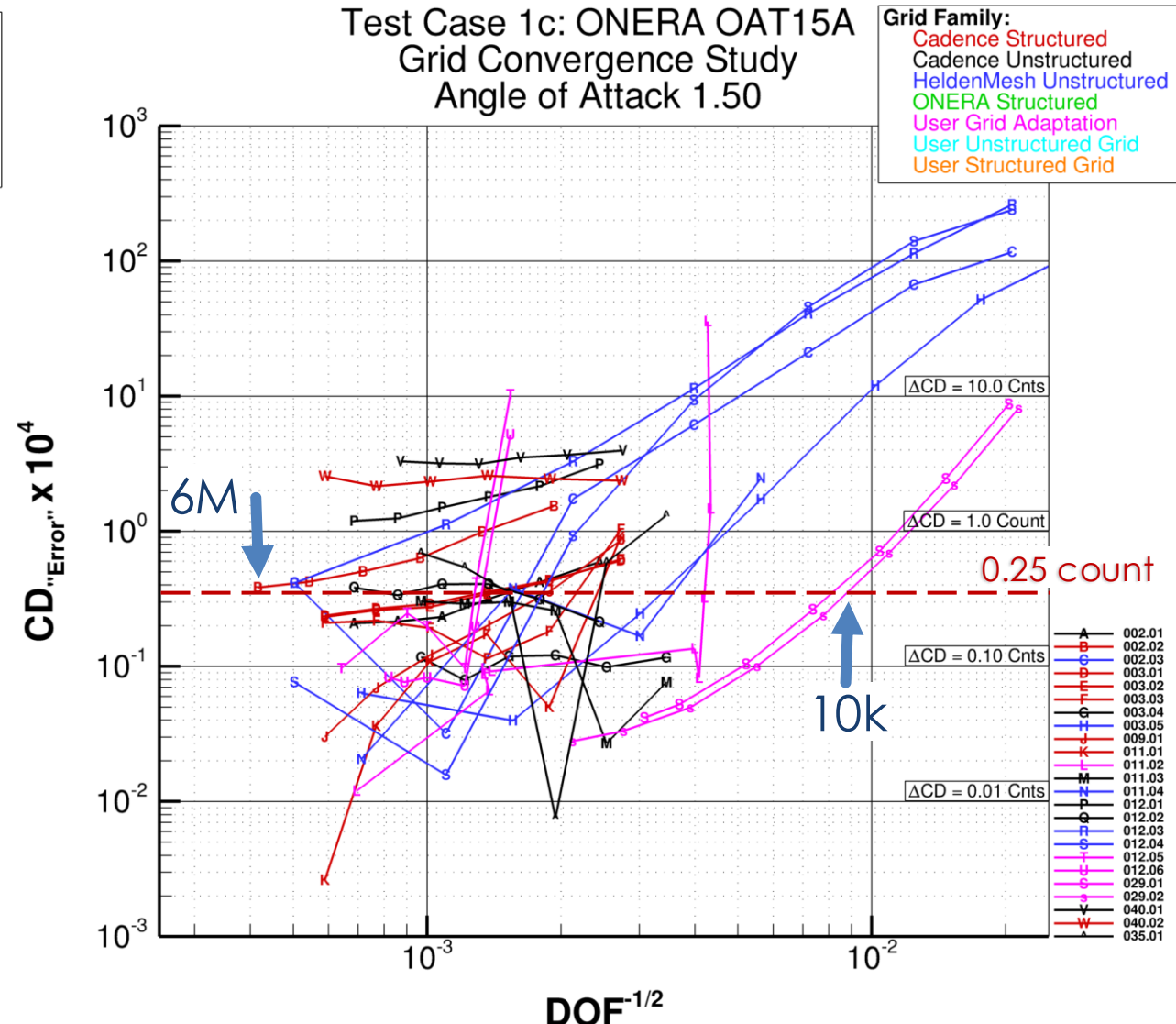
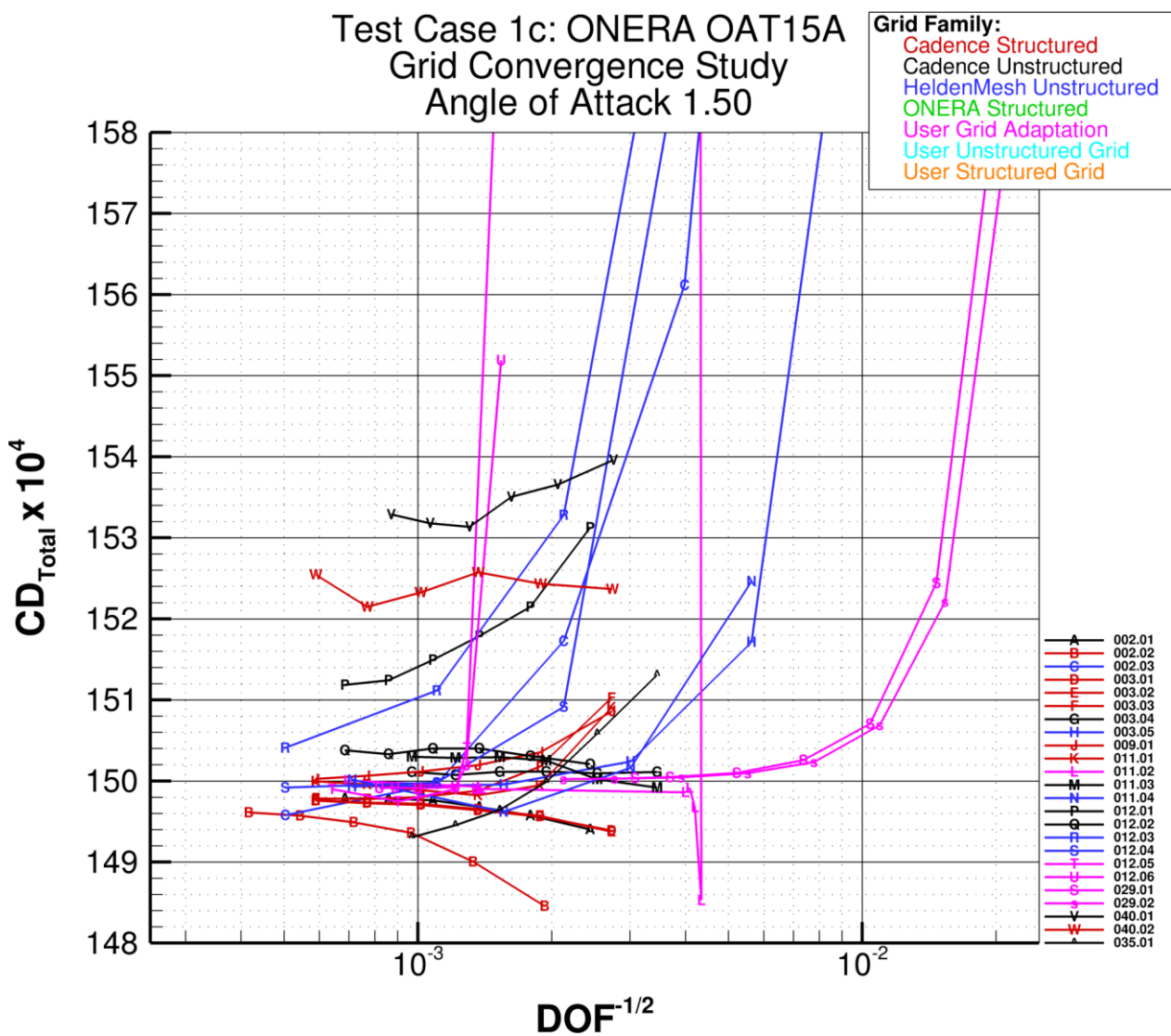


Test Case 1c: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid



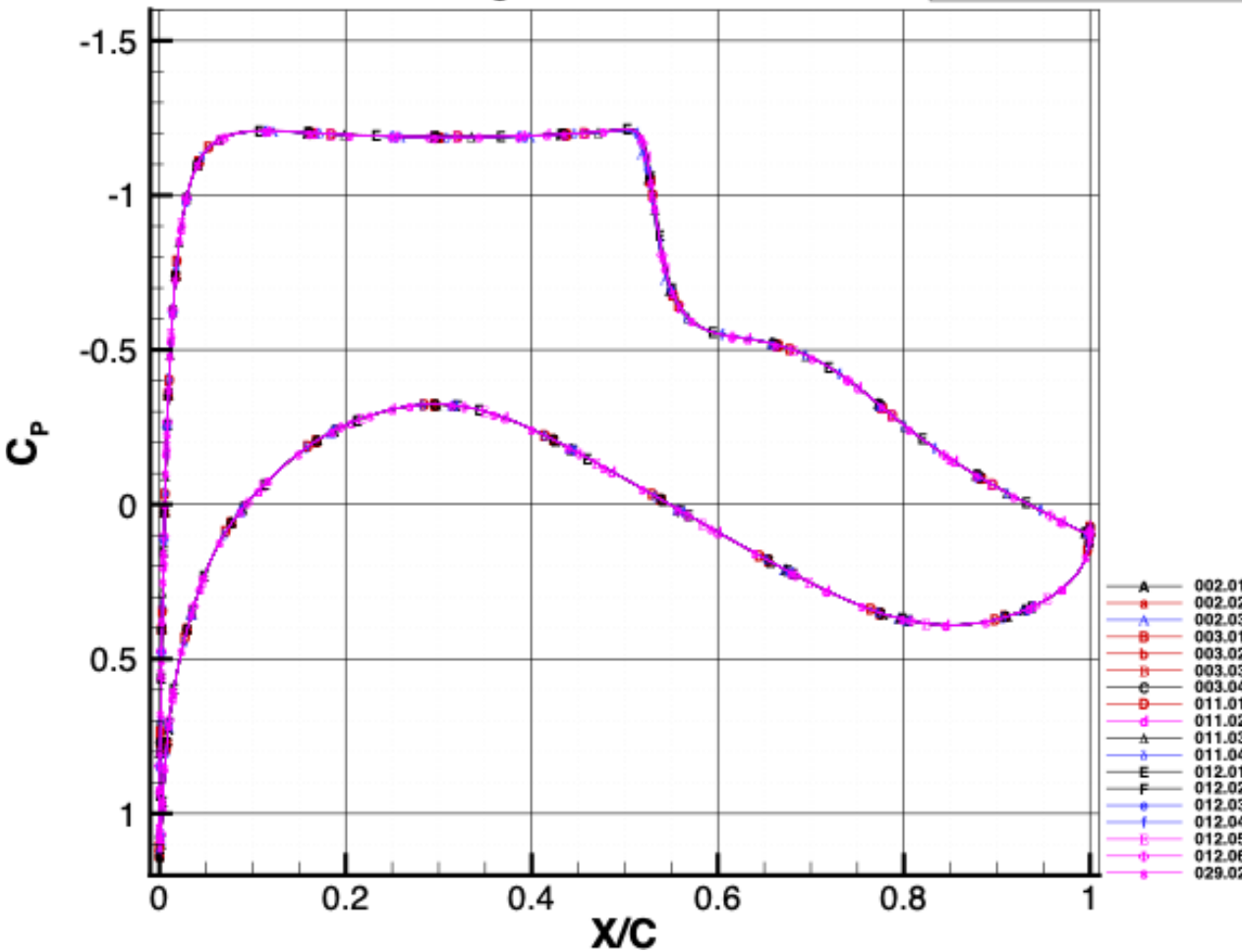
ONERA OAT15A C_D Convergence: $\alpha = 1.5^\circ$



ONERA OAT15A C_p and C_f $\alpha = 1.5^\circ$

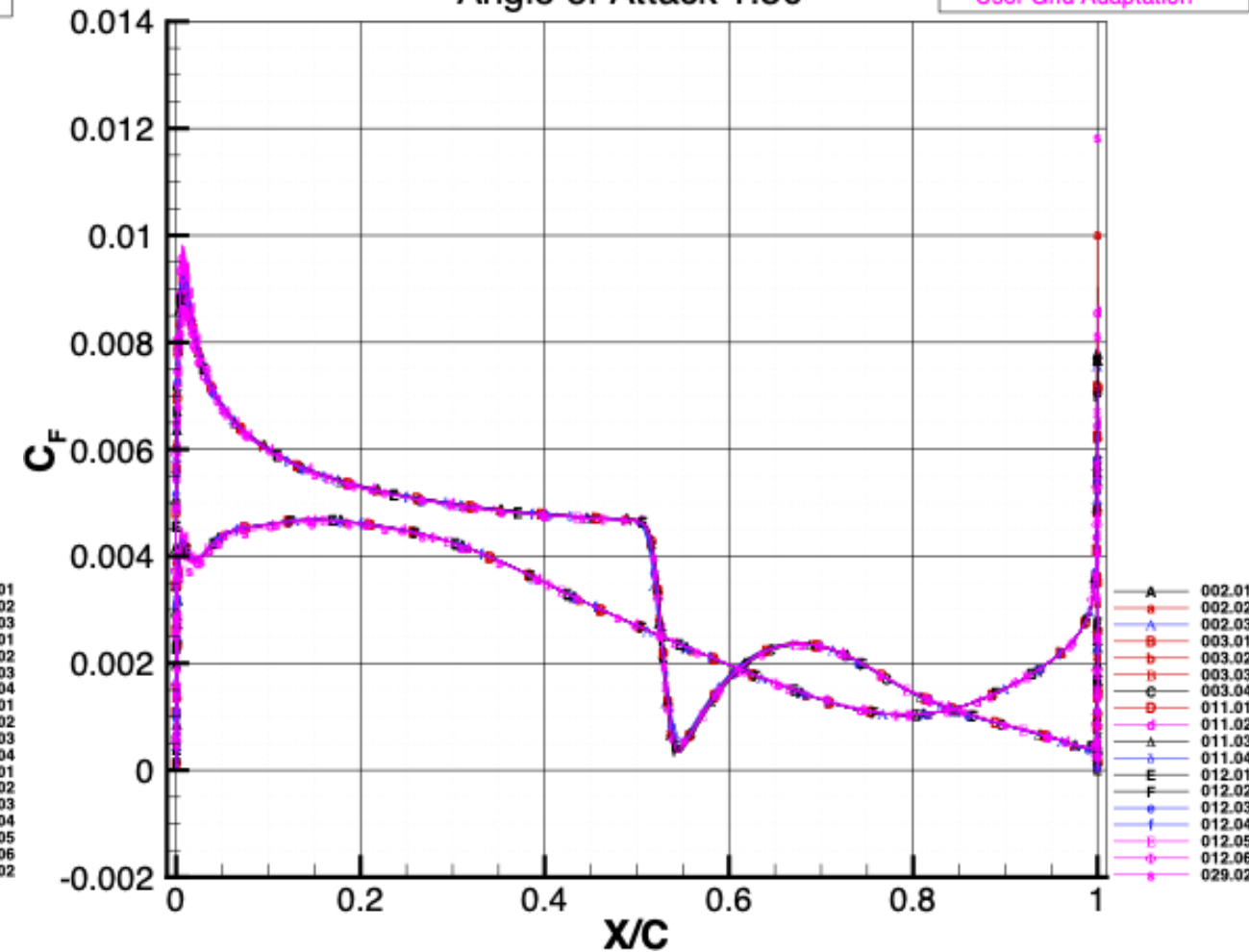
Test Case 1a: ONERA OAT15A
Sectional Cuts: Grid N
Angle of Attack 1.50

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
User Grid Adaptation



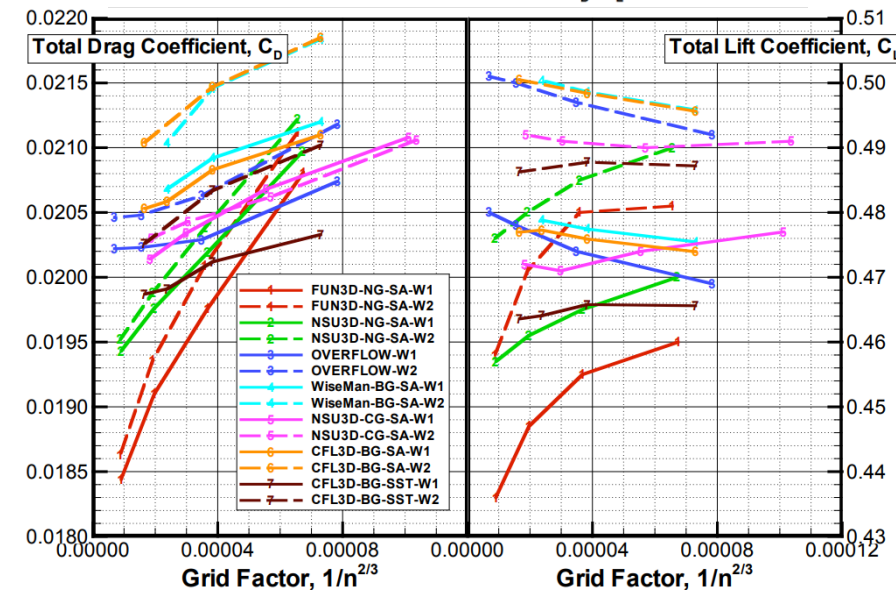
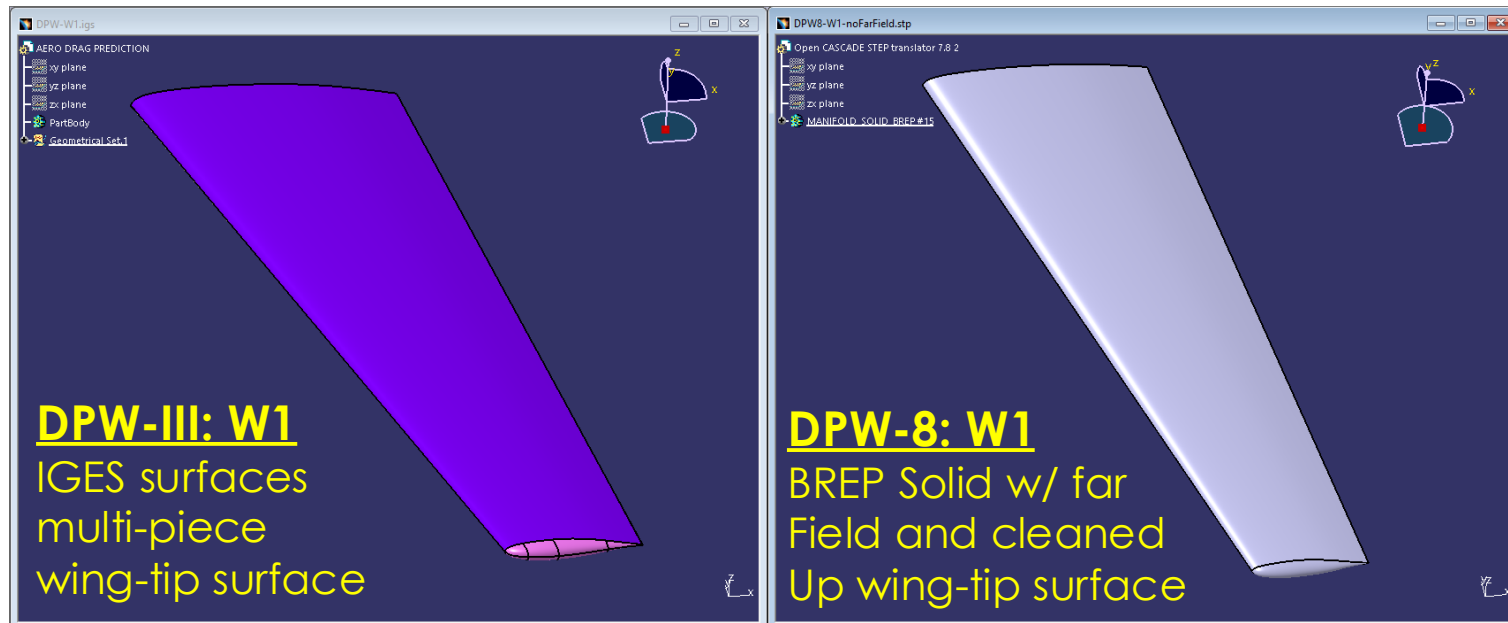
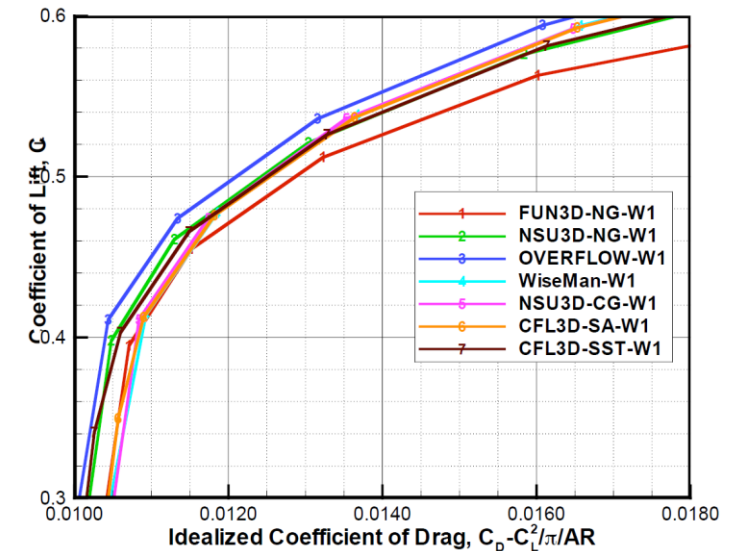
Test Case 1a: ONERA OAT15A
Sectional Cuts: Grid N
Angle of Attack 1.50

Grid Family:
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Cadence Unstructured
HeldenMesh Unstructured
User Grid Adaptation

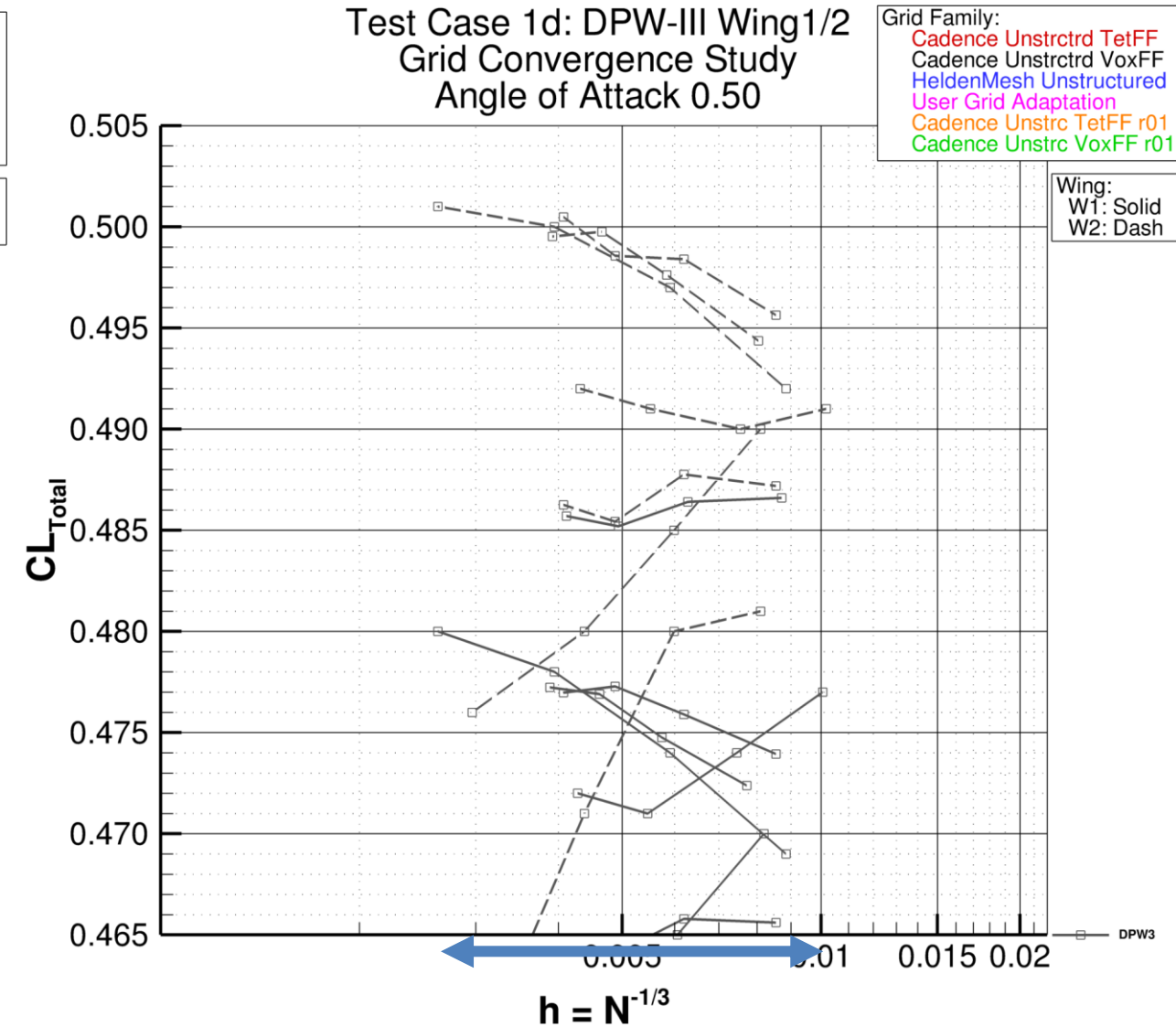
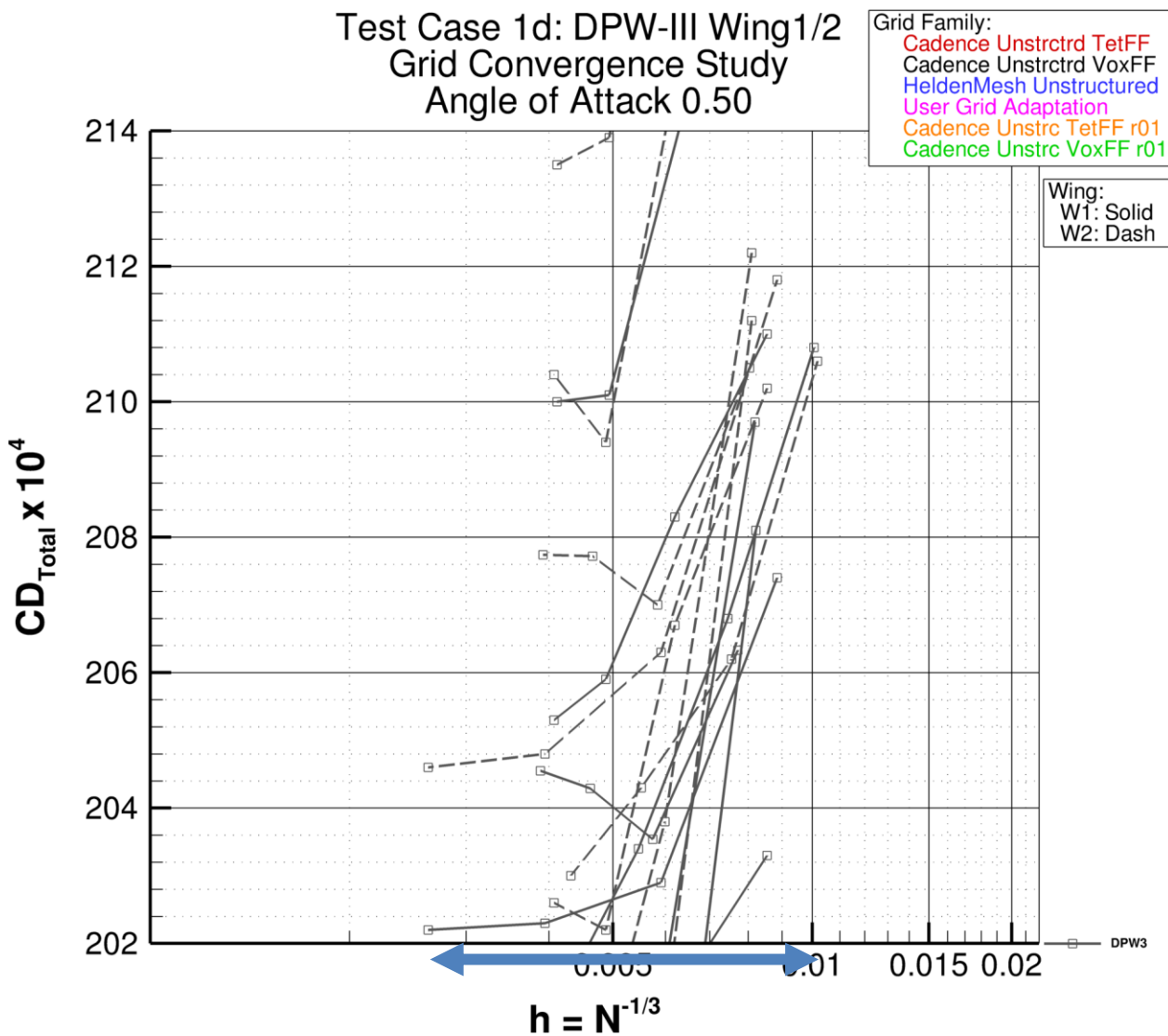


