

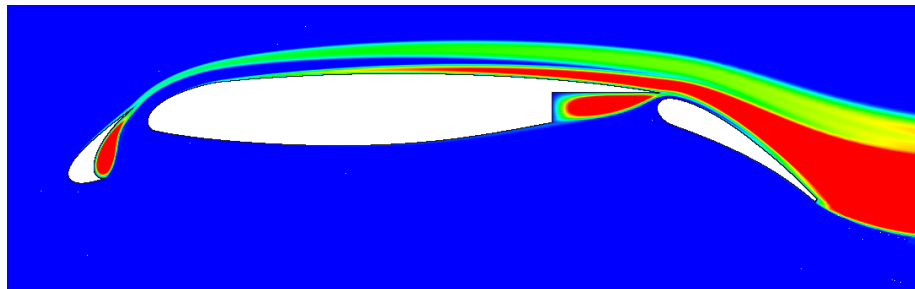
Case 3.1

Turbulent Flow over a 2D Multi-Element Airfoil

Summary

Turbulent Flow over a 2D Multi-Element Airfoil

- $M_\infty = 0.2$
- $\alpha = 16^\circ$
- $Re = 9 \times 10^6$
- Fully turbulent
- Our farfield distance is at least $50c$



Turbulent working variable contours

MIT

- DG, SA turbulence model
- Farfield 60000c away

UMich

- DG, SA turbulence model
- Farfield 50c away

Bergamo

- DG, $k - \omega$ turbulence model
- Farfield 50c(?) away

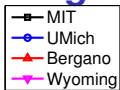
Wyoming

- DG, SA turbulence model
- Farfield 120c away

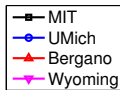
- Different farfield boundary locations
- Different turbulence models
- Different parameters (Prandtl number, dynamic viscosity)
- Numerical errors ...

<u>Group</u>	<u>C_d</u>	<u>C_l</u>
MIT	0.047	4.17
UMich	0.054	4.12
Bergamo	0.051	4.13
Wyoming	0.057	4.13

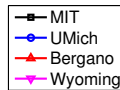
C_d convergence with DOF



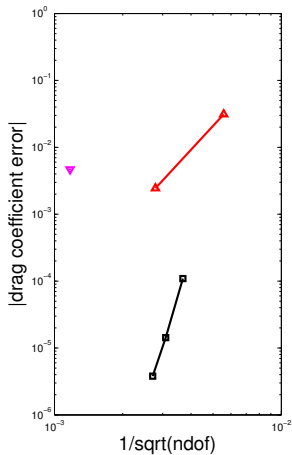
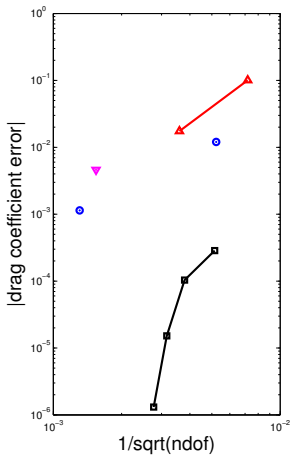
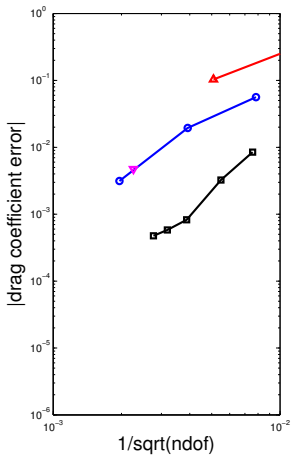
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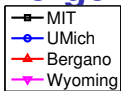
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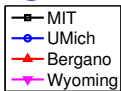
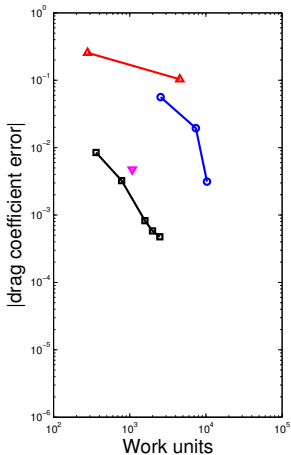
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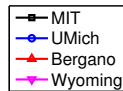
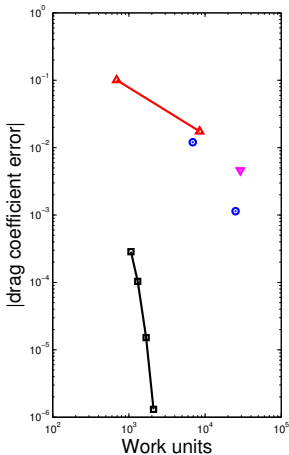
C_d convergence with WU



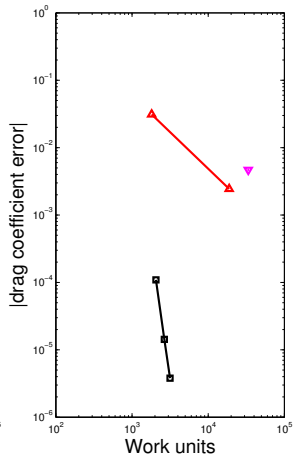
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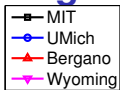
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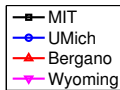
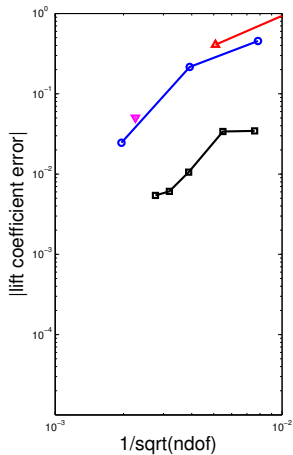
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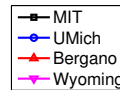
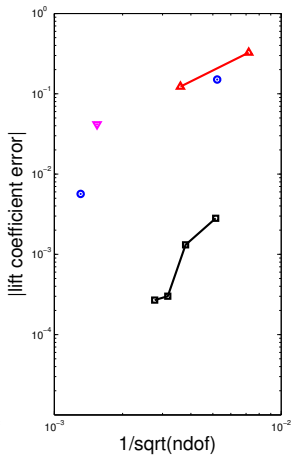
C_l convergence with DOF