Test Case 1d/1e: DPW-III W1 & W2 (20 years later)

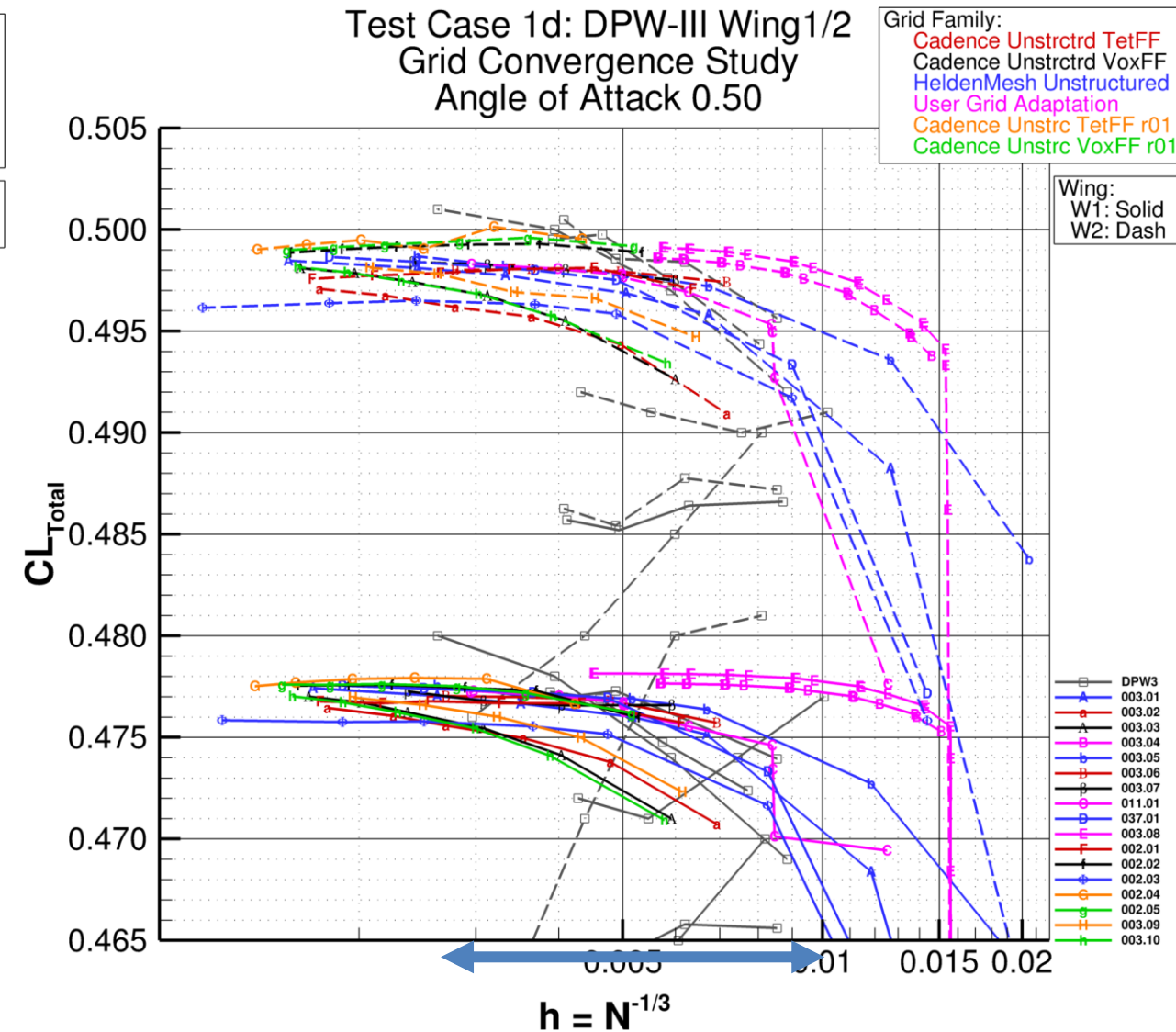
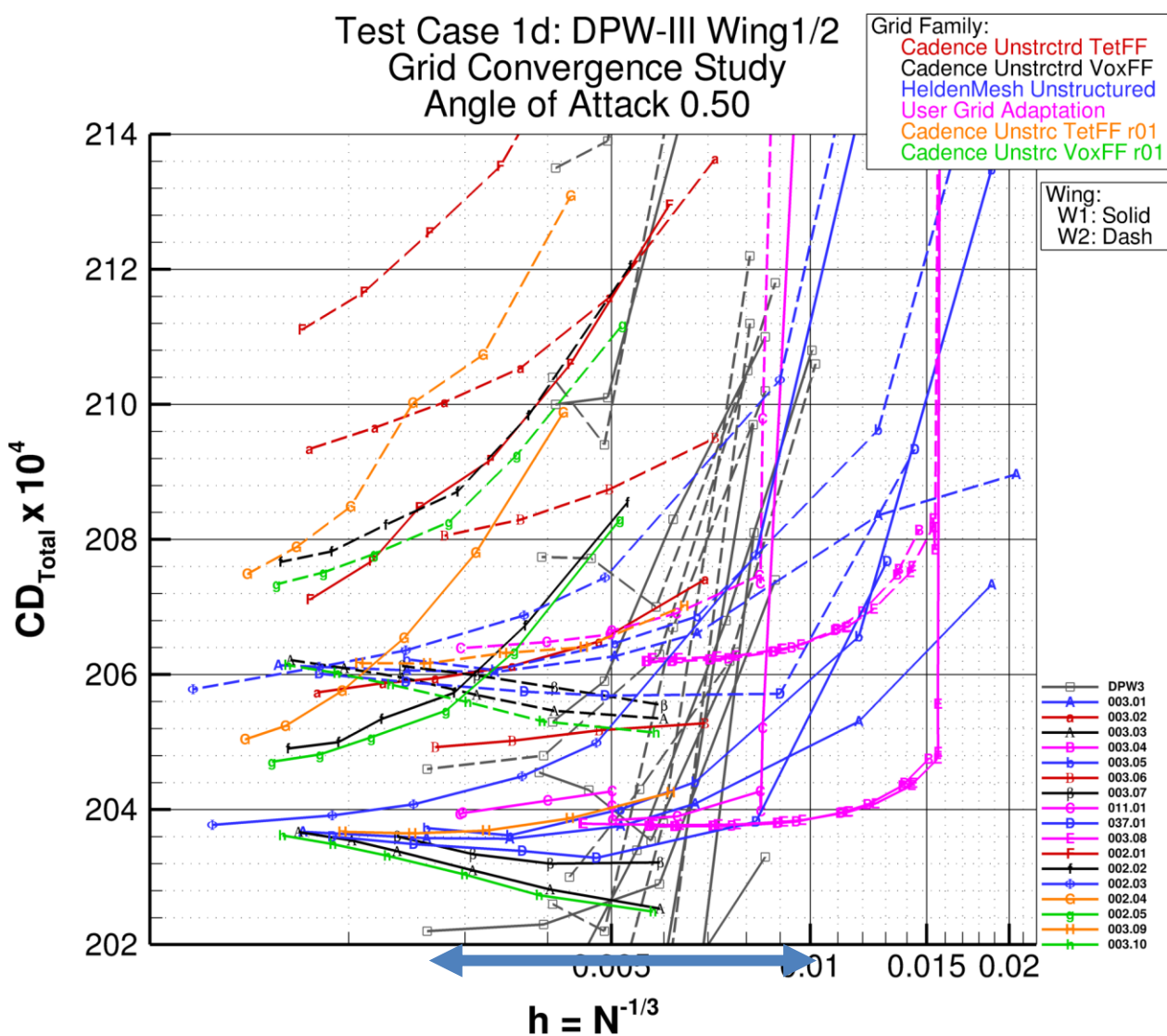
- **DPW-III: Wing-Only Test Case**
 - W1 & W2, incremental comparison
- **DPW-8: Scatter WG**
 - Revisit W1/W2 case to measure the progress over 20 years
- **Grids**
 - Cadence Tet/Voxel Farfield, Helden Mesh Anisotropic Tet, Adapted



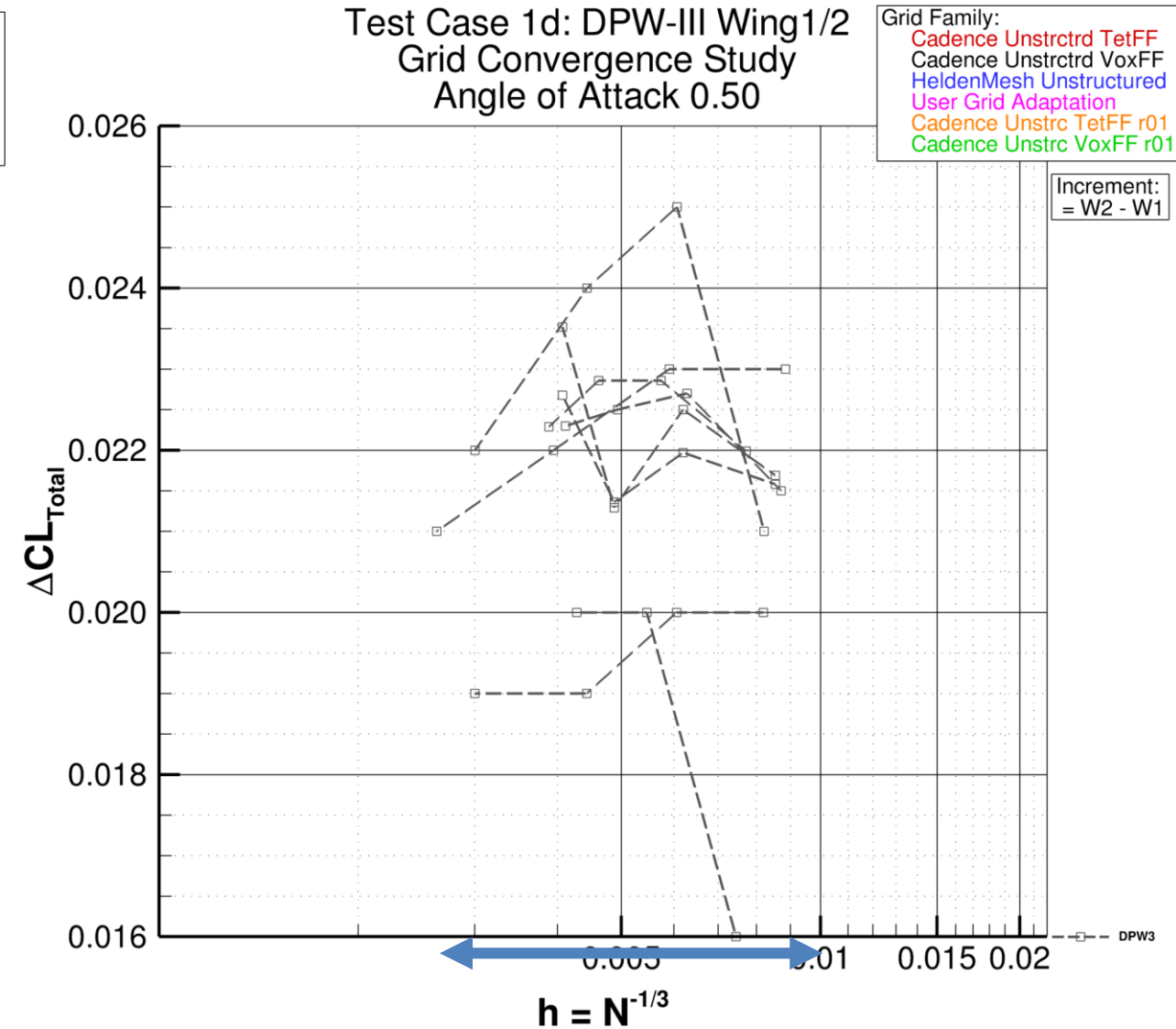
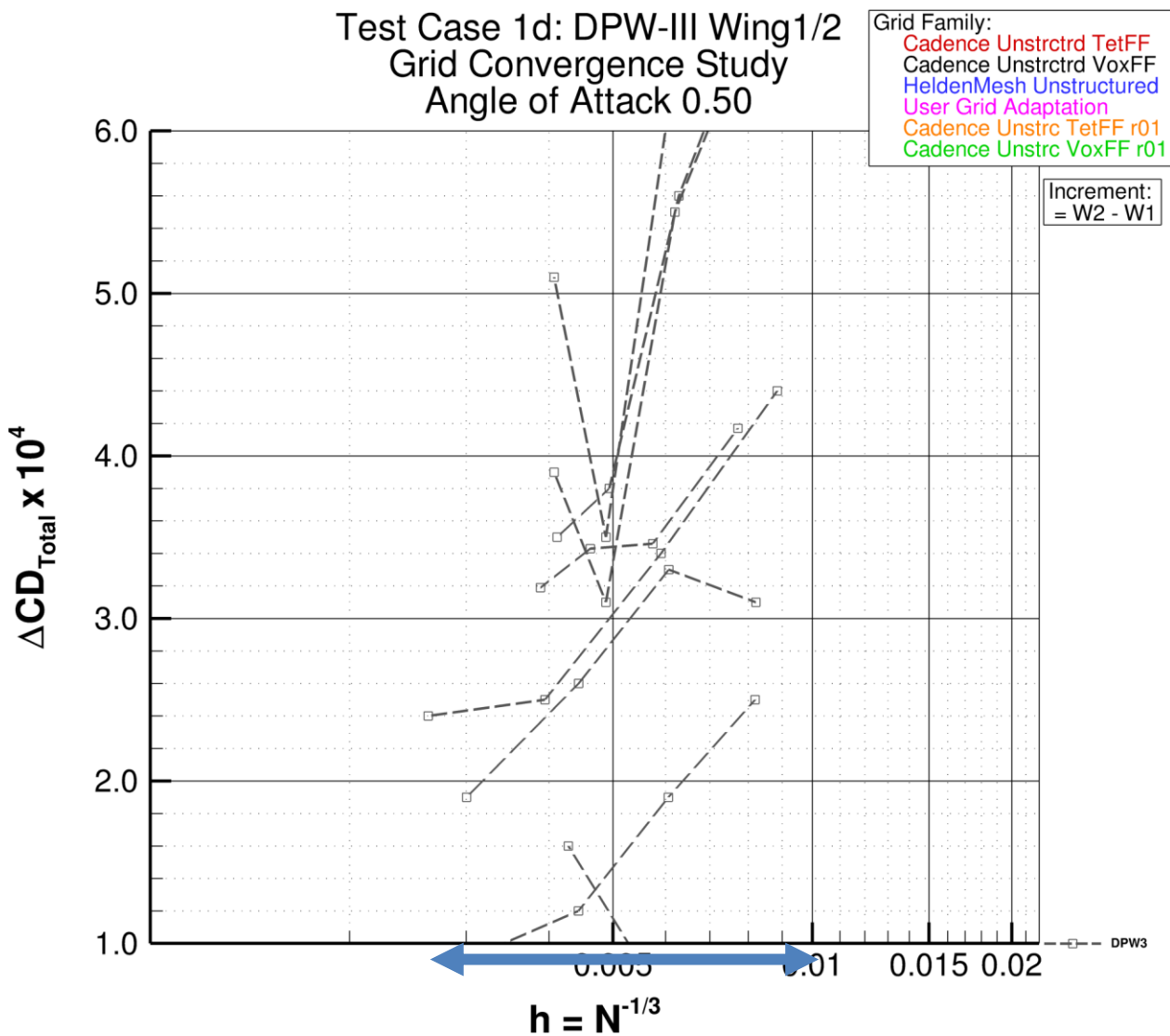
W1/W2 C_D and C_L Convergence: $\alpha = 0.5^\circ$



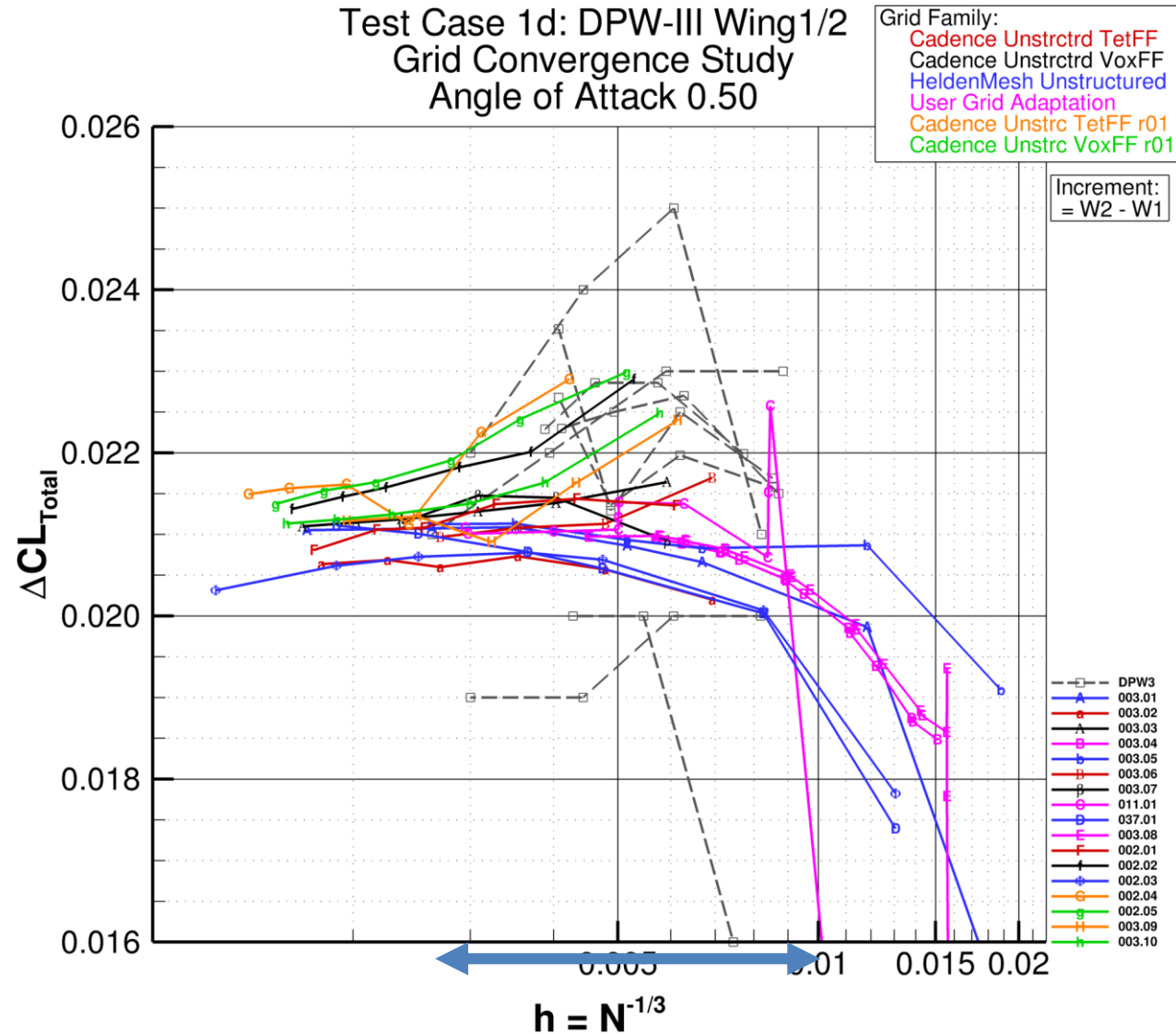
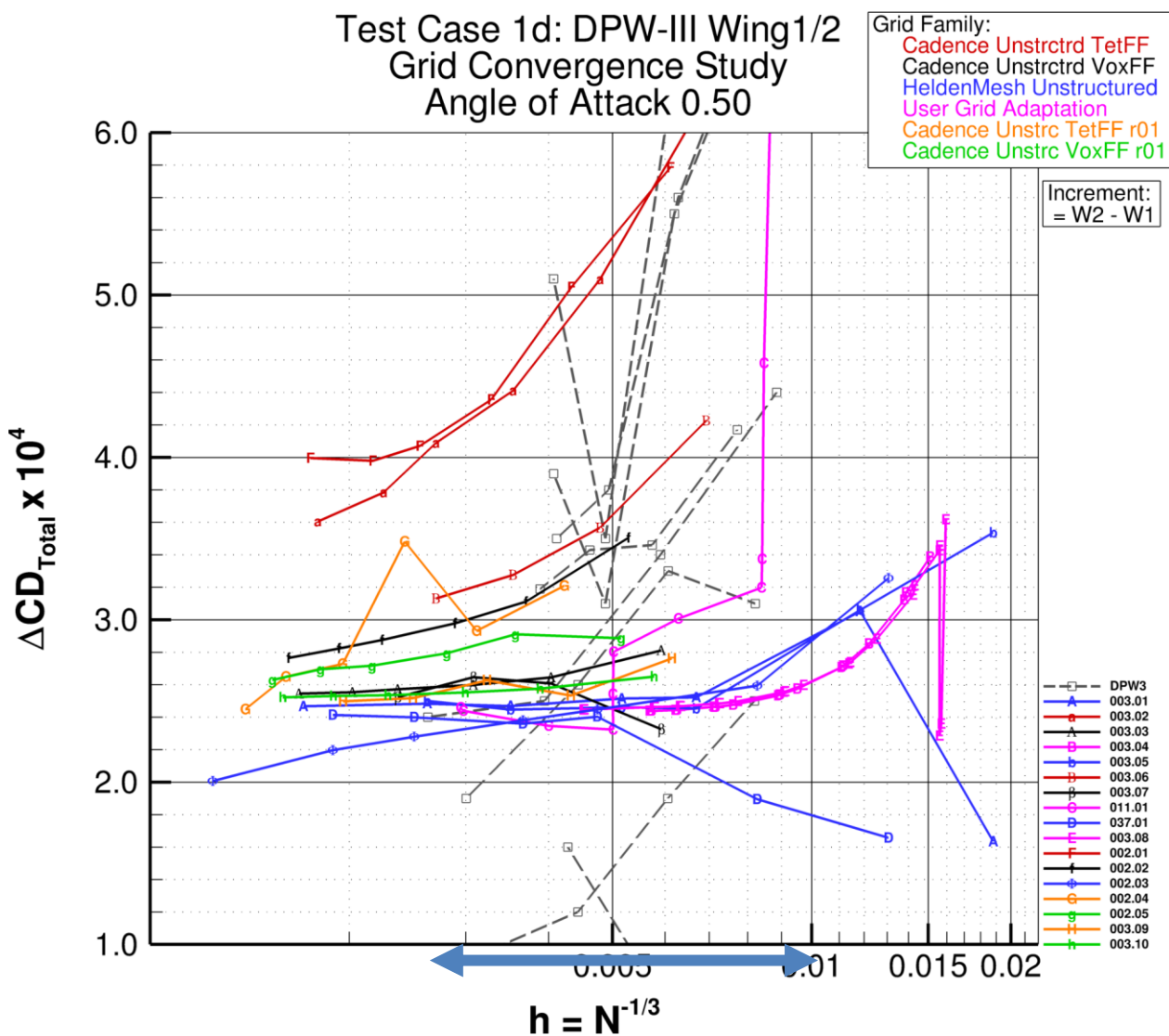
W1/W2 C_D and C_L Convergence: $\alpha = 0.5^\circ$



W1/W2 ΔC_D and ΔC_L Convergence: $\alpha = 0.5^\circ$



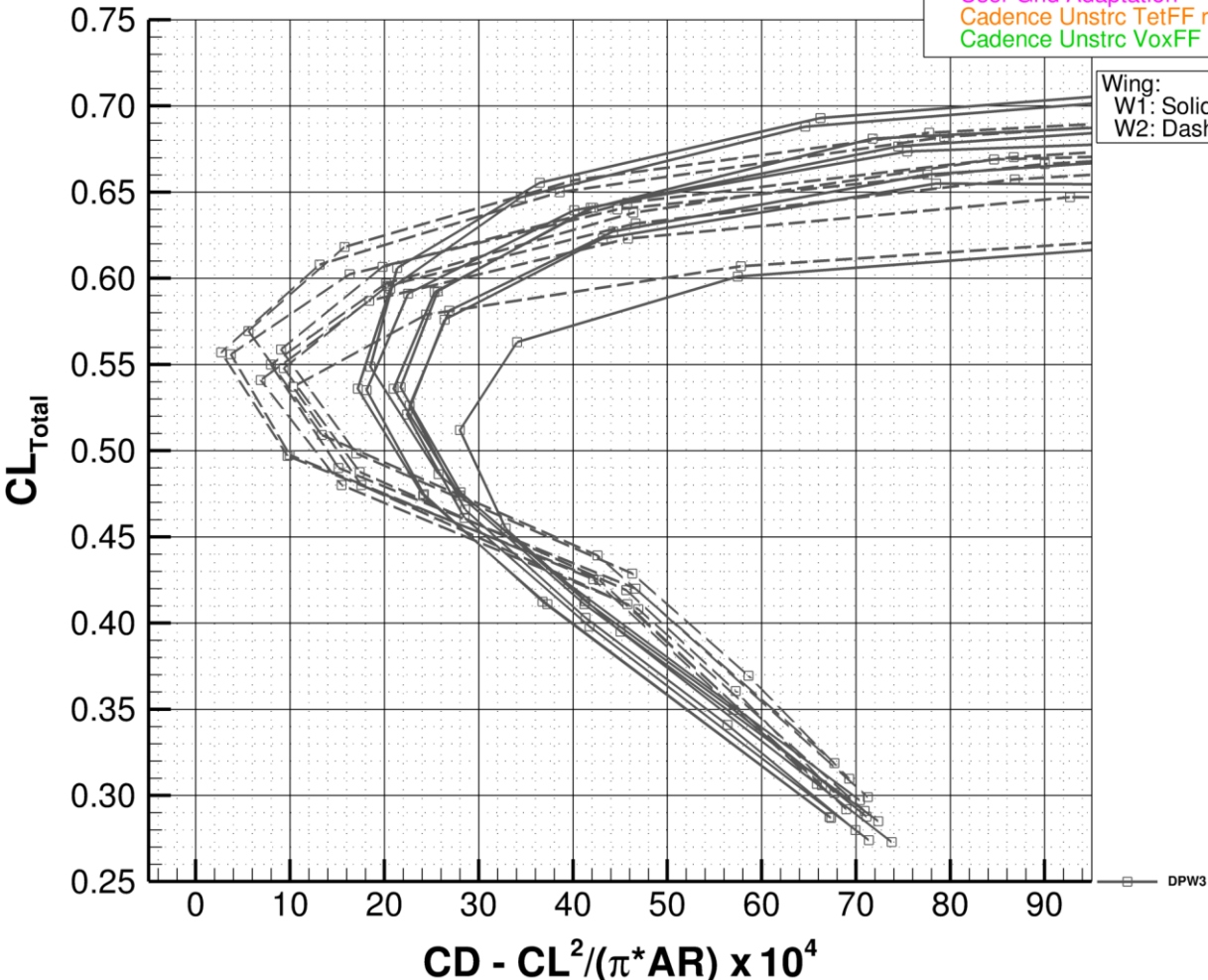
W1/W2 ΔC_D and ΔC_L Convergence: $\alpha = 0.5^\circ$



Test Case 1e: DPW-III Wing1/2
Polar Study

Grid Family:
Cadence Unstrctrd TetFF
Cadence Unstrctrd VoxFF
HeldenMesh Unstructured
User Grid Adaptation
Cadence Unstrc TetFF r01
Cadence Unstrc VoxFF r01

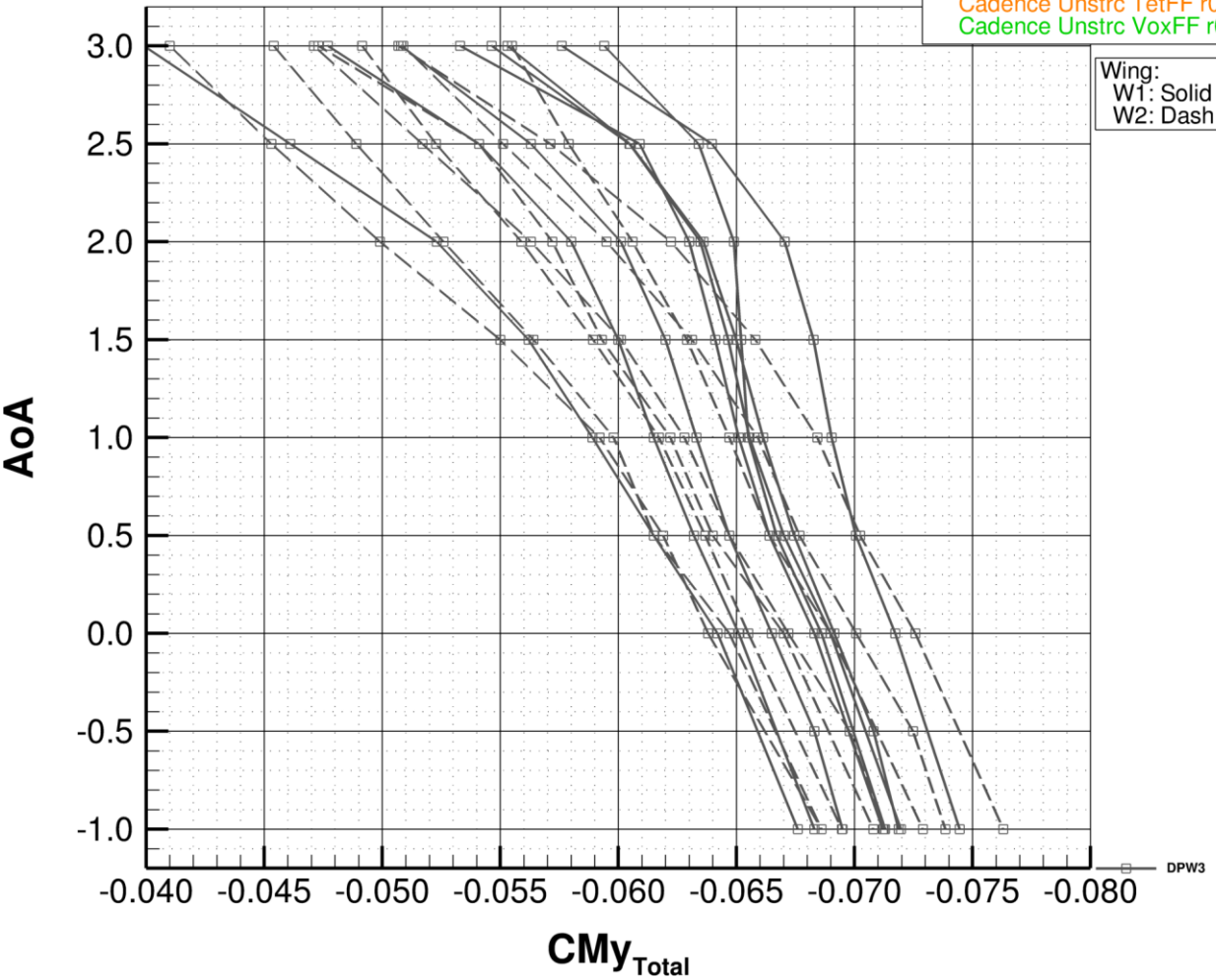
Wing:
W1: Solid
W2: Dash



Test Case 1e: DPW-III Wing1/2
Polar Study

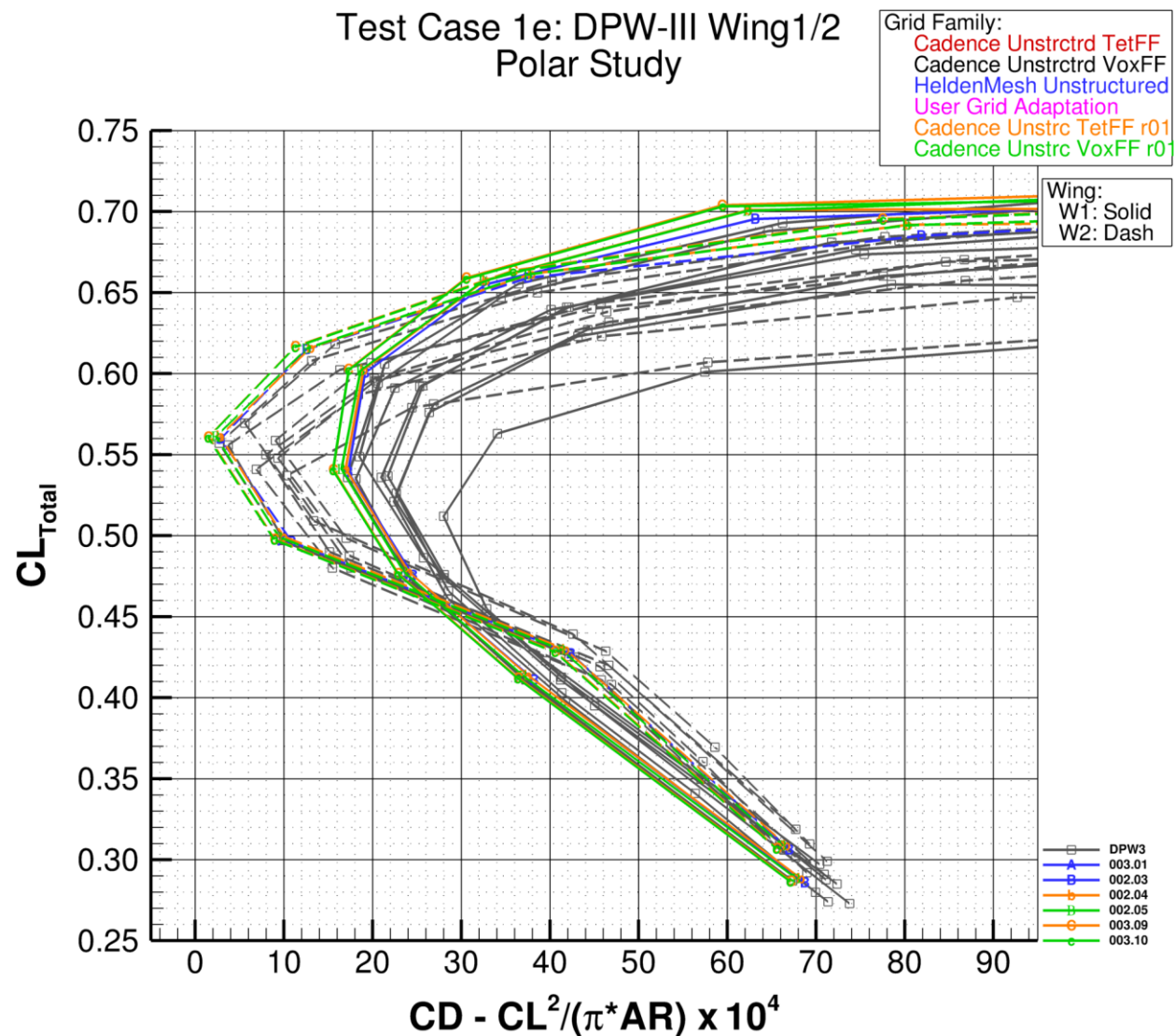
Grid Family:
Cadence Unstrctrd TetFF
Cadence Unstrctrd VoxFF
HeldenMesh Unstructured
User Grid Adaptation
Cadence Unstrc TetFF r01
Cadence Unstrc VoxFF r01

Wing:
W1: Solid
W2: Dash

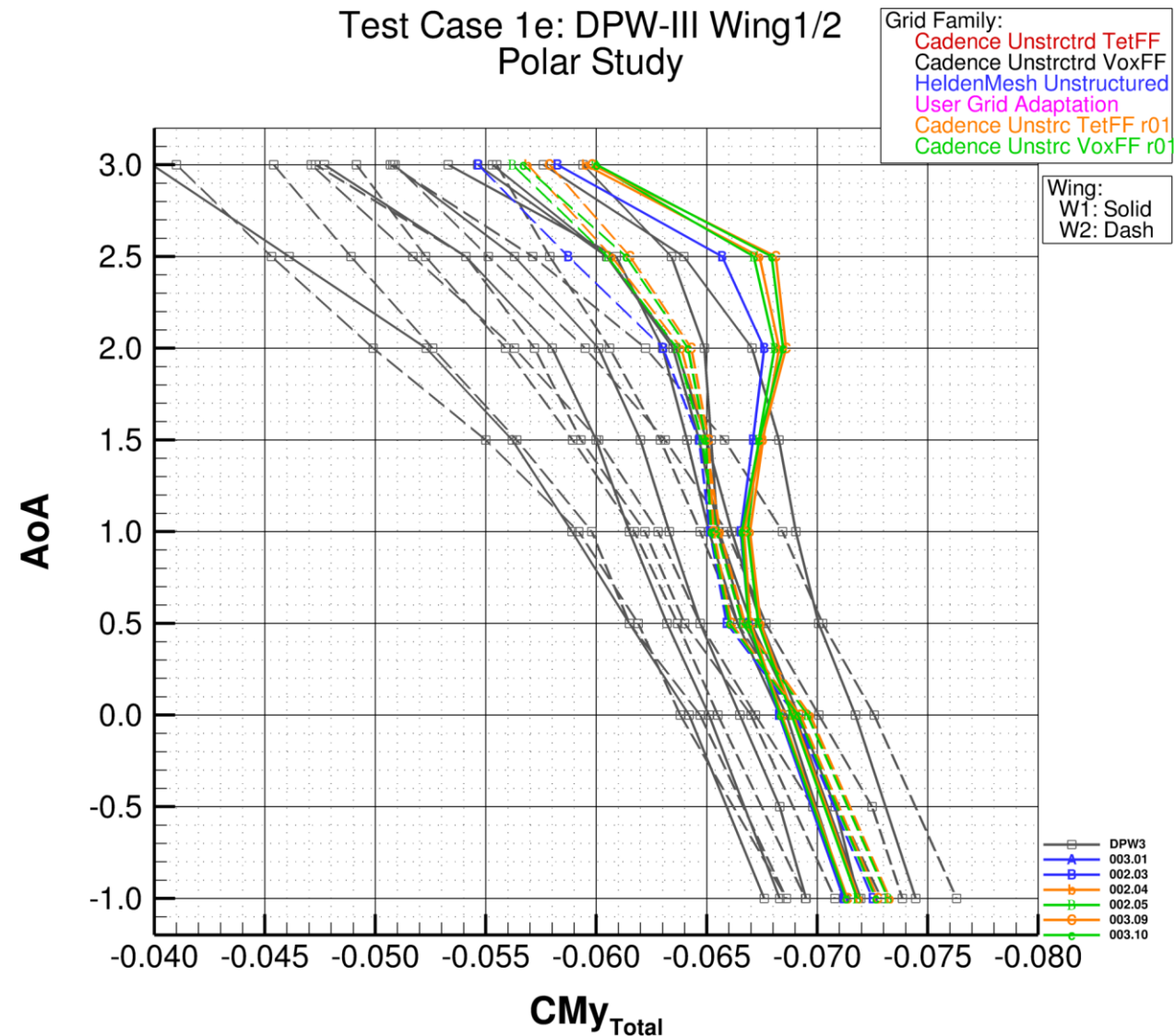


W1/W2 Polars

Test Case 1e: DPW-III Wing1/2
Polar Study

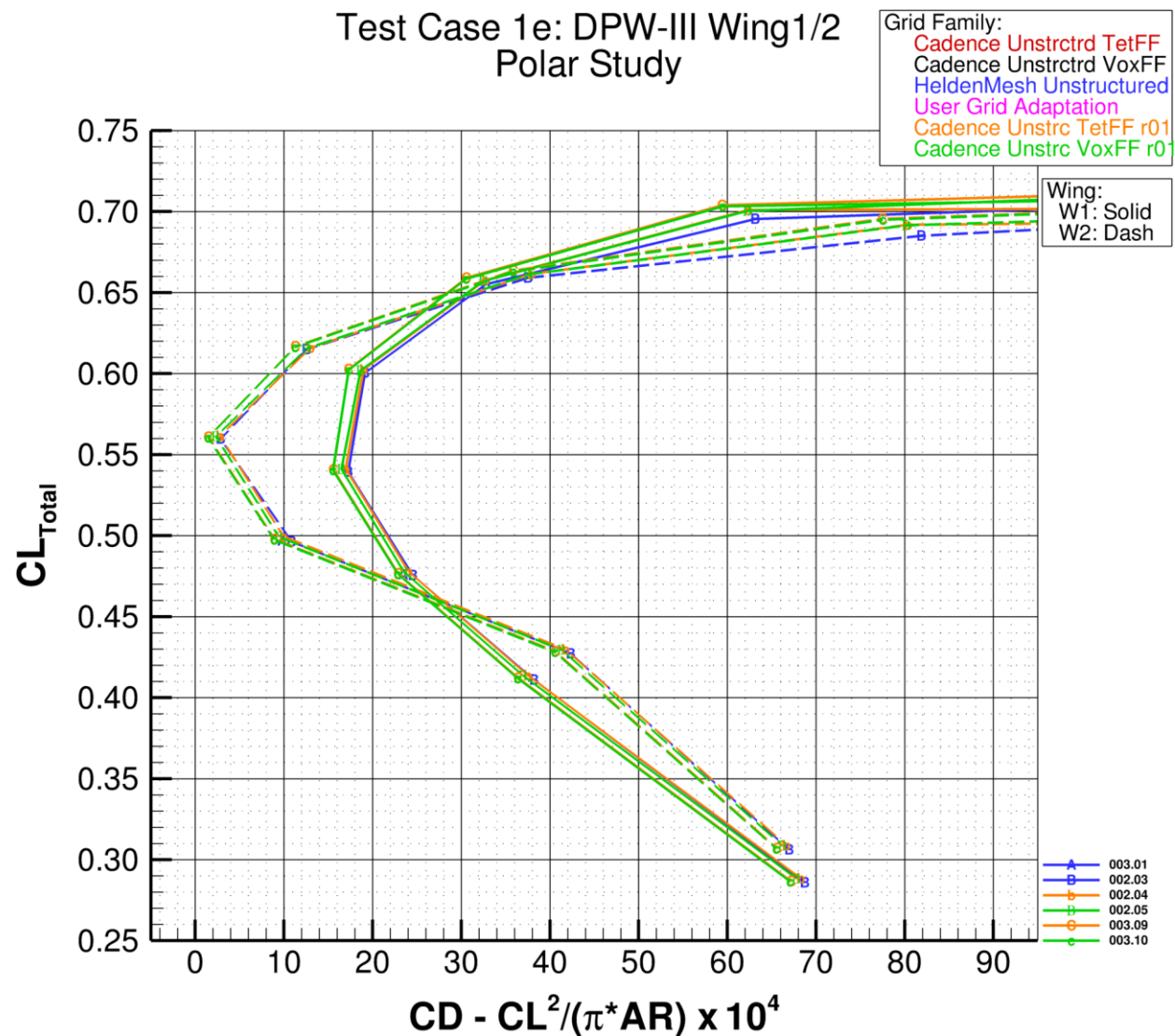


Test Case 1e: DPW-III Wing1/2
Polar Study

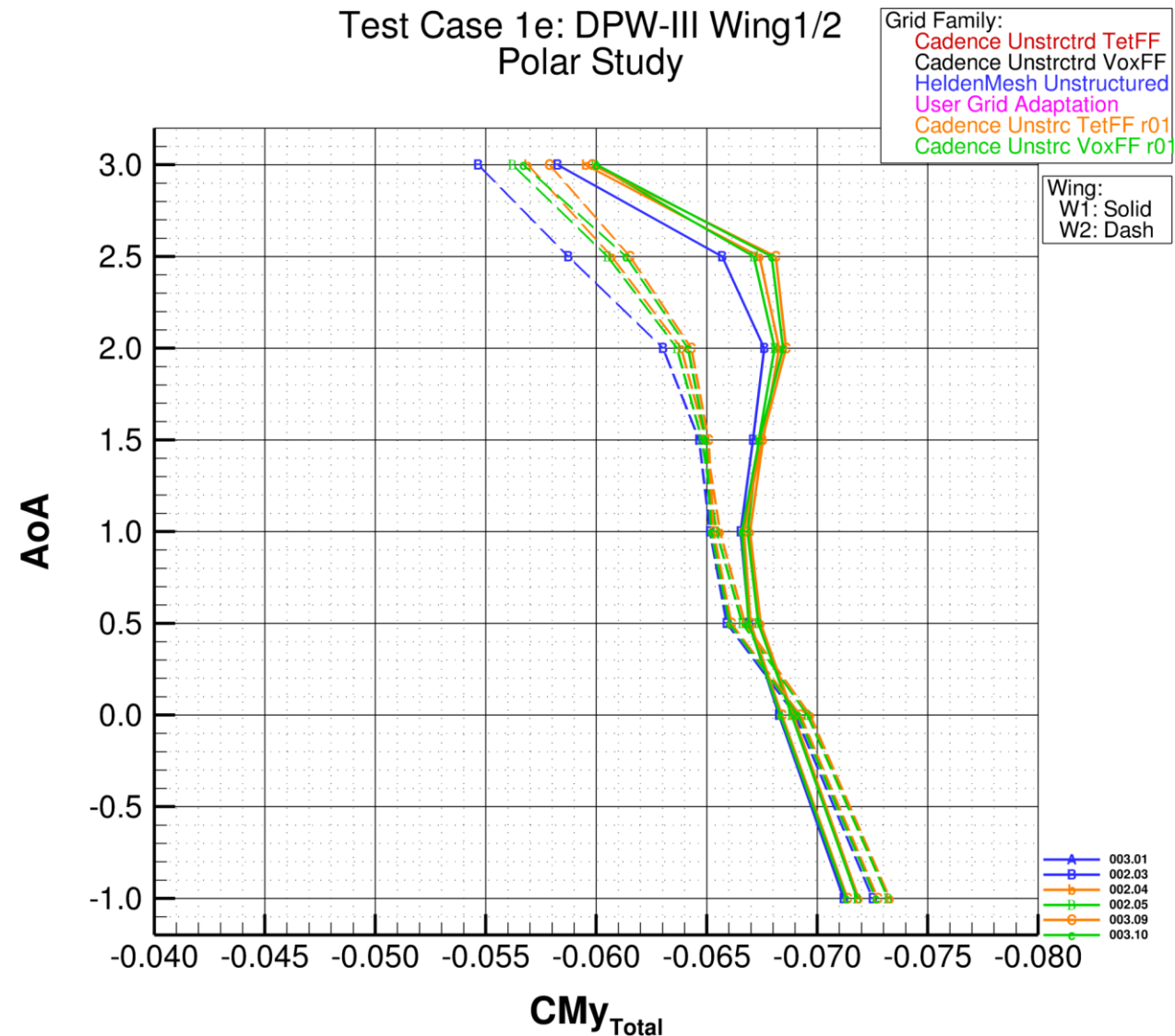


W1/W2 Polars

Test Case 1e: DPW-III Wing1/2
Polar Study



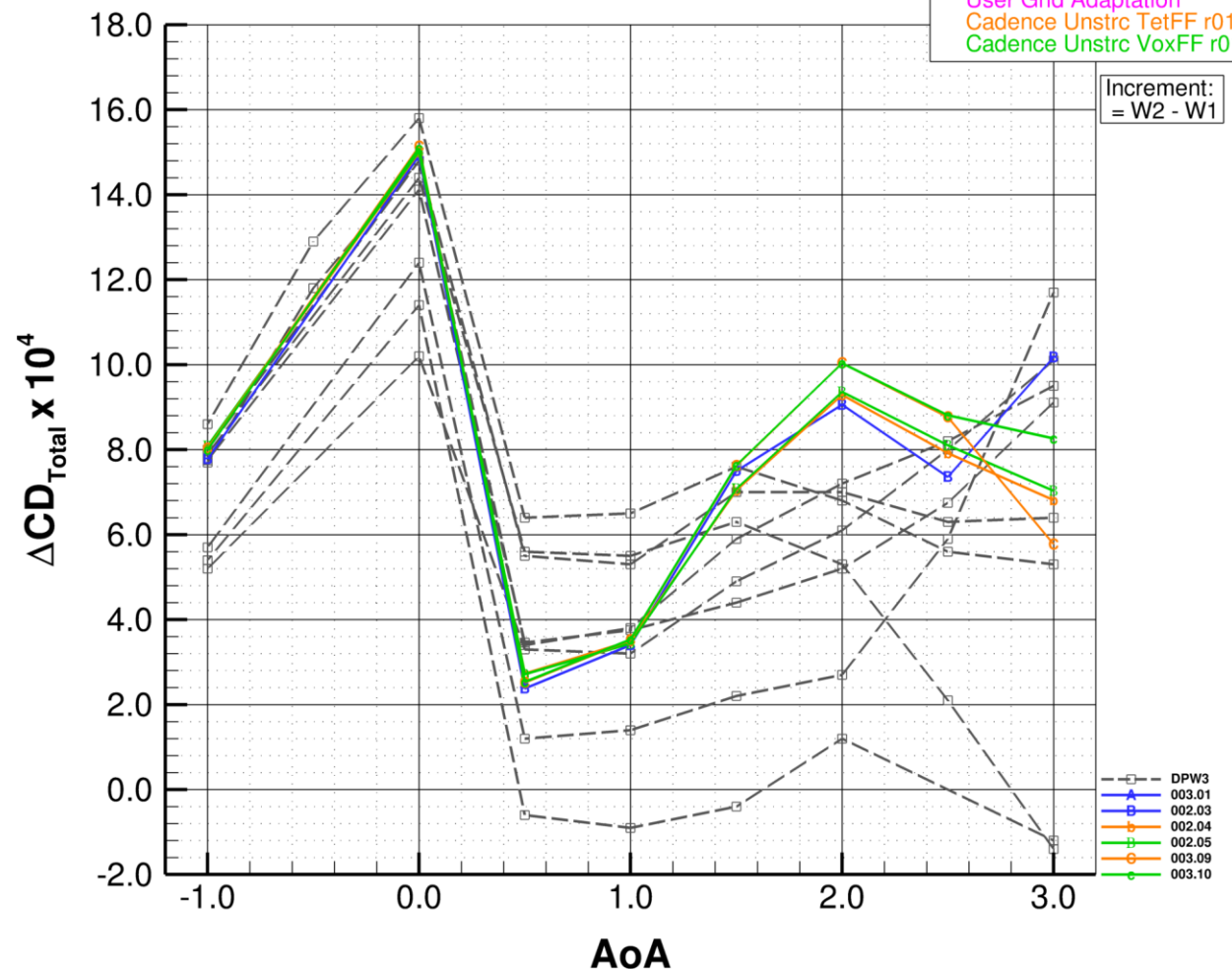
Test Case 1e: DPW-III Wing1/2
Polar Study