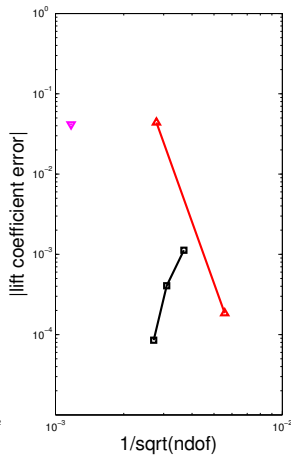
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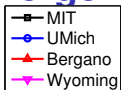
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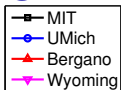
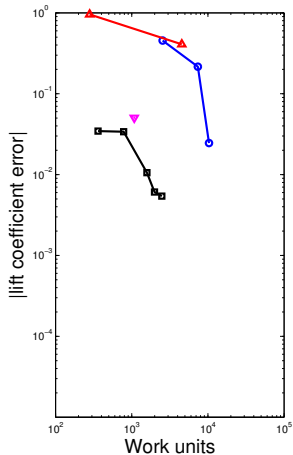
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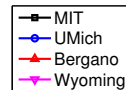
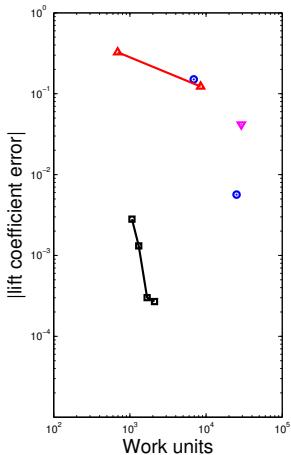
C_l convergence with WU



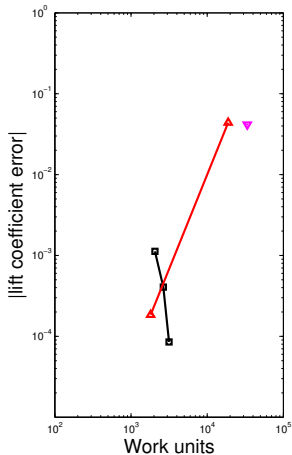
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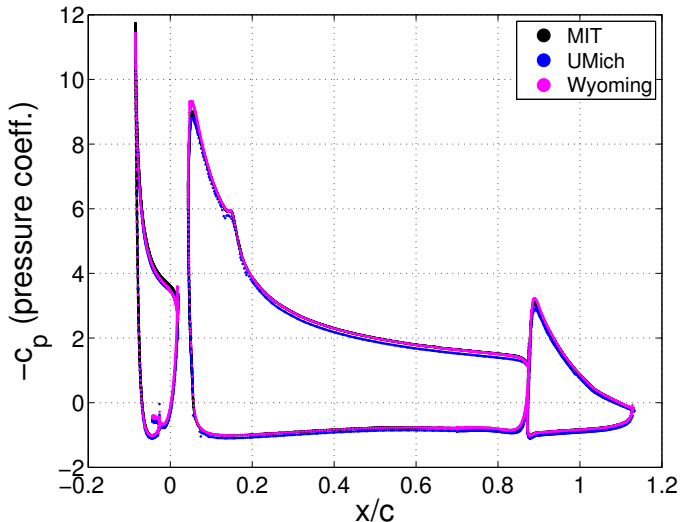


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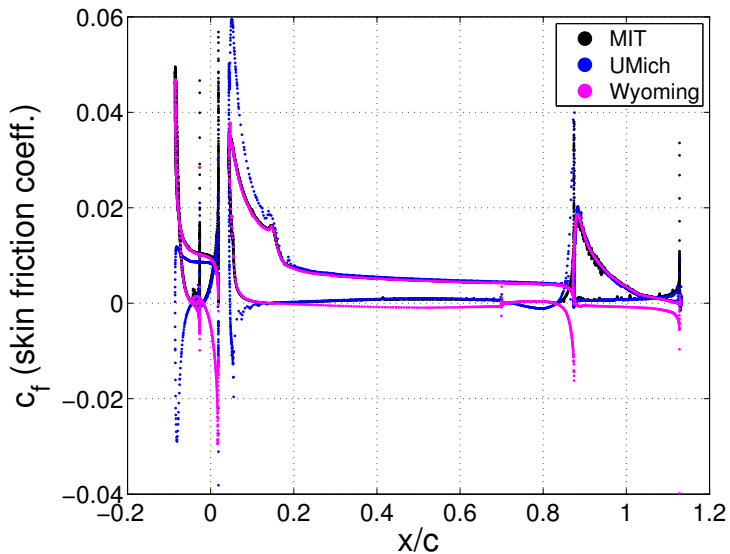


Pressure coefficient distribution

Obtained from high-accuracy/reference solutions



Skin-friction coefficient distribution



|Skin-friction coefficient| distribution