Test Case 1e: DPW-III Wing1/2
Polar Study

Grid Family:
Cadence Unstrctrd TetFF
Cadence Unstrctrd VoxFF
HeldenMesh Unstructured
User Grid Adaptation
Cadence Unstrc TetFF r01
Cadence Unstrc VoxFF r01

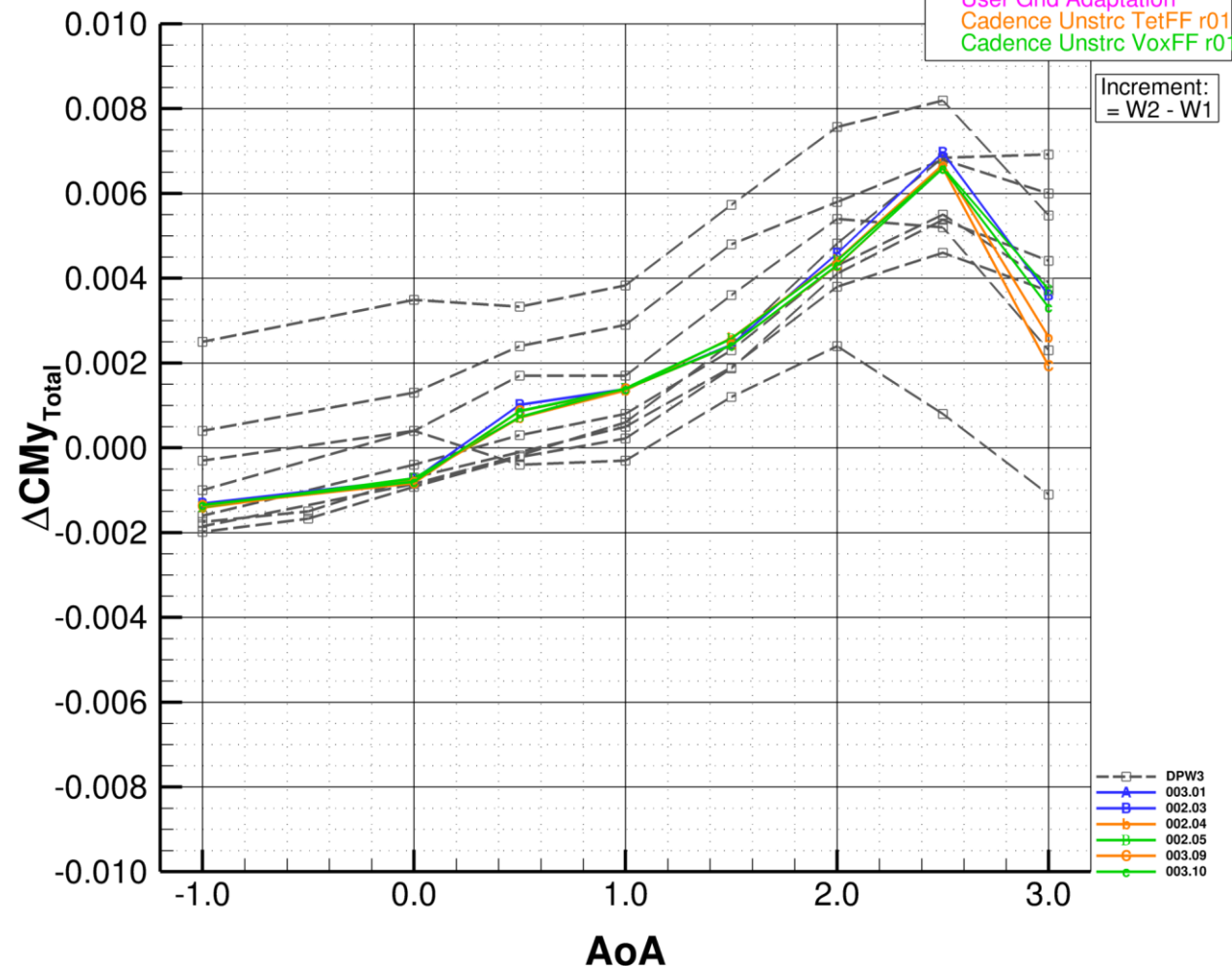
Increment:
= W2 - W1



Test Case 1e: DPW-III Wing1/2
Polar Study

Grid Family:
Cadence Unstrctrd TetFF
Cadence Unstrctrd VoxFF
HeldenMesh Unstructured
User Grid Adaptation
Cadence Unstrc TetFF r01
Cadence Unstrc VoxFF r01

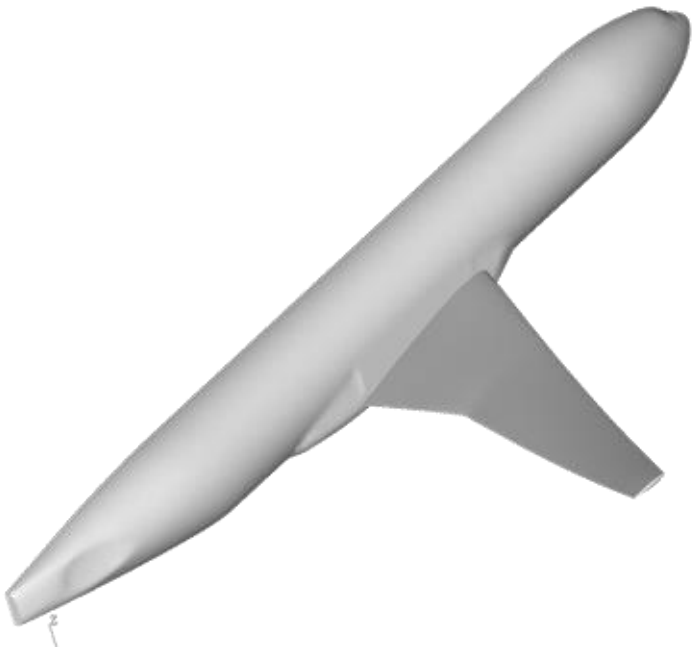
Increment:
= W2 - W1



Test Case 2a/2b: Wing/Body Cruise



- Verification of steady CFD analysis, required
- Settings
 - Steady CFD RANS **French Vanilla SA-[neg] (All terms!)**
 - Adiabatic Wall (not isothermal)
 - Converge residuals to machine precision (~1e-10)
- Grids: <https://dpw.larc.nasa.gov/DPW8/Scatter/Test Case 2>
 - NASA CRM geometry including deformed wing matching condition
 - (L1:Itiny/L2:Coarse/L3:Medium/L4:Fine/L5:eXtra-fine/L6:Ultra-fine)
 - Six-member grid family; four are required, six are desirable
 - Encourage use of committee-supplied grids; user-generated grids are acceptable



- Reference Units

Sref (semi-span grid)	Cref	Semispan	Moment Center
297360.0 sq.in	275.8 in	1156.75 in	(1325.90, 0.00, 177.95)

- Conditions

Mach	Re _c	α	T _{static} (100° F)	γ	Pr	Pr _t	Farfield $\chi = \tilde{v}/v$
0.85	5×10^6	2.50°	559.67 R 310.928 K	1.4	0.72	0.90	3

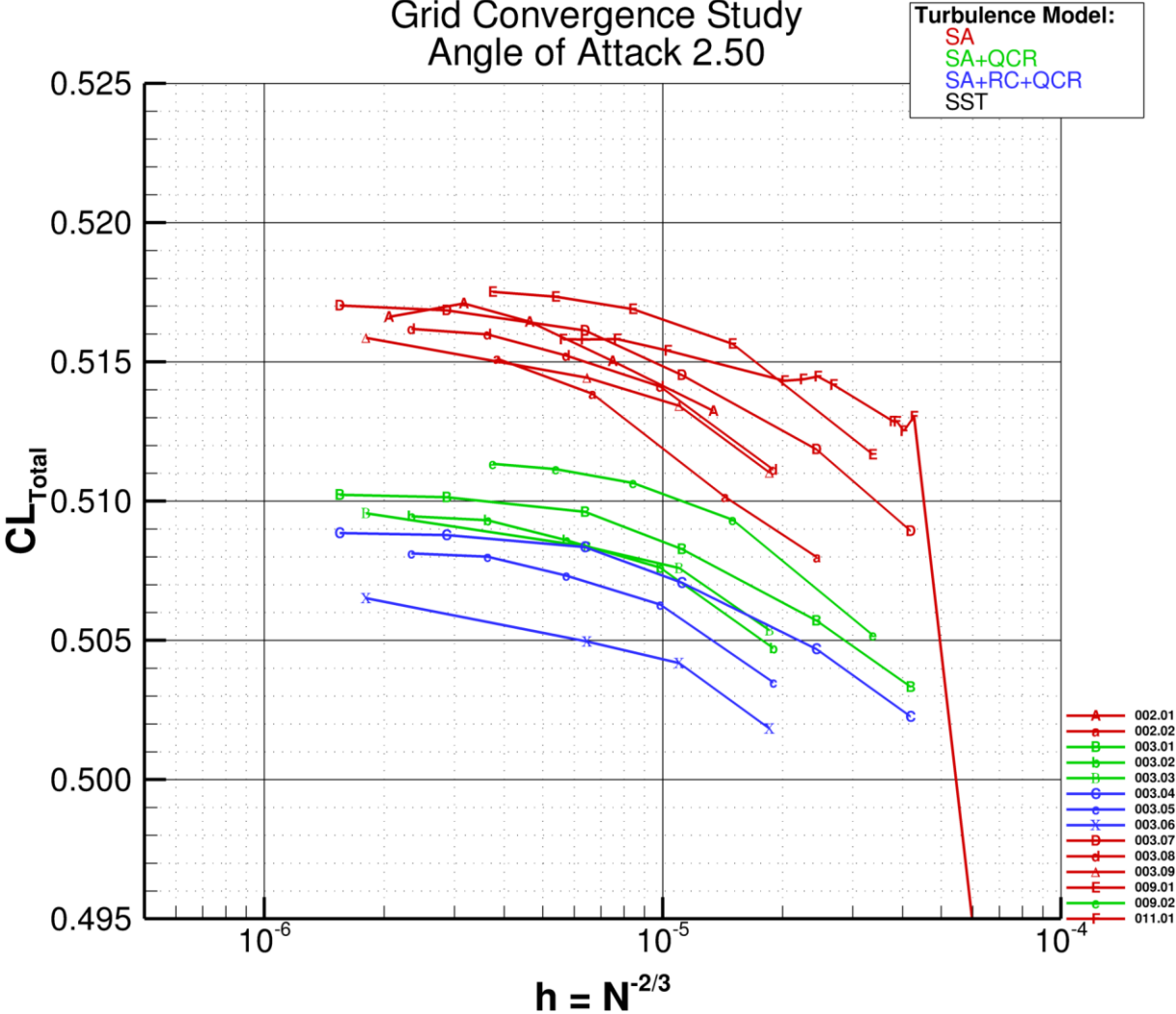
- Sutherland's Law

$$\mu(T) = \mu_0 \left(\frac{T}{T_0} \right)^{3/2} \left(\frac{T_0 + S}{T + S} \right) \quad \mu_0 = 1.716 \times 10^{-5} \frac{\text{kg}}{\text{m s}} \quad T_0 = 491.6^\circ \text{R} \quad S = 198.6^\circ \text{R} \quad \frac{\mu(T)}{\mu_{ref}} = \left(\frac{T}{T_{ref}} \right)^{3/2} \left(\frac{1 + S/T_{ref}}{T/T_{ref} + S/T_{ref}} \right)$$

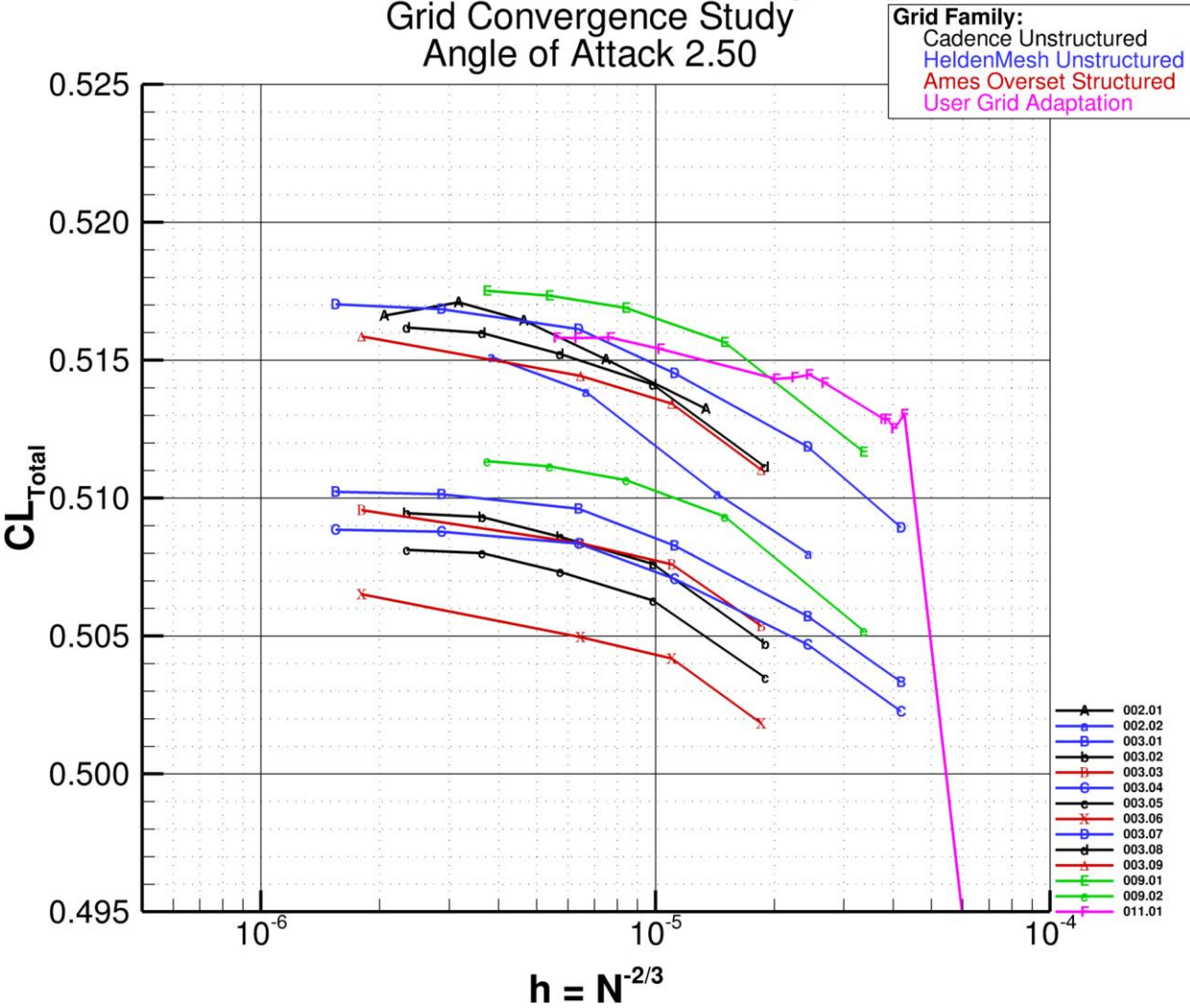
Wing/Body C_L Convergence: $\alpha = 2.5^\circ$



Test Case 2a: NASA CRM Wing/Body
Grid Convergence Study
Angle of Attack 2.50



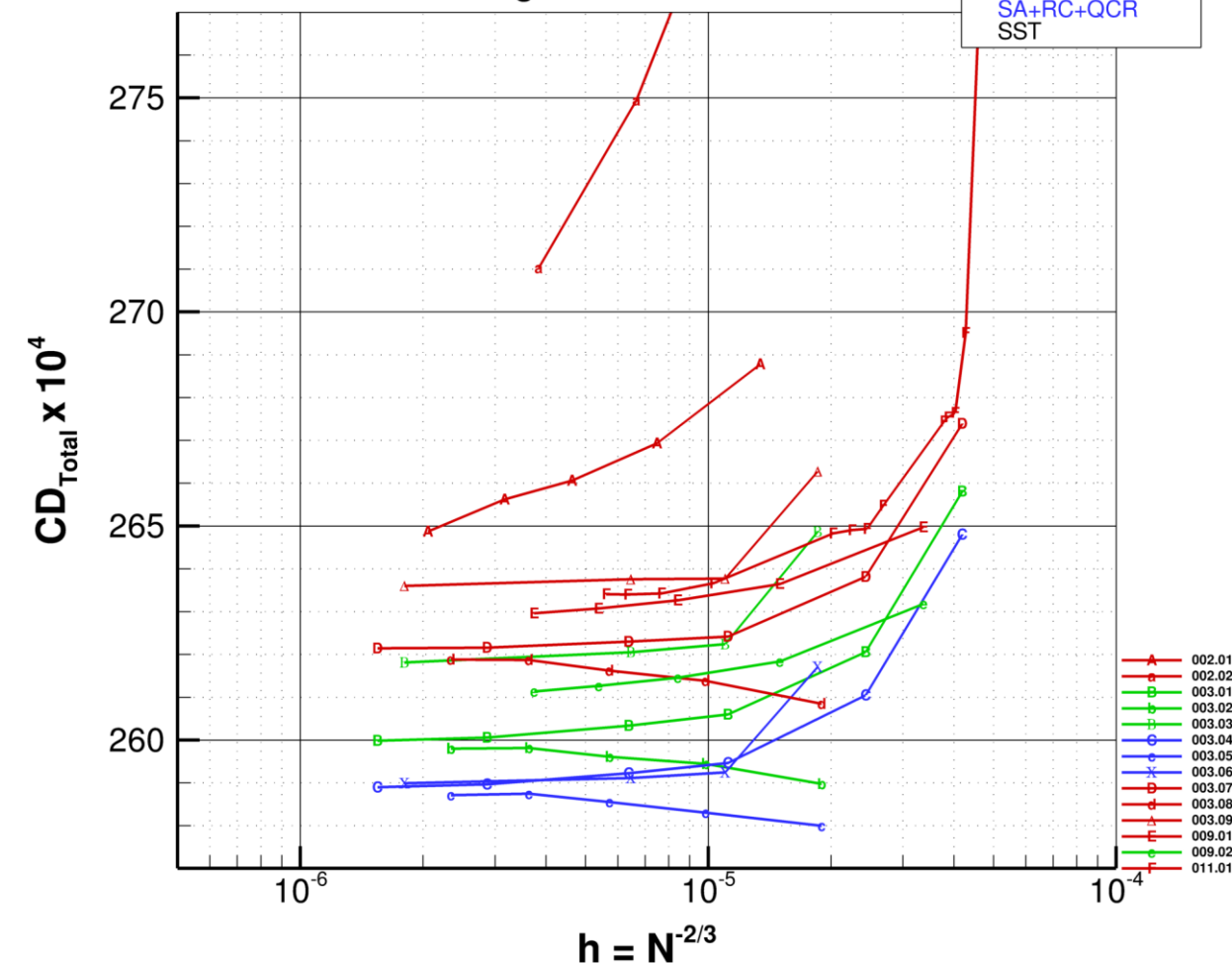
Test Case 2a: NASA CRM Wing/Body
Grid Convergence Study
Angle of Attack 2.50



Wing/Body C_D Convergence: $\alpha = 2.5^\circ$

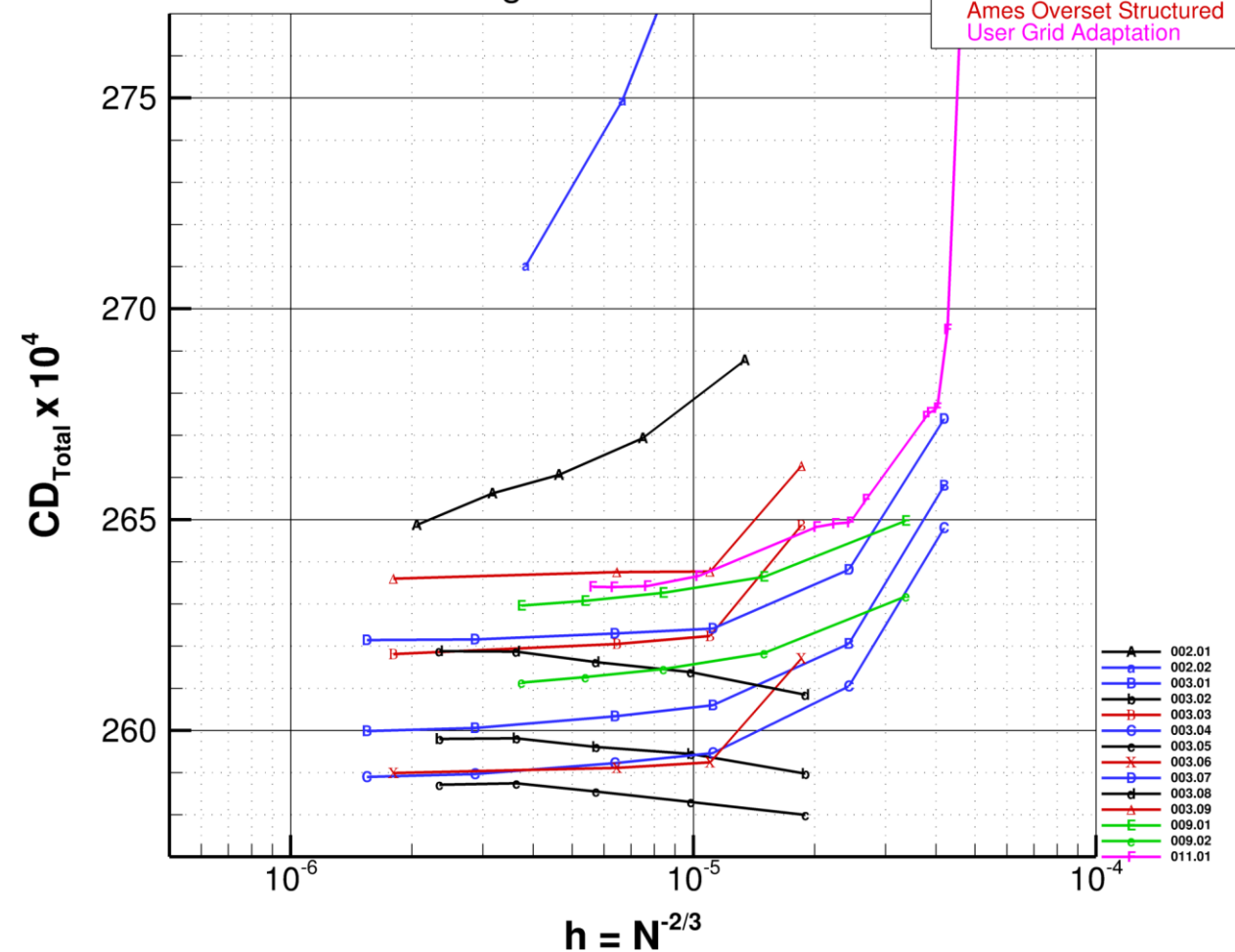
Test Case 2a: NASA CRM Wing/Body
Grid Convergence Study
Angle of Attack 2.50

Turbulence Model:
SA
SA+QCR
SA+RC+QCR
SST

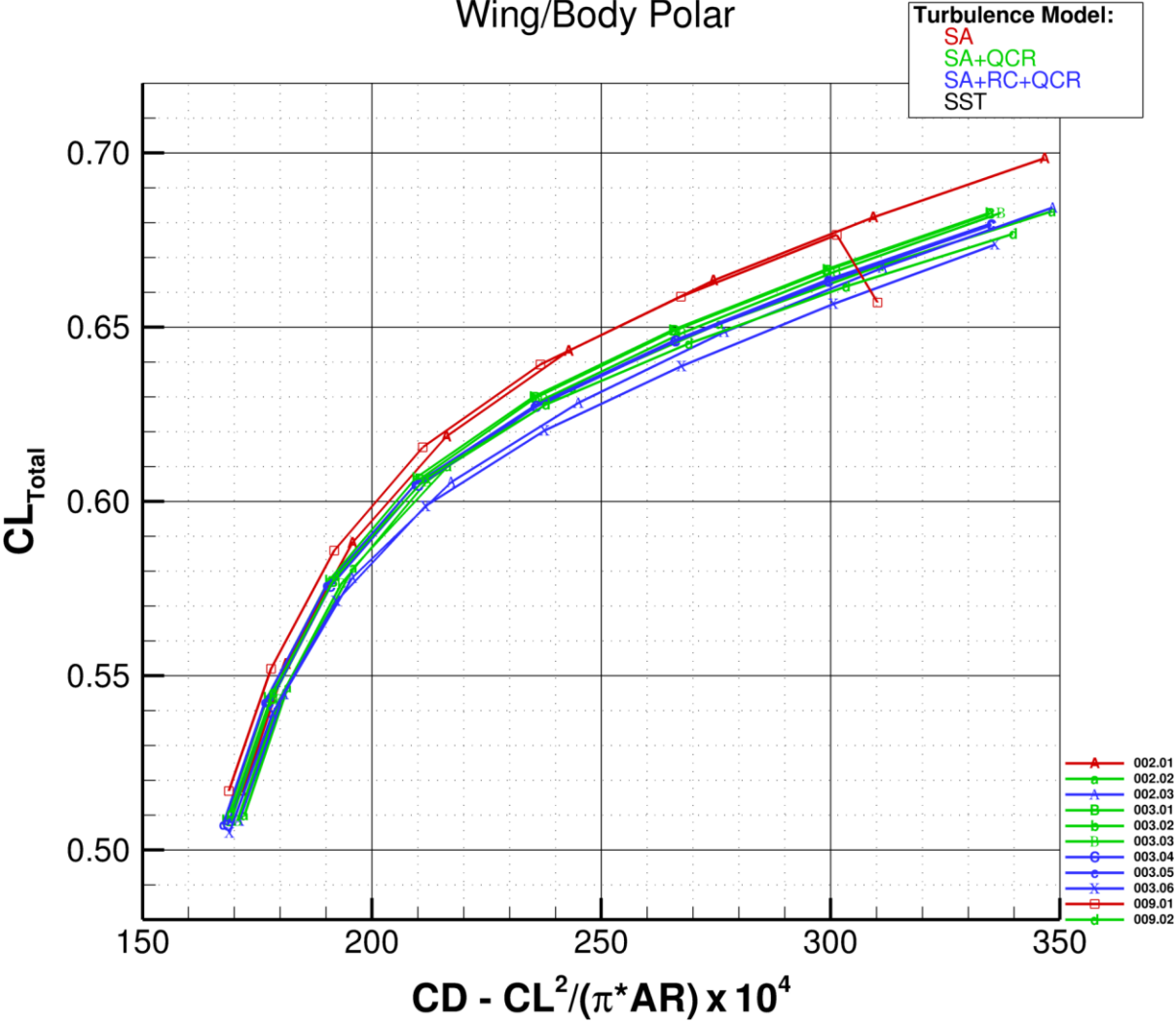


Test Case 2a: NASA CRM Wing/Body
Grid Convergence Study
Angle of Attack 2.50

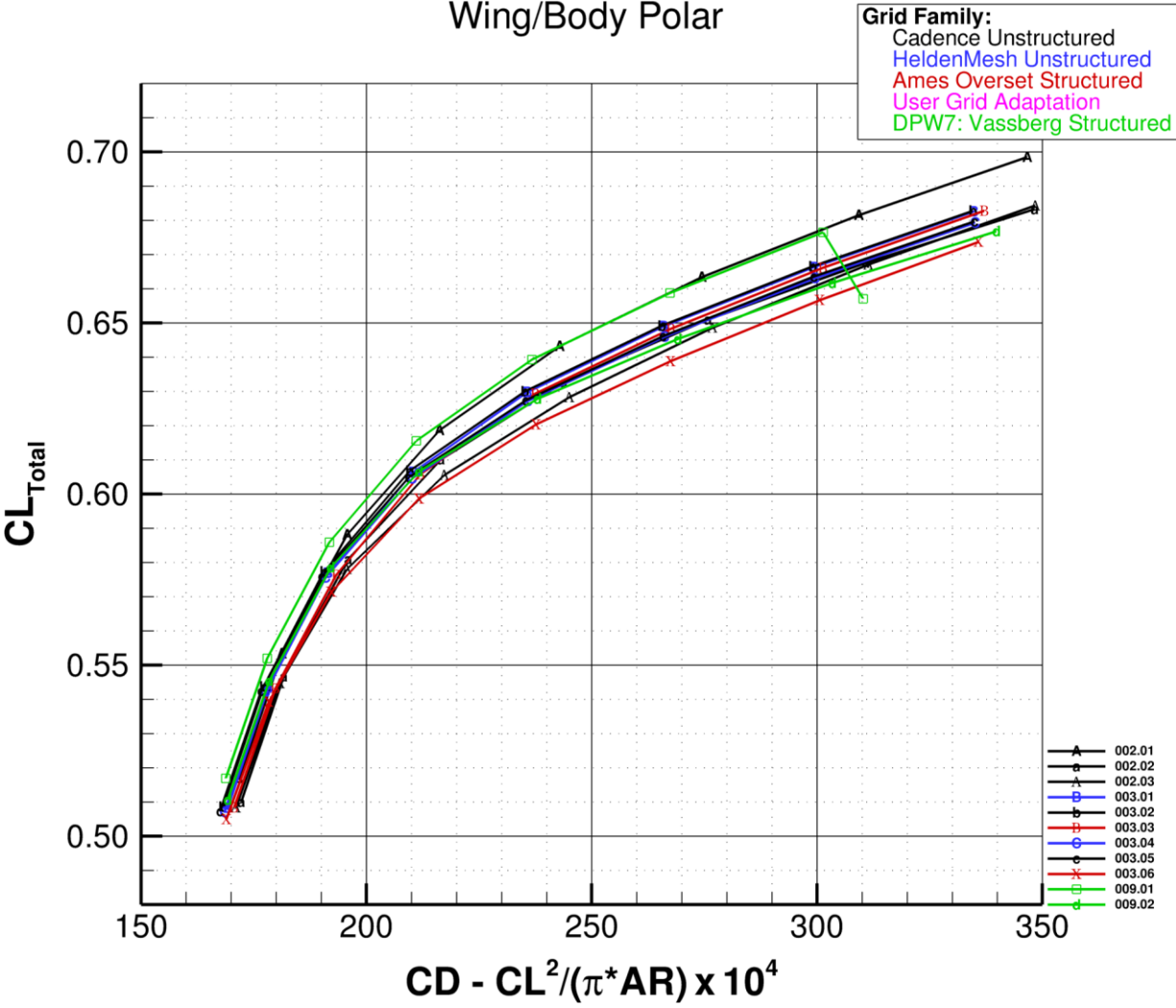
Grid Family:
Cadence Unstructured
HeldenMesh Unstructured
Ames Overset Structured
User Grid Adaptation



Test Case 2b: NASA CRM
Wing/Body Polar

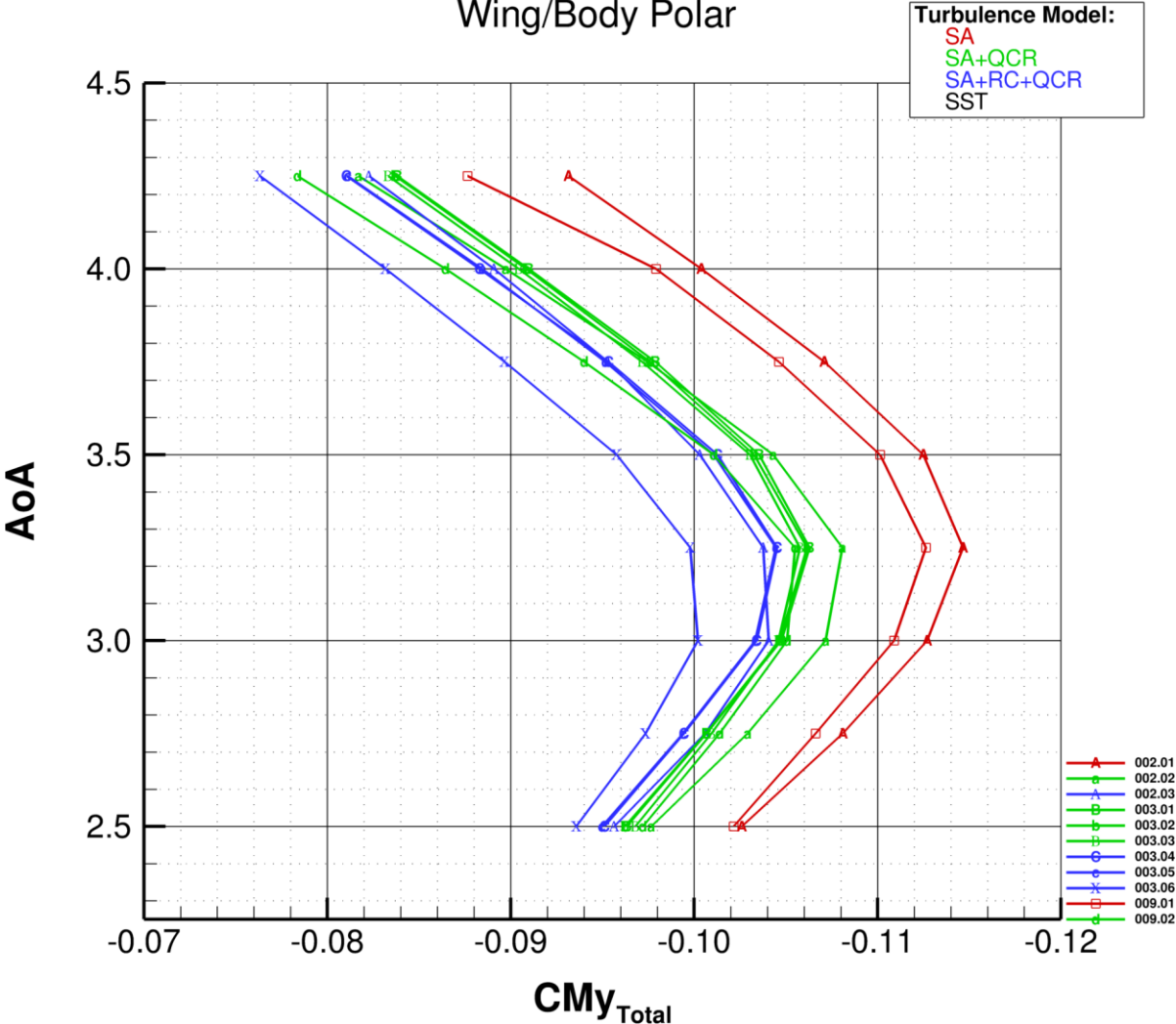


Test Case 2b: NASA CRM
Wing/Body Polar

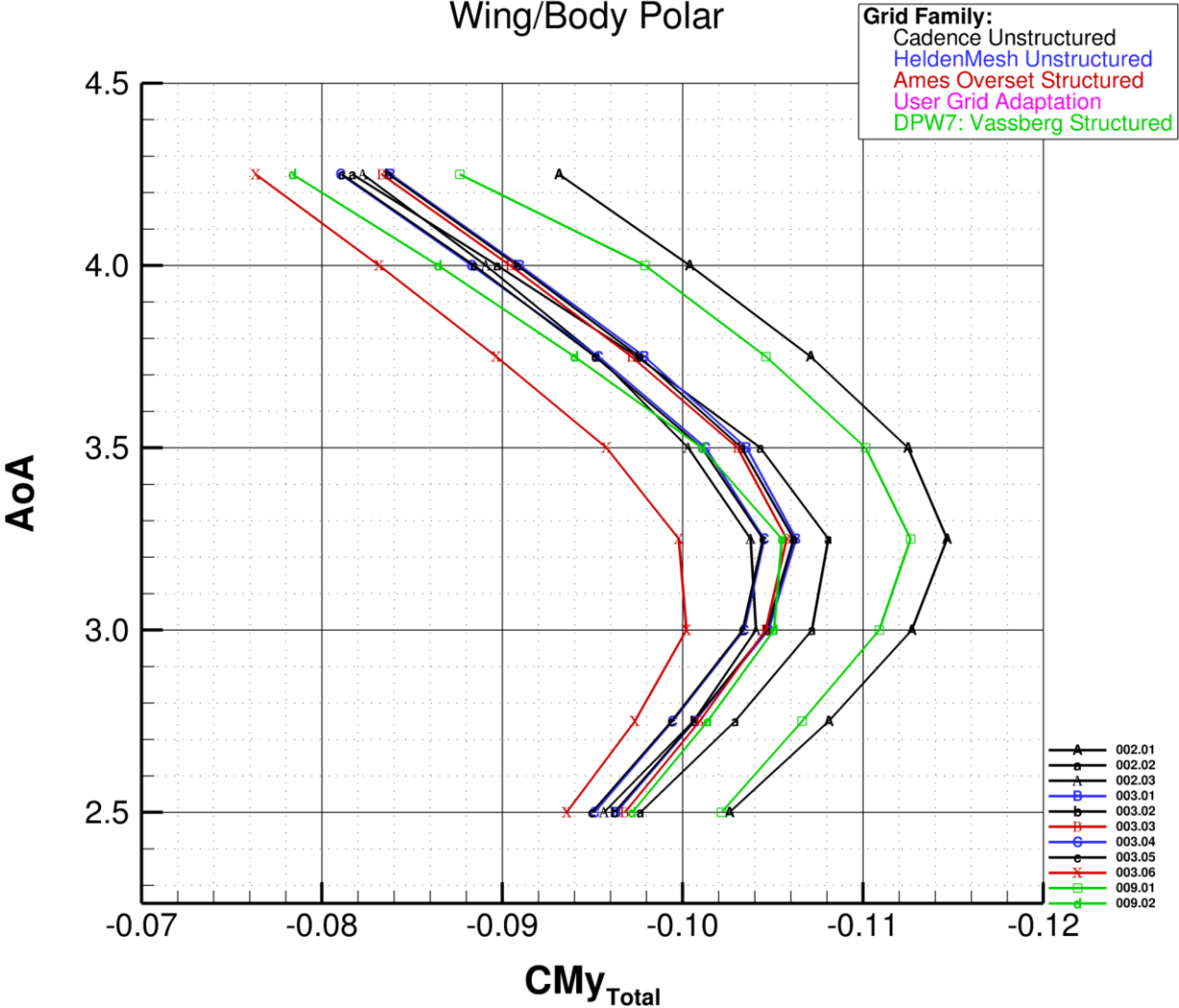


Wing/Body Polar

Test Case 2b: NASA CRM
Wing/Body Polar



Test Case 2b: NASA CRM
Wing/Body Polar



- **Test Case 1a: ONERA OAT15A**
 - Surprisingly large scatter!
- **Test Case 1b: Joukowski**
 - Excellent agreement between participants
 - Clear demonstration of 2nd-order accuracy (and higher!)
- **Test Case 1c: ONERA OAT15A**
 - Reduction in scatter!
 - Consistent Turbulence Model
 - Consistent problem definition (nothing left to participants)
 - Fairfield Distance
 - Residual Convergence
- **Test Case 1d/1e: W1/W2 increment**
 - Looking better after 20 years!
- **Test Case 2a/2b: Wing/Body Cruise**
 - Clear impact of SA-[neg] vs SA-[neg]-QCR2000 vs SA-[neg]-RC-QCR2000
- **Need more participants...**

- **Major Sources**

- Mesh!
- Turbulence Model
- Residual Convergence
- Problem Specification (Boundary Conditions, Constants, Viscosity model, etc.)
 - Farfield Boundary Location

- **Minor Sources**

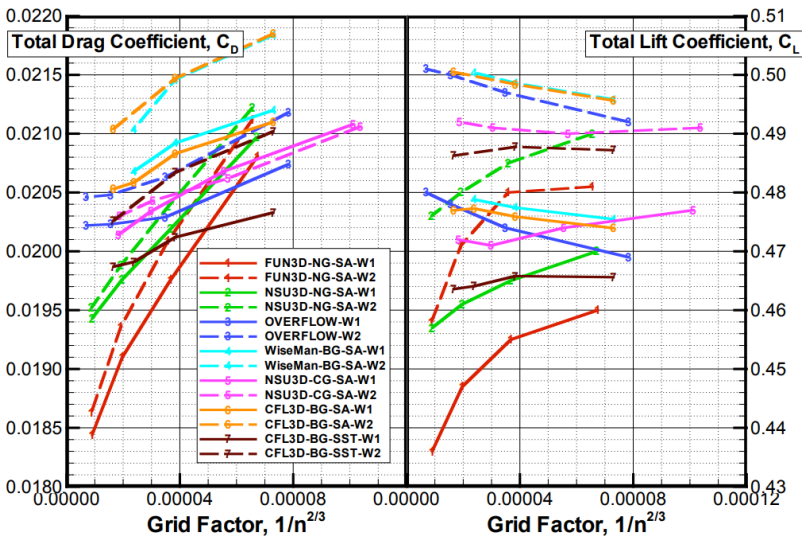
- Discretization and Numerics
- Shock Capturing / Limiters

`dpwaiaa@gmail.com`

Test Case 3a: DPW-III W1 & W2 (20 years later)



- Grid Convergence Verification of steady CFD analysis
- Settings
 - Steady CFD RANS **French Vanilla SA-[neg]** (All terms!)
 - Adiabatic Wall (not isothermal)
 - Converge residuals to machine precision (~1e-10)
- Grids: https://dpw.larc.nasa.gov/DPW8/Scatter/Test_Case_3
 - DPW-III W1 wing-only geometry (with symmetry plane)
 - (L1:Itiny/L2:Coarse/L3:Medium/L4:Fine/L5:eXtra-fine/L6:Ultra-fine)
 - Six-member grid family; four are required, six are desirable
 - Encourage use of committee-supplied grids; user-generated grids are acceptable



<https://www.aiaa-dpw.org/Workshop3/presentations/S9-Zickhur-Case2-Summary.pdf>

Reference Units

Sref (semi-span grid)	Cref	Semispan	Moment Center
225.0 sq.in	7.7778 in	30.0 in	(6.0726, 0.0, 0.0)

Conditions

Mach	Re _c	α	T _{static} (120.33° F)	γ	Pr	Pr _t	Farfield $\chi = \tilde{v}/v$
0.76	5×10^6	0.50°	580.0 R 322.22 K	1.4	0.72	0.90	3

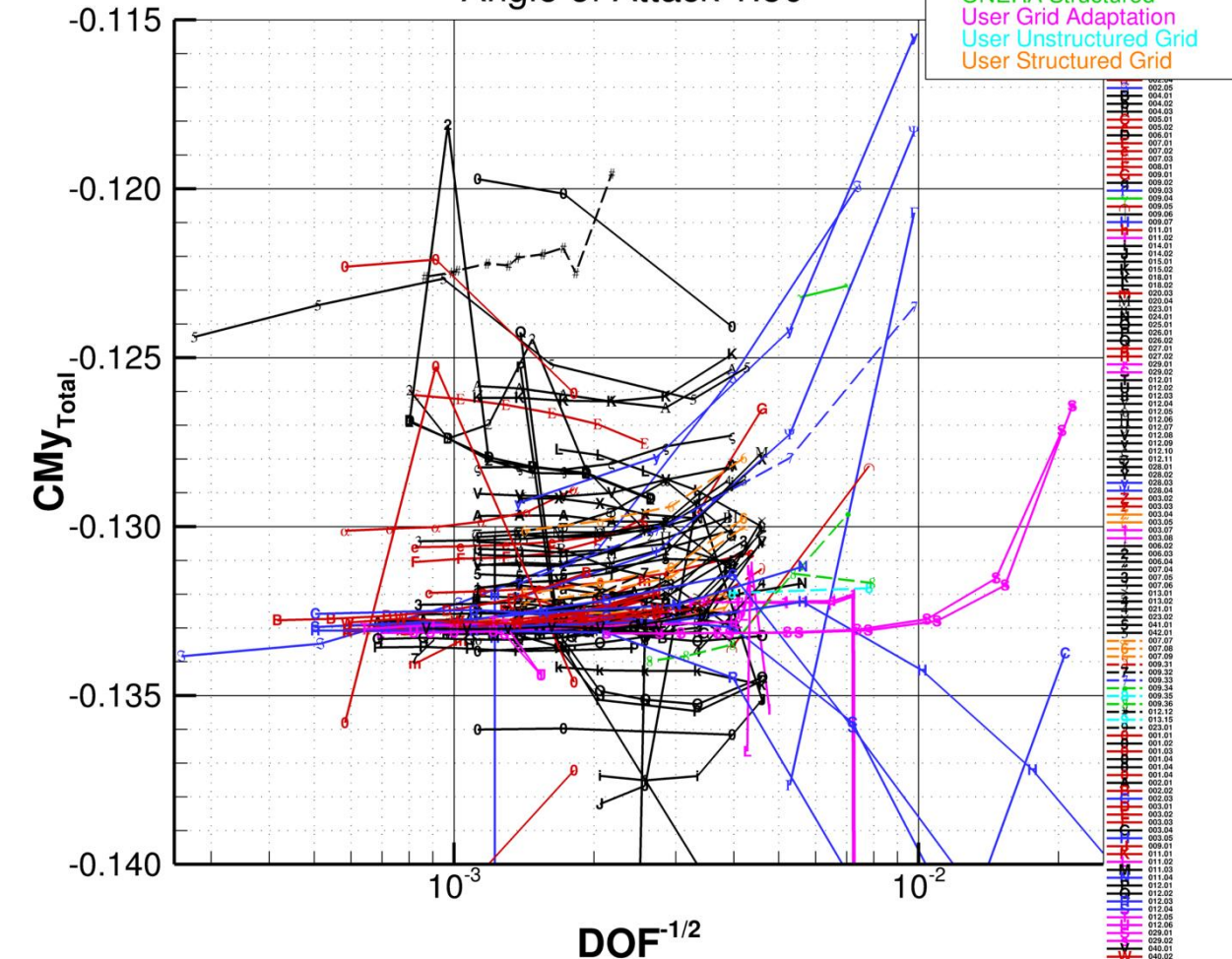
Sutherland's Law

$$\mu(T) = \mu_0 \left(\frac{T}{T_0} \right)^{3/2} \left(\frac{T_0 + S}{T + S} \right) \quad \mu_0 = 1.716 \times 10^{-5} \frac{\text{kg}}{\text{m s}} \quad T_0 = 491.6^\circ \text{R} \quad S = 198.6^\circ \text{R} \quad \frac{\mu(T)}{\mu_{ref}} = \left(\frac{T}{T_{ref}} \right)^{3/2} \left(\frac{1 + S/T_{fef}}{T/T_{fef} + S/T_{fef}} \right)$$

ONERA OAT15A C_M Convergence: $\alpha = 1.5^\circ$

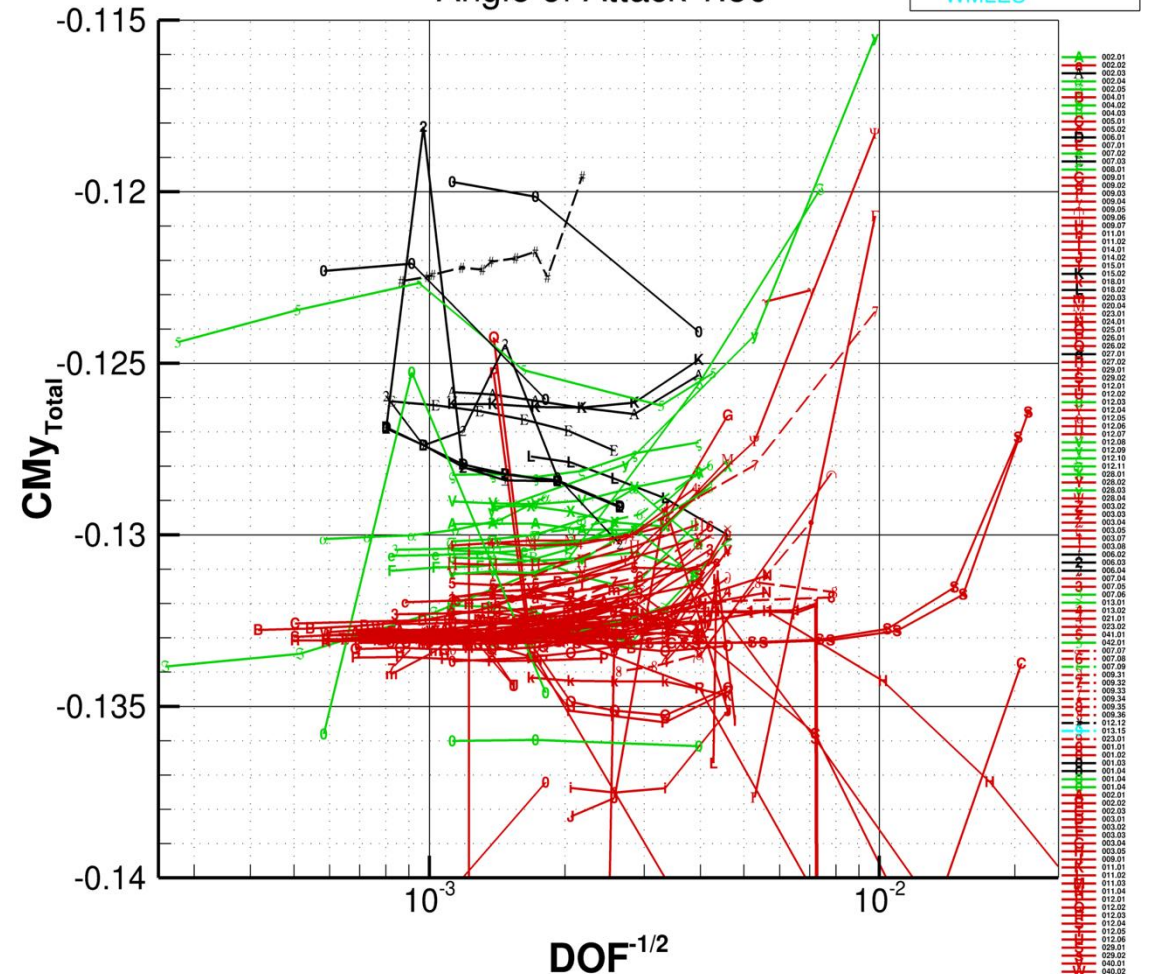
Test Case 1a: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid



Test Case 1a: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

Turbulence Model:
SA (+R/RC/CC)
SA + QCR
SST
WMLES

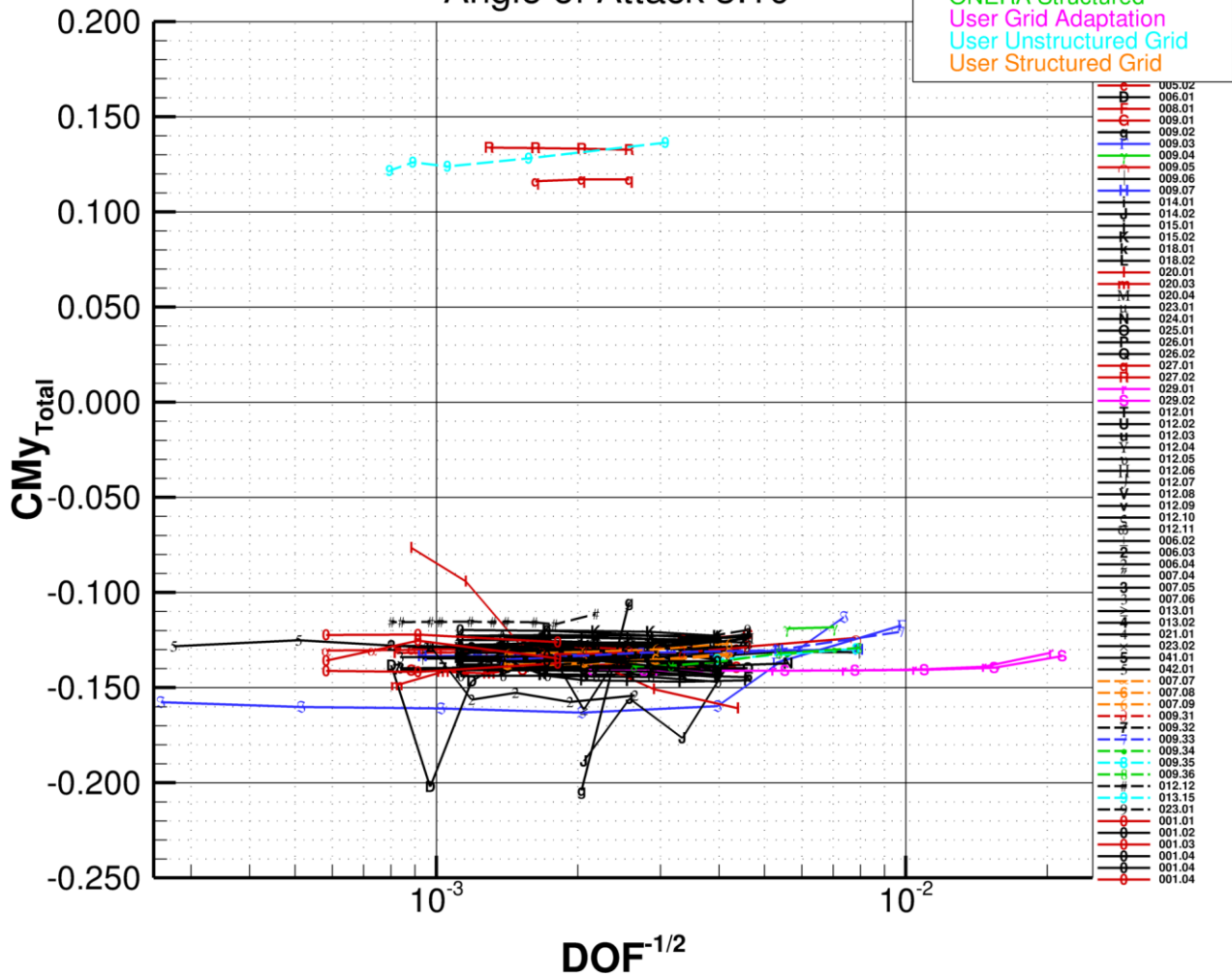


ONERA OAT15A C_M Convergence: $\alpha = 3.1^\circ$



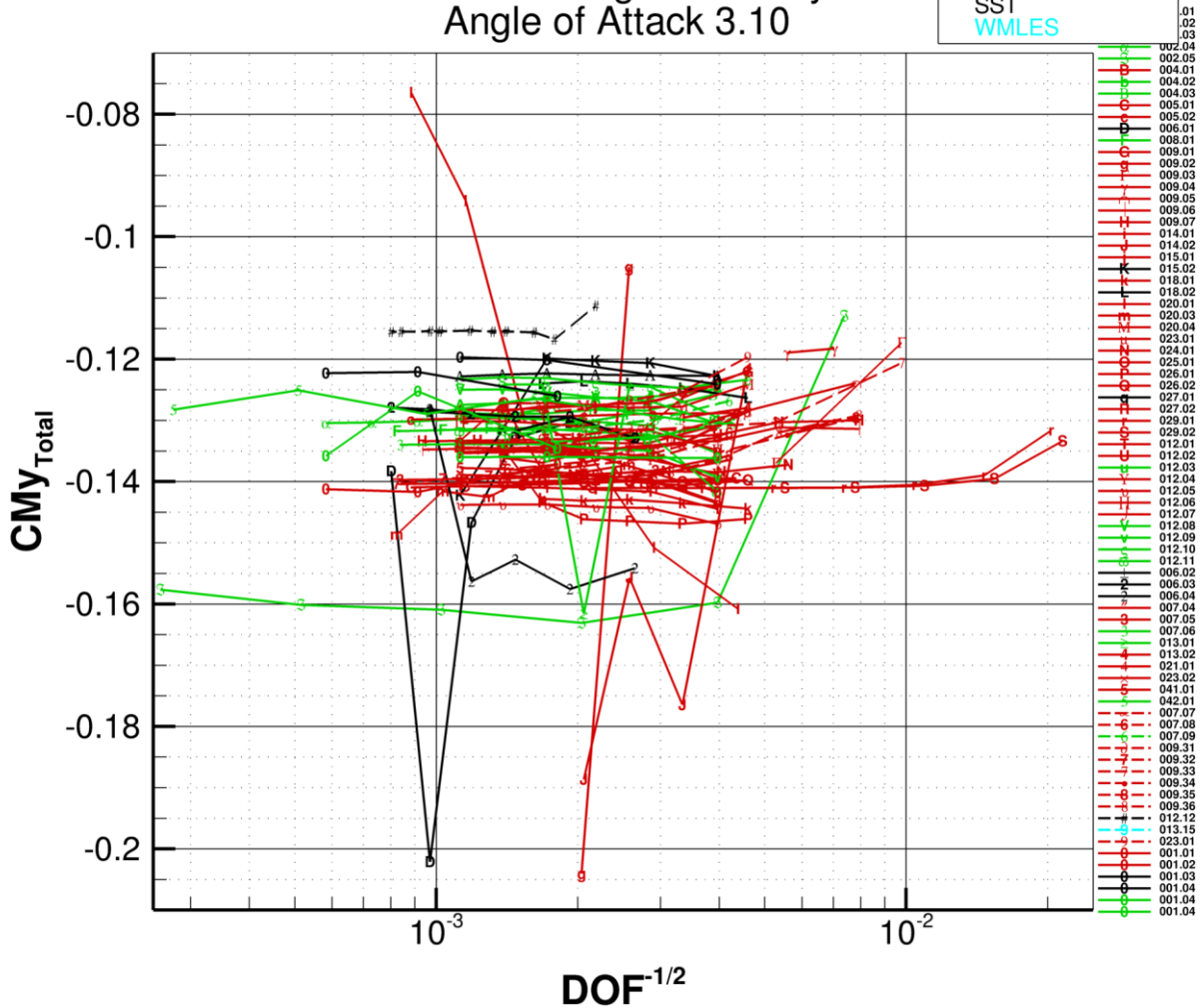
Test Case 1a: ONERA OAT15A
Grid Convergence Study
Angle of Attack 3.10

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid



Test Case 1a: ONERA OAT15A
Grid Convergence Study
Angle of Attack 3.10

Turbulence Model:
SA (+R/RC/CC)
SA + QCR
SST
WMLES

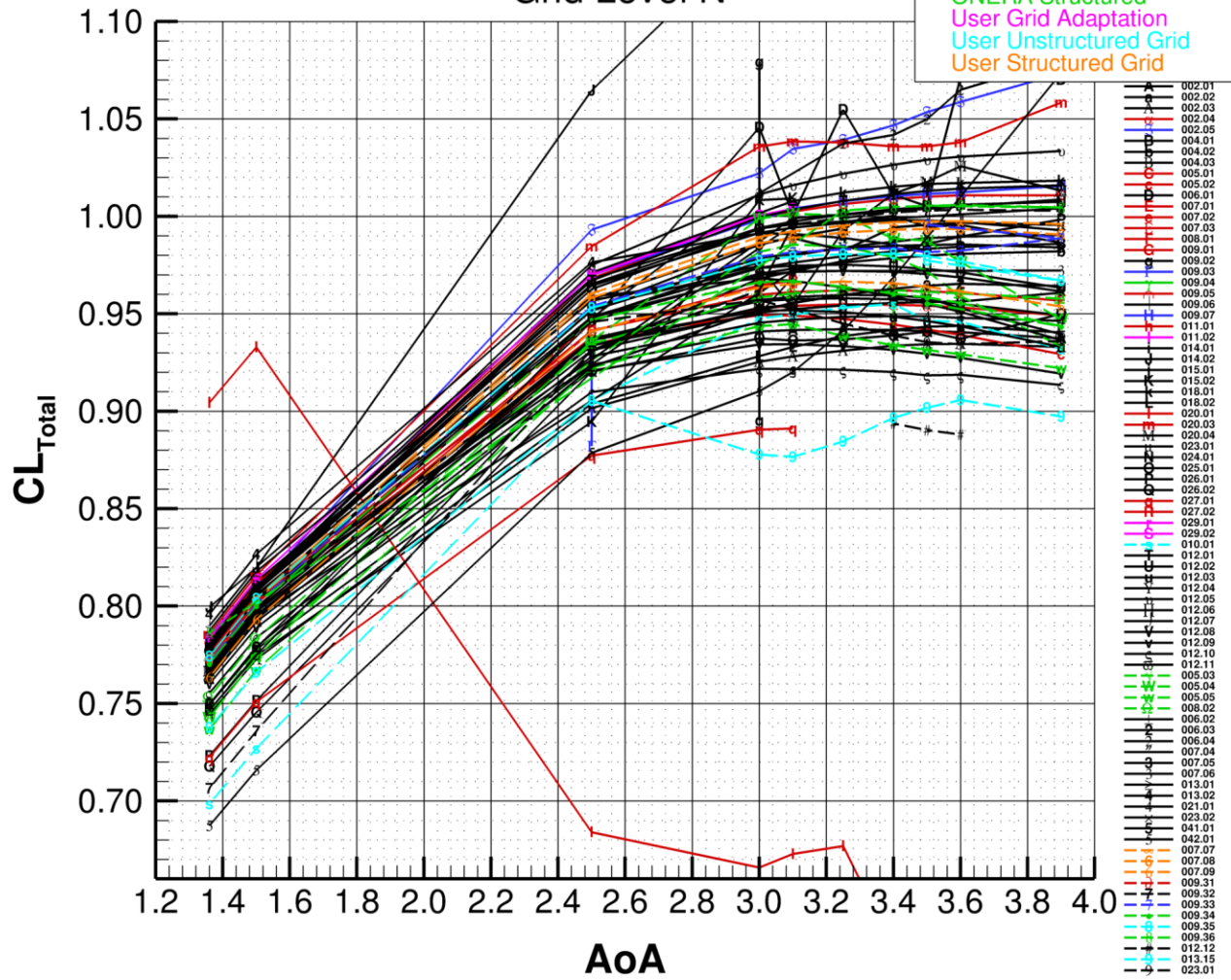


ONERA OAT15A $C_L - \alpha$ Polar: Finest Mesh



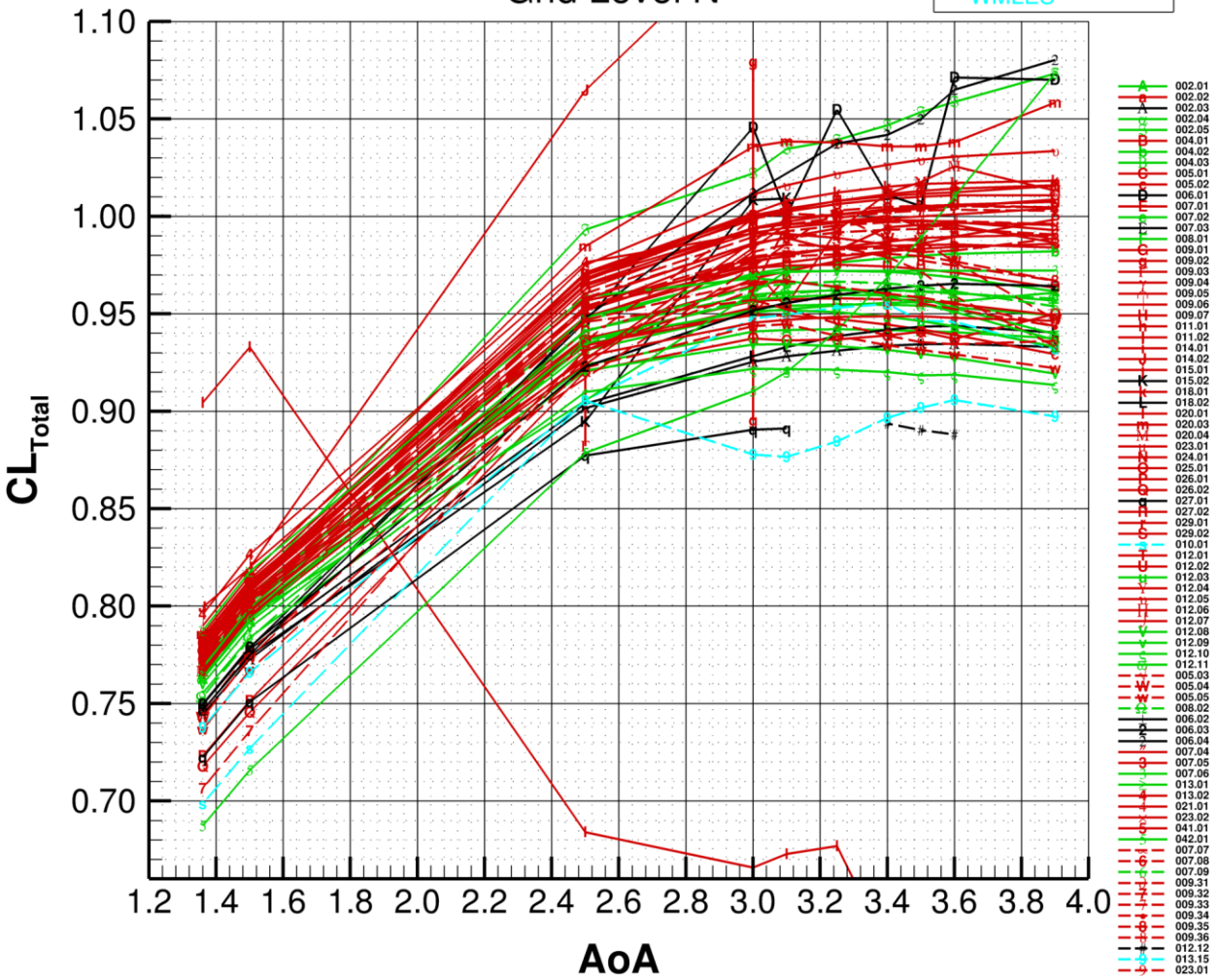
Test Case 1a: ONERA OAT15A
Polar Study
Grid Level N

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid

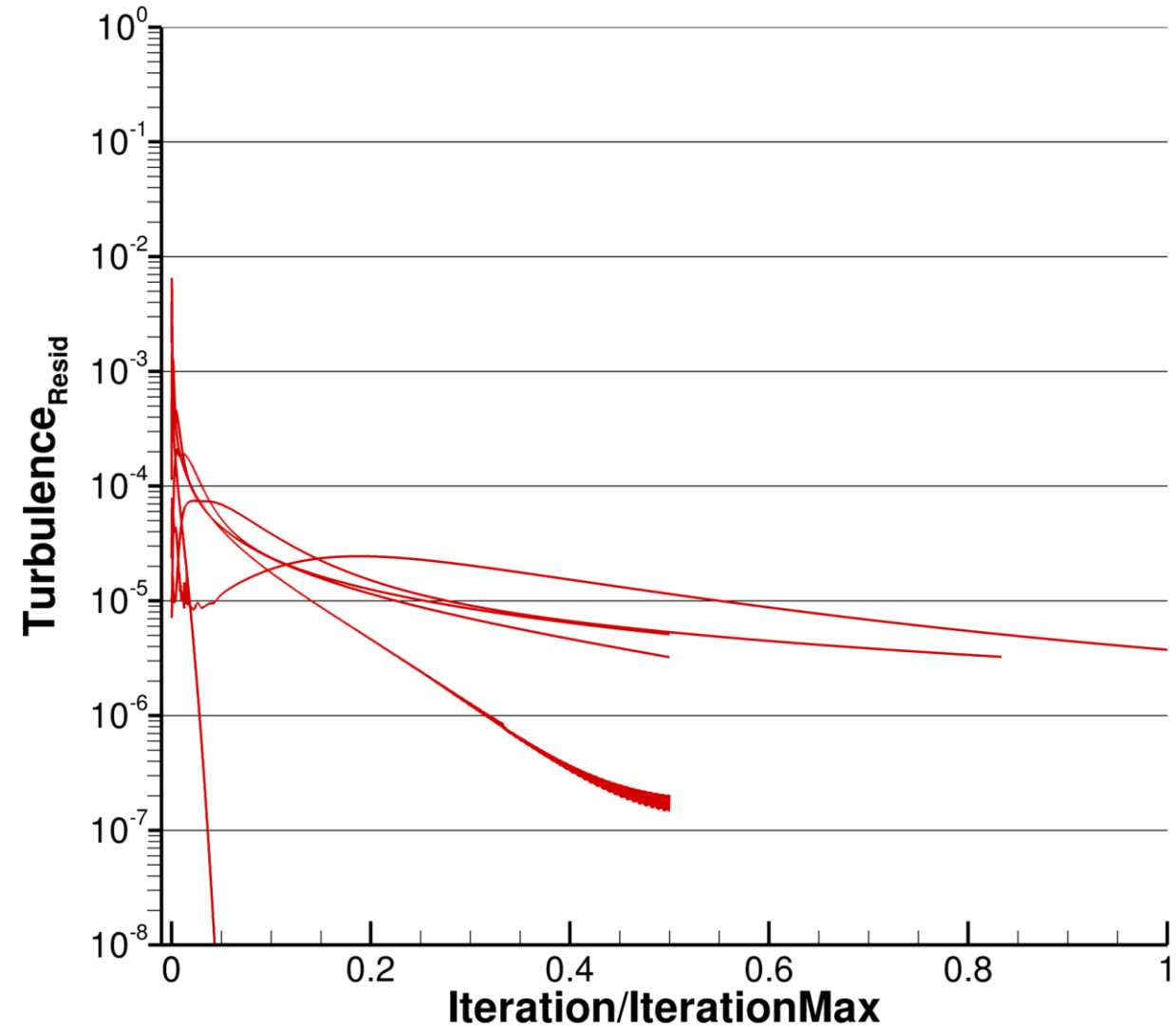
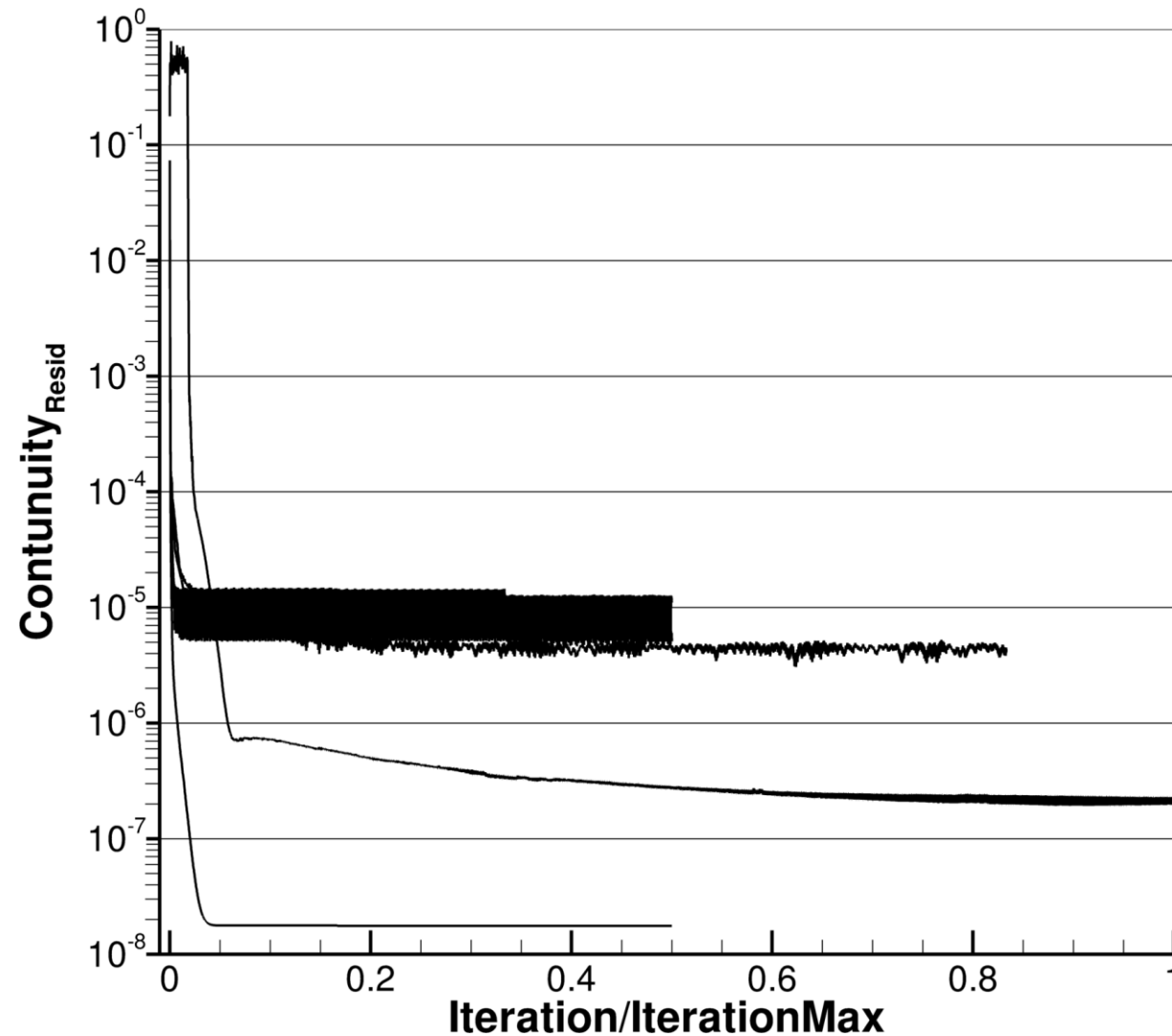


Test Case 1a: ONERA OAT15A
Polar Study
Grid Level N

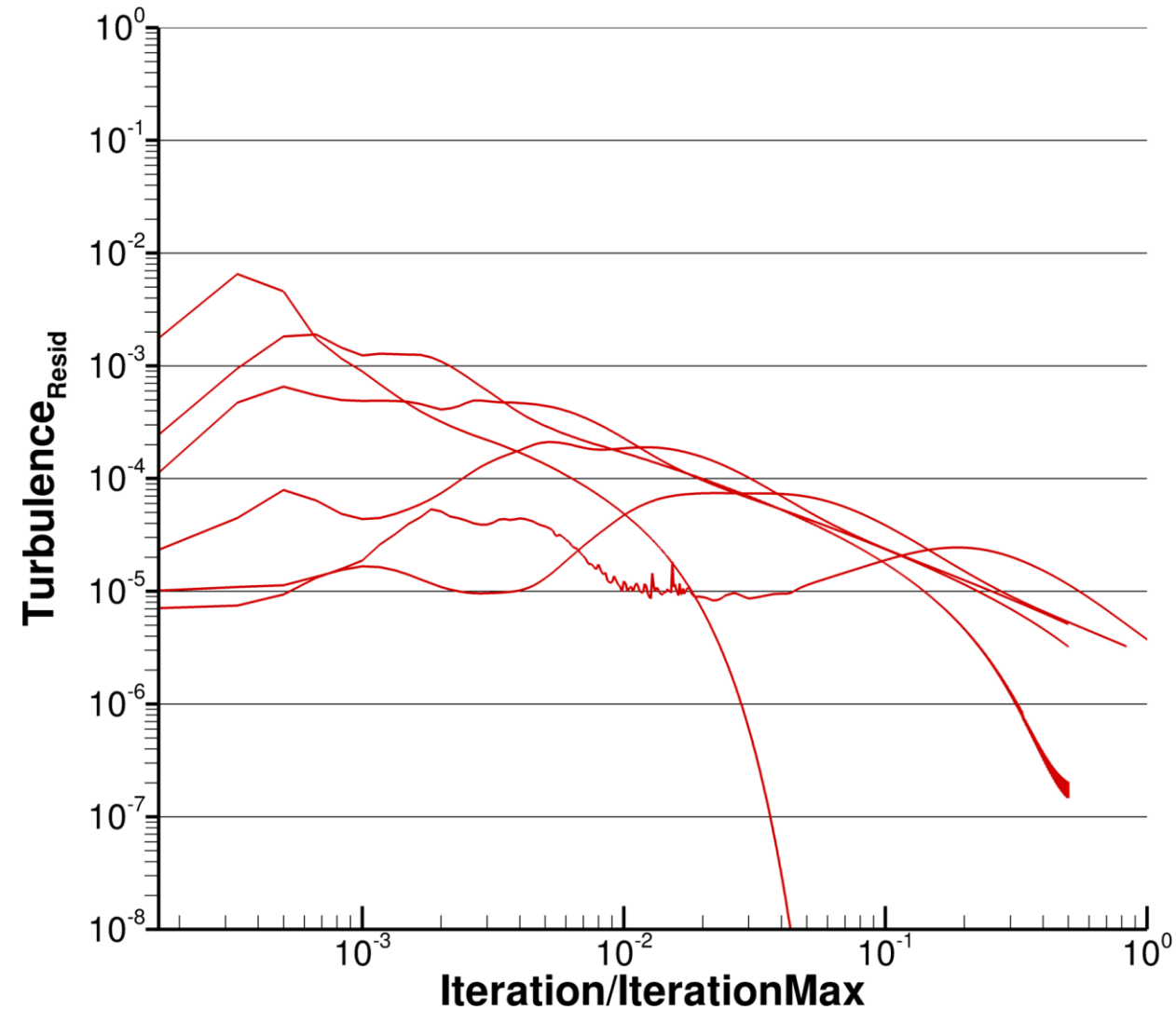
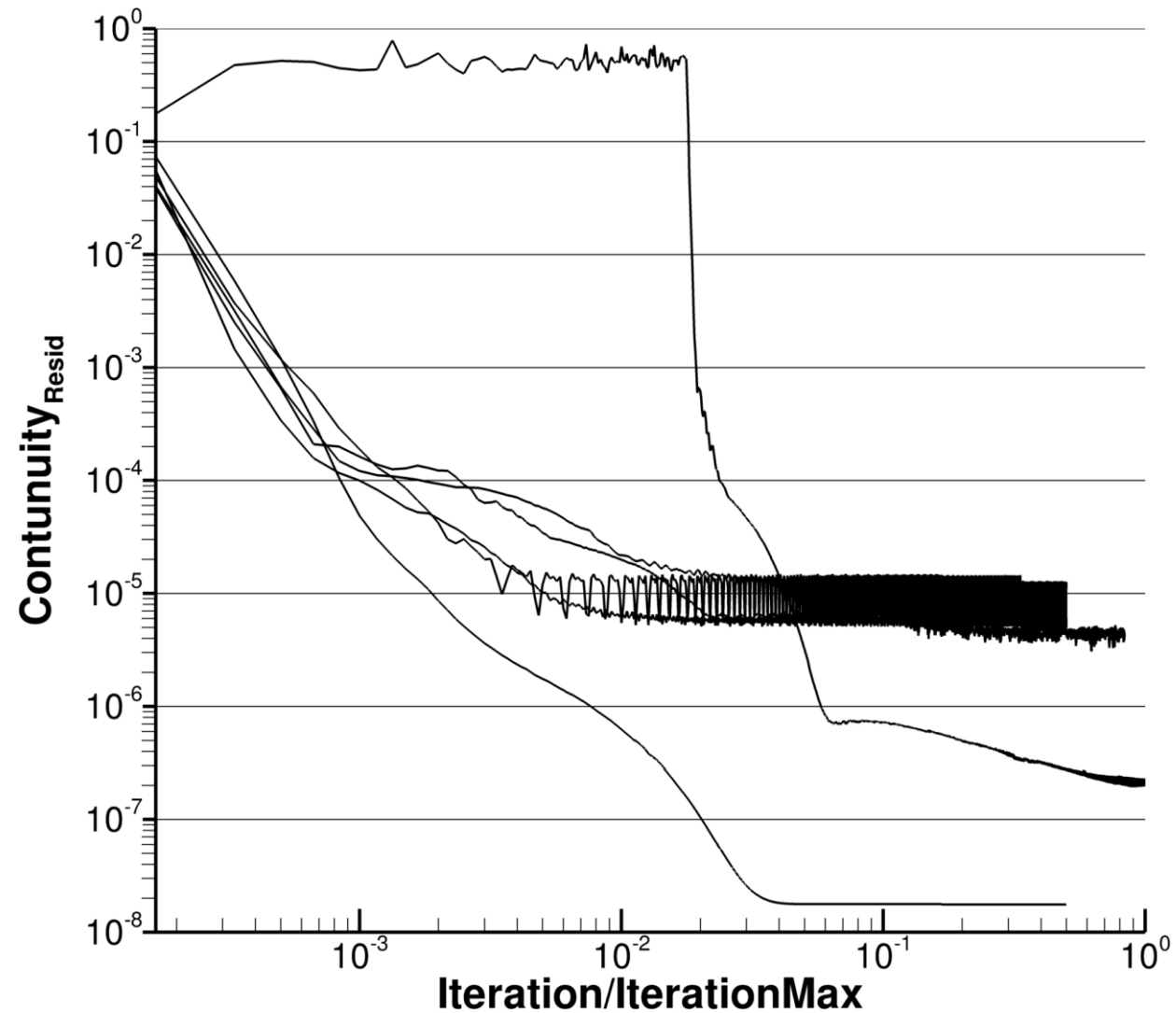
Turbulence Model:
SA (+R/RC/CC)
SA + QCR
SST
WMLES



Might be the Residual



Might be the Residual

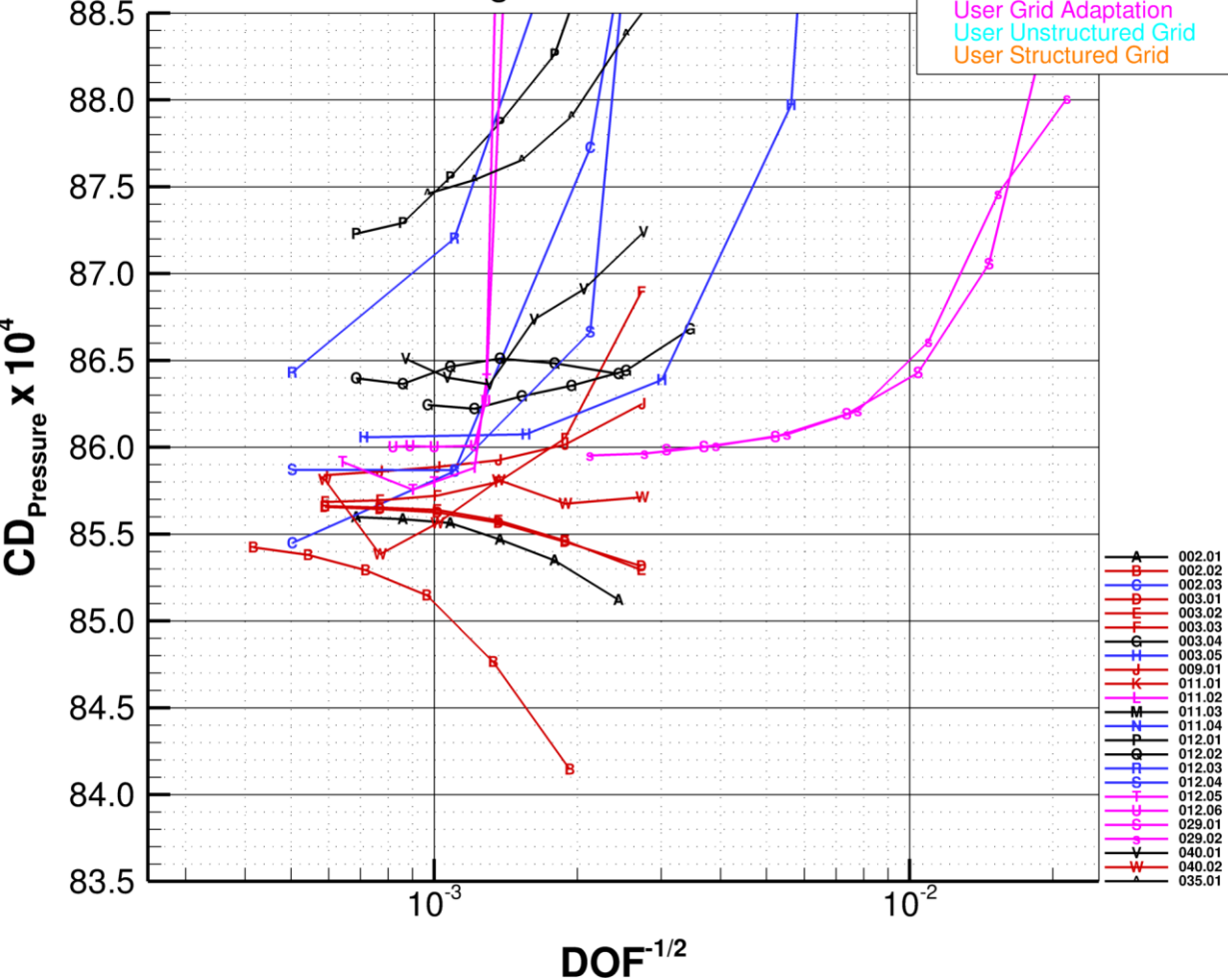


ONERA OAT15A C_{Dp} and C_{Dv} : $\alpha = 1.5^\circ$



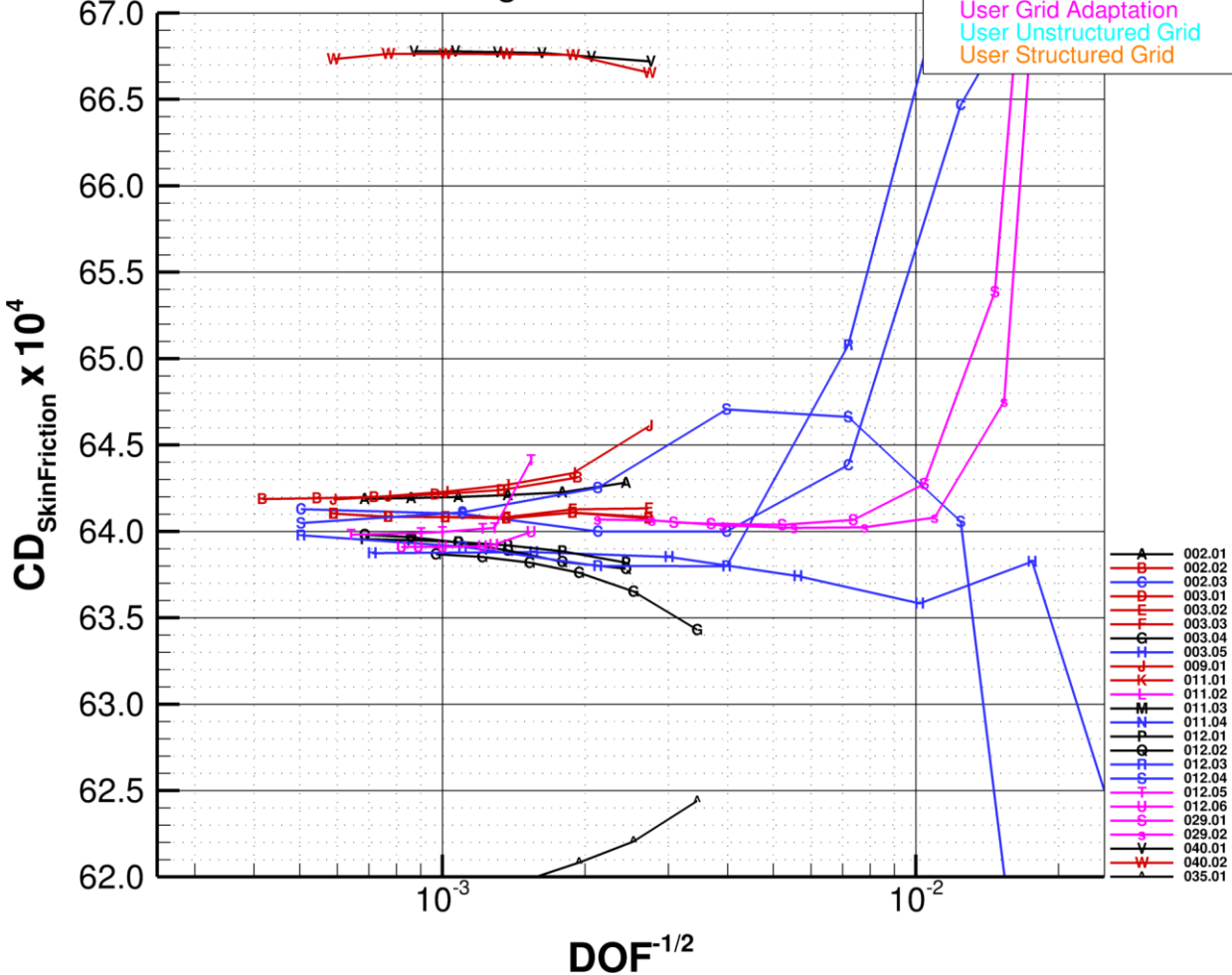
Test Case 1c: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid

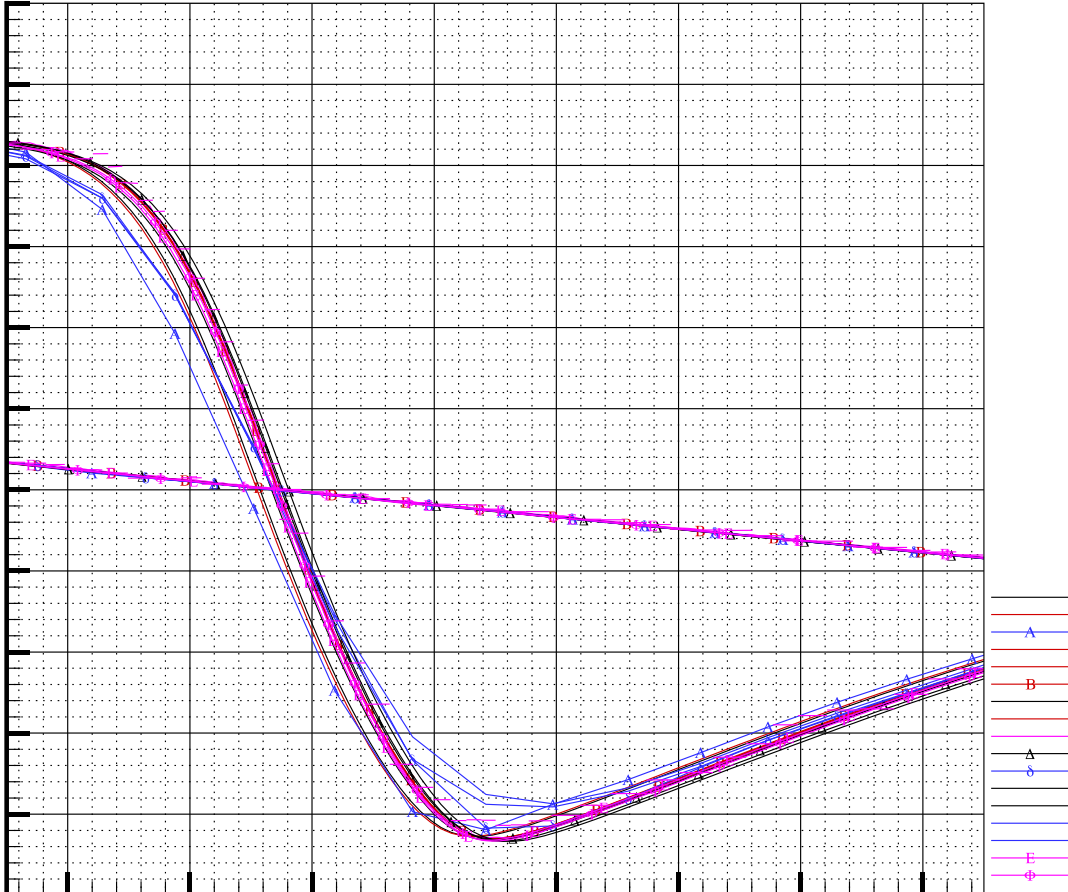
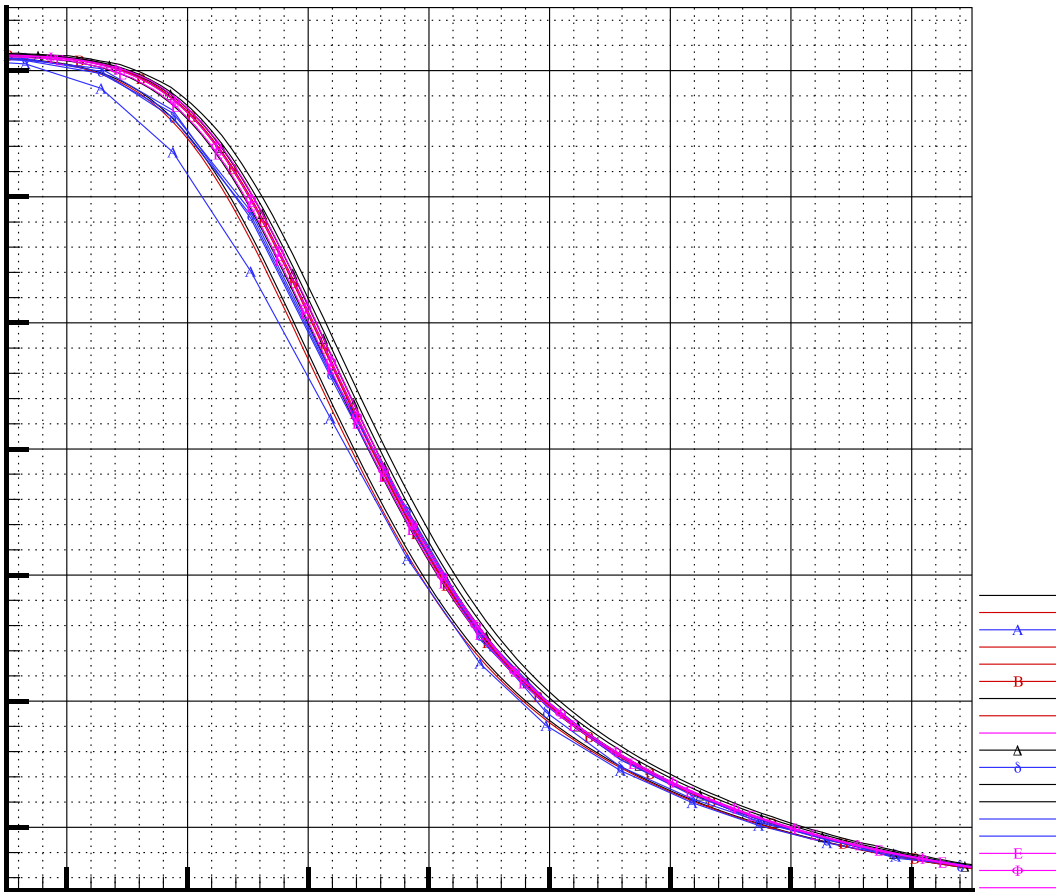


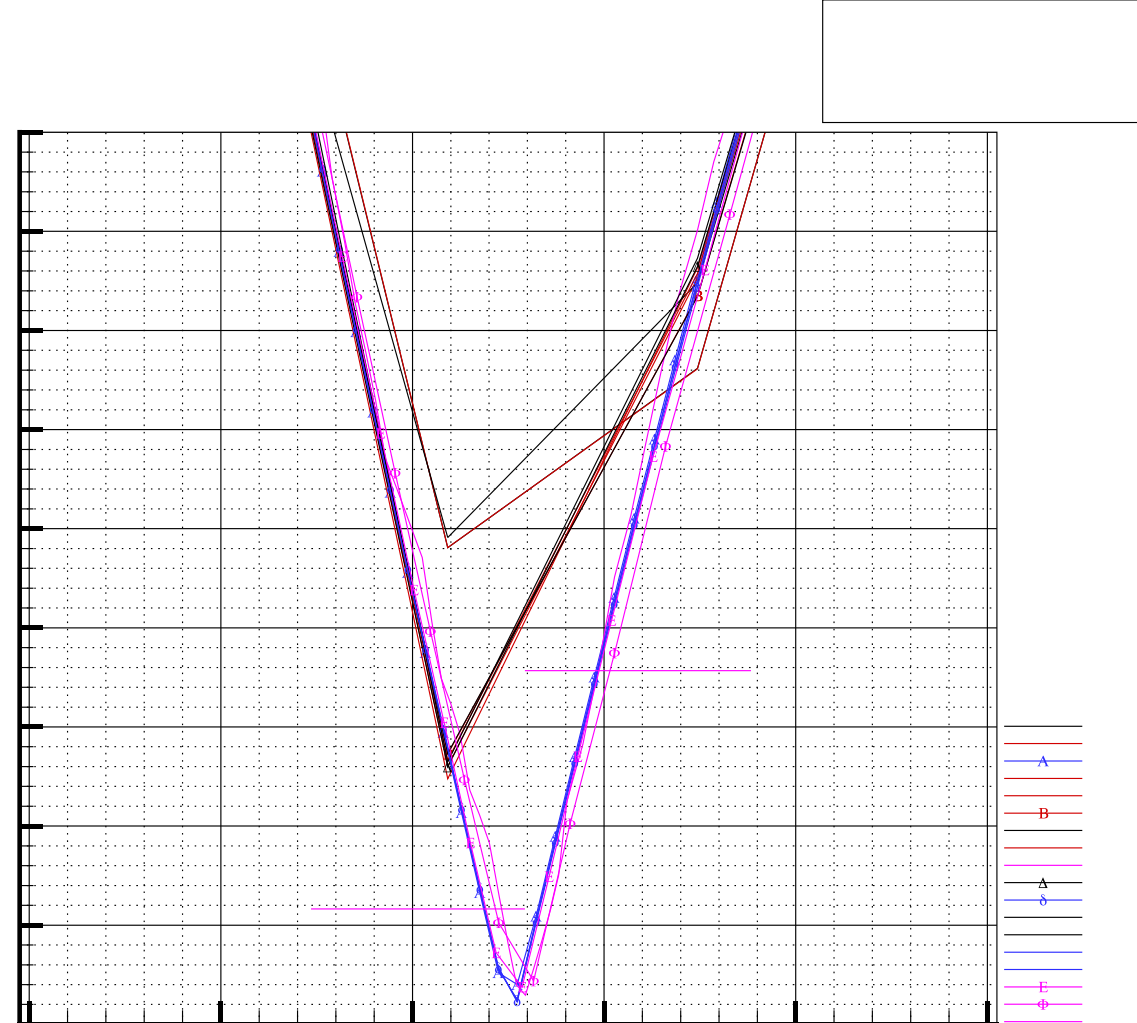
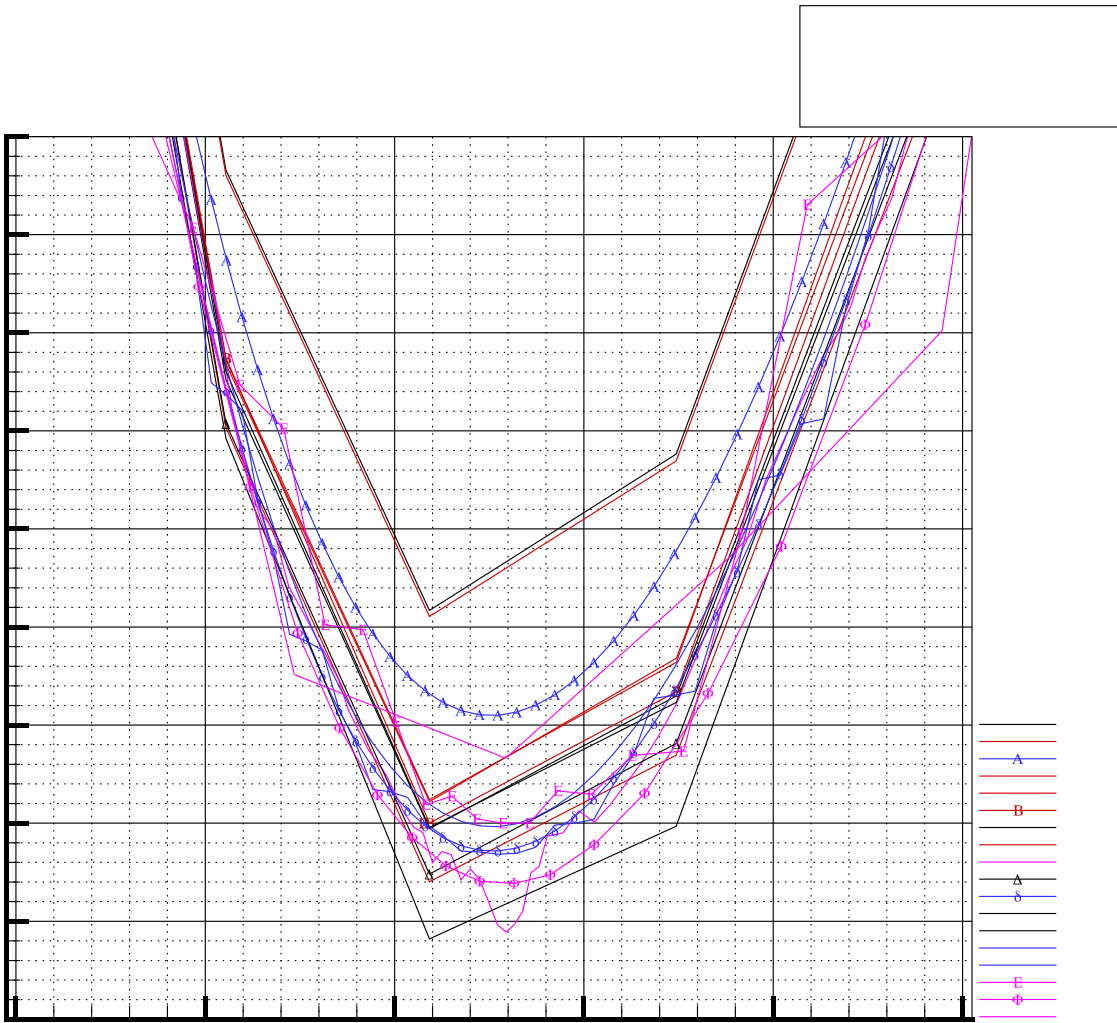
Test Case 1c: ONERA OAT15A
Grid Convergence Study
Angle of Attack 1.50

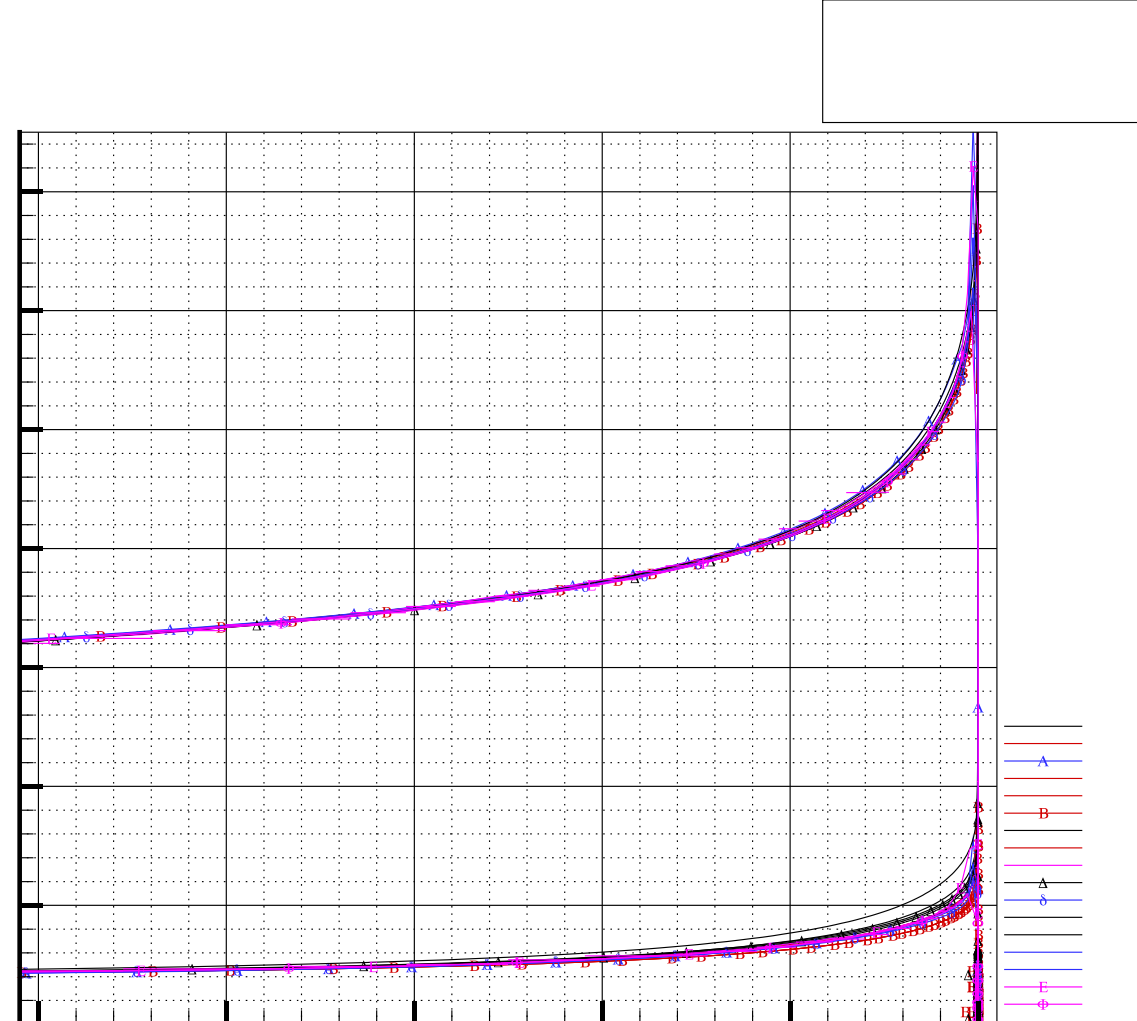
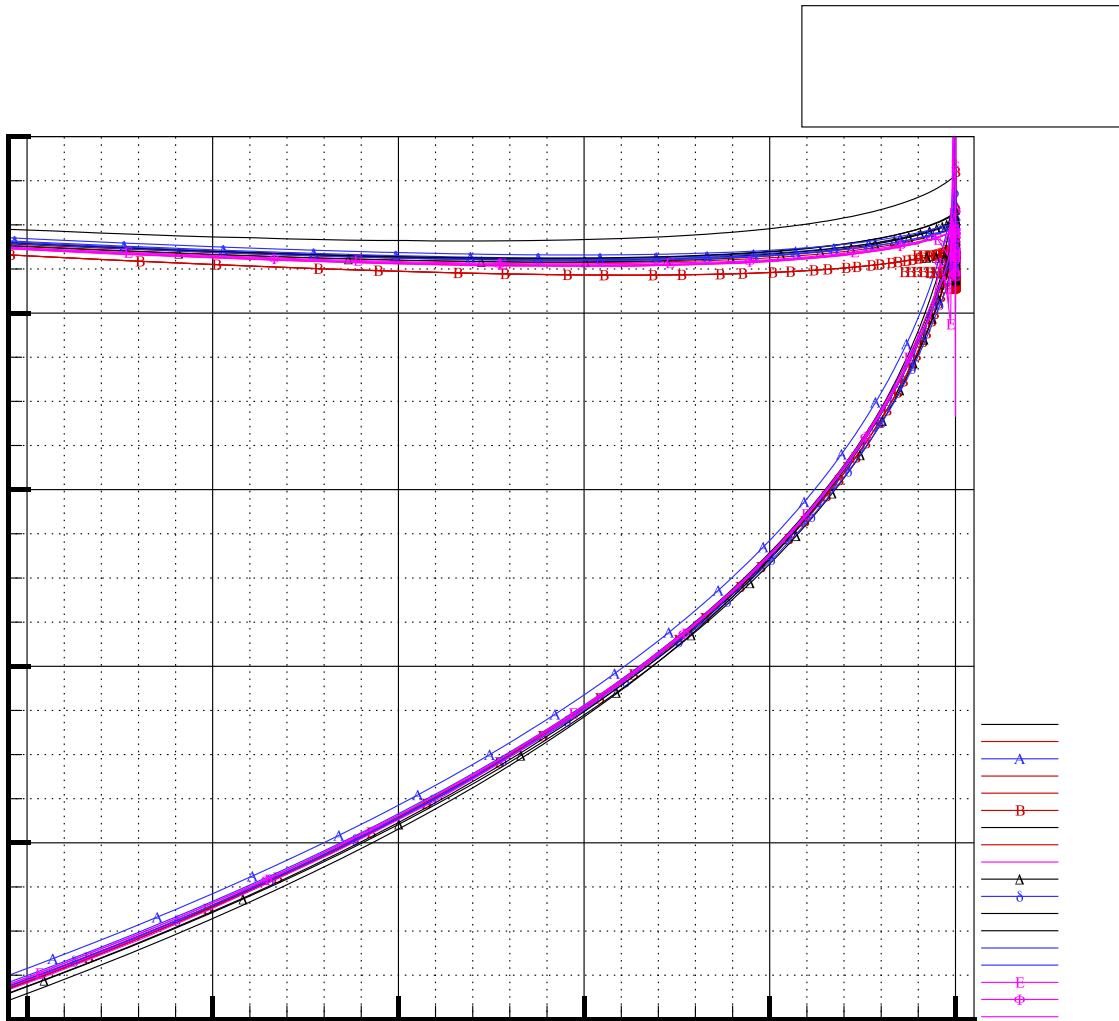
Grid Family:
Cadence Structured
Cadence Unstructured
HeldenMesh Unstructured
ONERA Structured
User Grid Adaptation
User Unstructured Grid
User Structured Grid



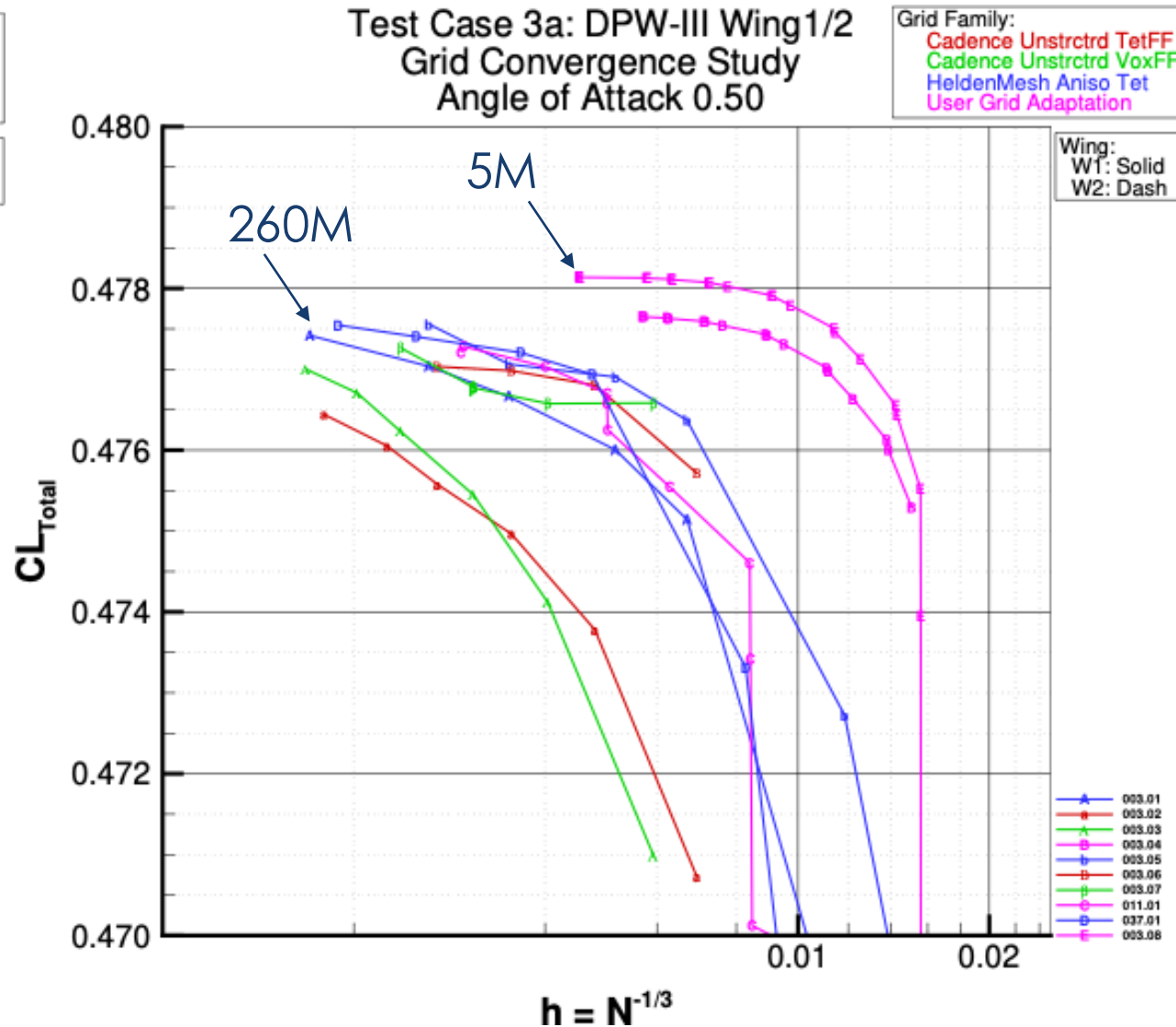
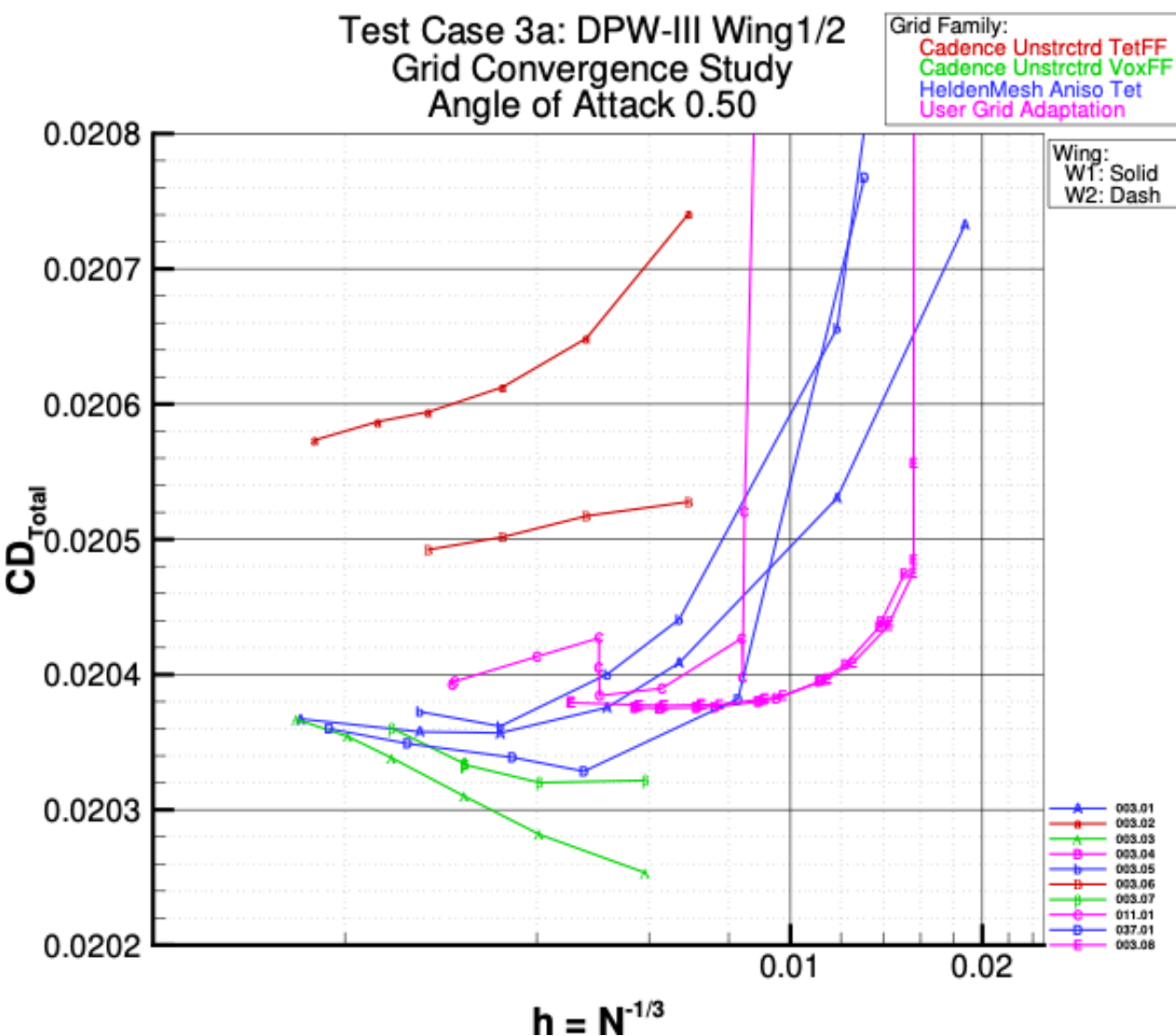
ONERA OAT15A C_p and C_f $\alpha = 1.5^\circ$ (Shock)

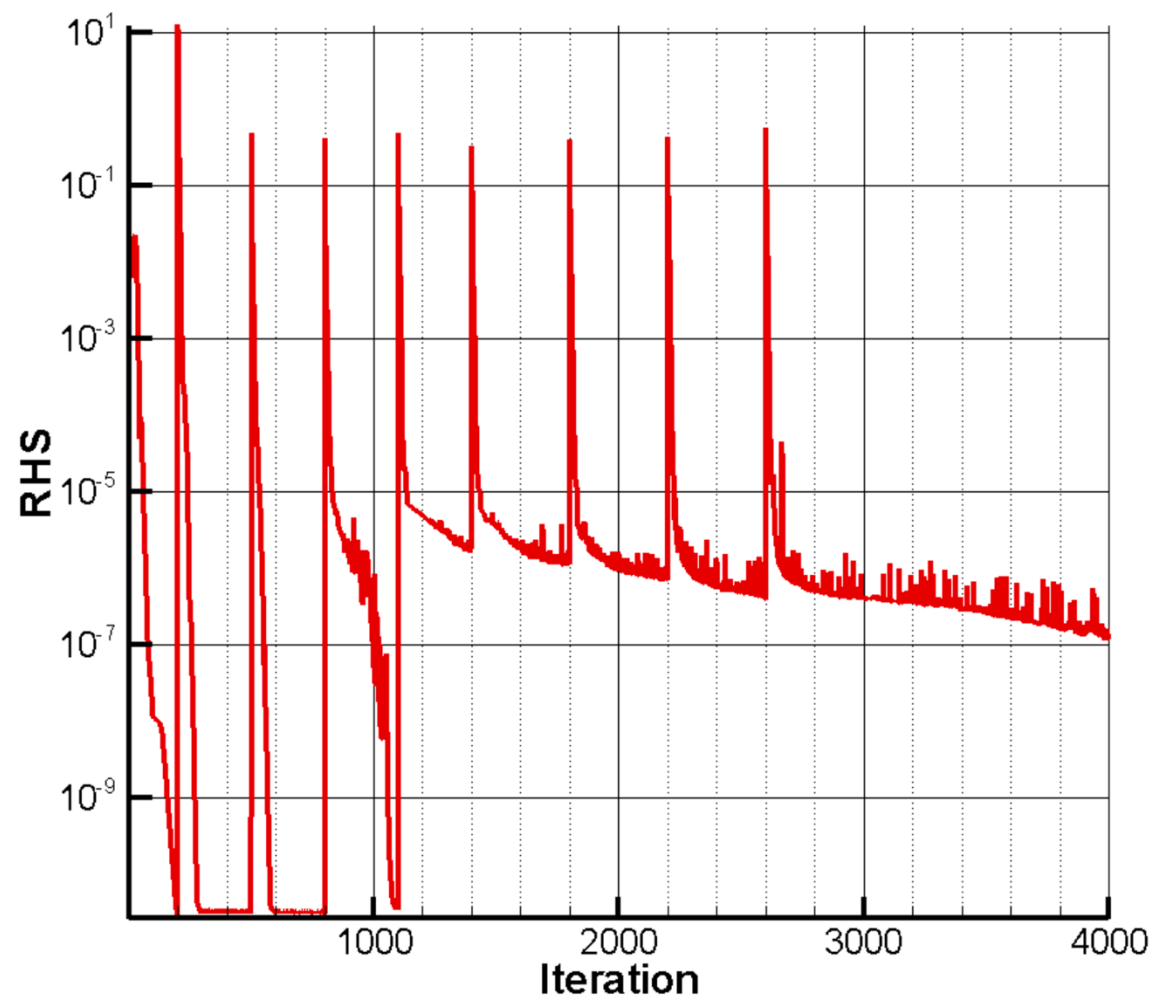
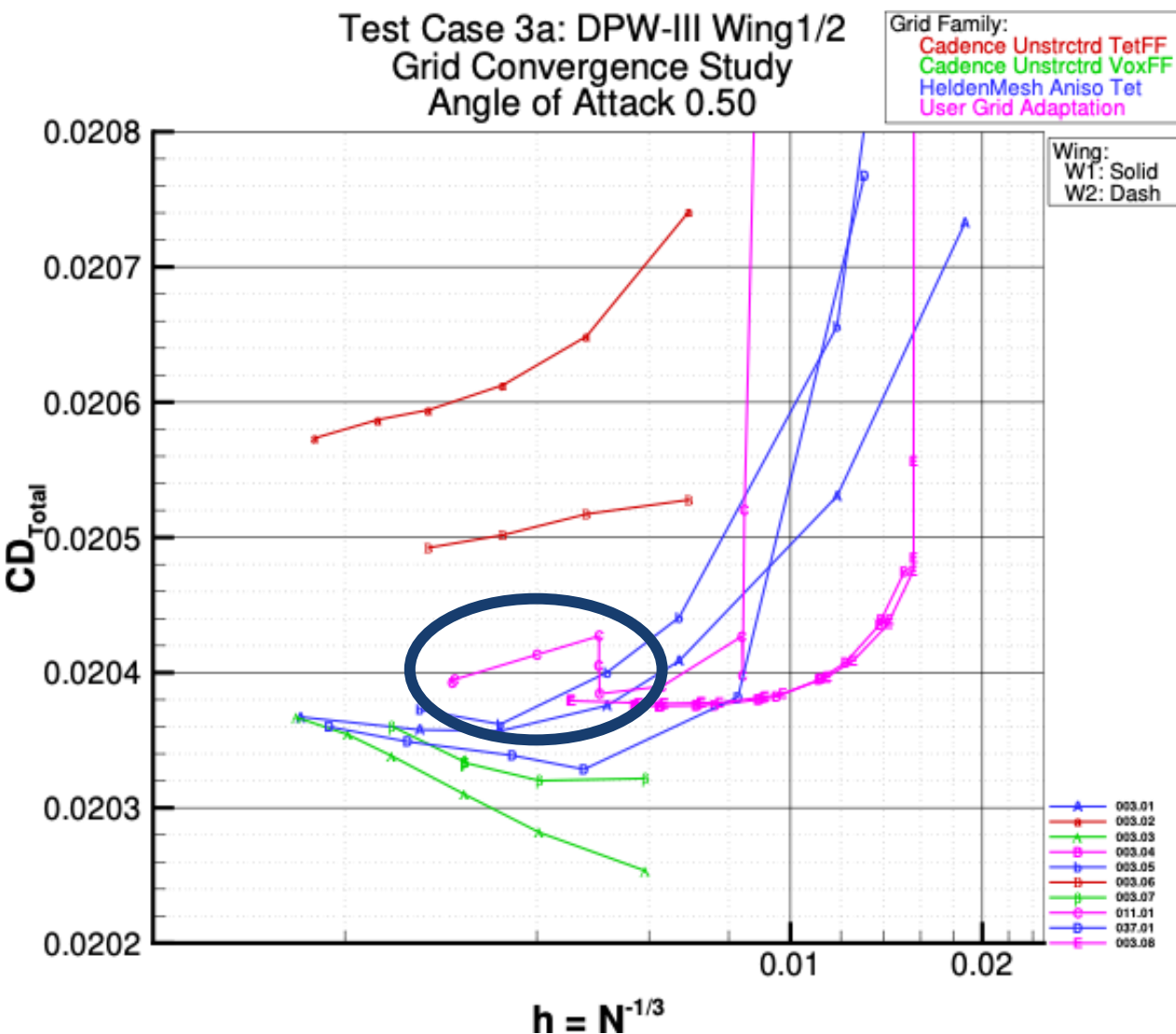






W1 C_D and C_L Convergence: $\alpha = 0.5^\circ$





- **Marshall Galbraith, Massachusetts Institute of Technology**
- **Kevin Holst, University of Tennessee, Knoxville**
- **Ben Rider, The Boeing Company**

Geometry/Grid Far Field Details

NASA CRM (Full Scale)

MAC = 275.8"

Semispan = 1156.75"



DPW8

DPW7: iges files (box)	Min	Max	+/- Range	Range / MAC	Range / Semispan
X (inch)	-22440.9	23838.6	23139.75	~ 84.0	~ 20.0
Y (inch)	0.0	35433.1	35433.1	~ 128.6	~ 30.6
Z (inch)	-23405.5	23838.6	23838.6	~ 86.5	~ 20.6

https://aiaa-dpw.larc.nasa.gov/Workshop7/Geometry/2021-03-02_Version_01/DPW7geometries.zip

DPW8: HeldenMesh (box)	Min	Max	+/- Range	Range / MAC	Range / Semispan
X (inch)	-55160.0	55160.0	55160.0	200.0	~ 47.7
Y (inch)	0.0	55160.0	55160.0	200.0	~ 47.7
Z (inch)	-55160.0	55160.0	55160.0	200.0	~ 47.7

https://dpw.larc.nasa.gov/DPW8/Scatter/Test_Case_2/Helden_Grids.REV00/

DPW8: Cadence (box)	Min	Max	+/- Range	Range / MAC	Range / Semispan
X (inch)	-115582.5	118237.9	116910.2	~ 424.2	~ 101.1
Y (inch)	0.0	116834.7	116834.7	~ 423.9	~ 101.0
Z (inch)	-115584.0	116018.1	115801.1	~ 420.2	~ 100.1

https://dpw.larc.nasa.gov/DPW8/Scatter/Test_Case_2/Cadence_Grids.REV00/

DPW7

DPW7: Vassberg (sphere)	Min	Max	+/- Range	Range / MAC	Range / Semispan
X (inch)	-30328.203	32996.560	31662.382	~ 114.8	~ 27.4
Y (inch)	0.0	31664.519	31664.519	~ 114.8	~ 27.4
Z (inch)	-31449.638	31865.992	31657.815	~ 114.8	~ 27.4

https://dpw.larc.nasa.gov/DPW7/Vassberg_Grids.REV00/

DPW7: JAXA (sphere)	Min	Max	+/- Range	Range / MAC	Range / Semispan
X (MAC)	-413.890	424.690	419.290	~ 419.3	~ 100
Y (MAC)	0.0	419.349	419.349	~ 419.3	~ 100
Z (MAC)	-418.675	420.005	419.340	~ 419.3	~ 100

https://dpw.larc.nasa.gov/DPW7/JAXA_Grids.REV00/

DPW7: NLR (sphere)	Min	Max	+/- Range	Range / MAC	Range / Semispan
X (m)	-2949.98	3050.00	2999.99	~ 428.2	~ 102.1
Y (m)	0.0	3000.00	3000.00	~ 428.2	~ 102.1
Z (m)	-2995.1	3004.99	3000.05	~ 428.2	~ 102.1

https://dpw.larc.nasa.gov/DPW7/NLR_Grids.REV00/DPW7-NLR-grids/

DPW7: DLR (box)	Min	Max	+/- Range	Range / MAC	Range / Semispan
X (m)	-570.0	630.0	1200.0	~ 171.3	~ 40.9
Y (m)	0.0	900.0	900.0	~ 128.5	~ 30.6
Z (m)	-594.5	605.5	1200.0	~ 171.3	~ 40.9

https://dpw.larc.nasa.gov/DPW7/DLR_Grids.REV00/

DPW7: GGNS (box)	Min	Max	+/- Range	Range / MAC	Range / Semispan
X (inch)	-22400.0	22400.0	22400.0	~ 81.2	~19.4
Y (inch)	0.0	22400.0	22400.0	~ 81.2	~19.4
Z (inch)	-22400.0	22400.0	22400.0	~ 81.2	~19.4

Adapted grids (not publicly released)