
National Aeronautics and
Space Administration
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California
JPL is able to apply its technologies, facilities, and expertise to assist our partners in product improvement and problem solving to reduce risk.
CFD Capabilities

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CFD CAPABILITIES

Kevin Anderson

Thermal and Fluids System Engineering
(3547)

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CFD CAPABILITIES AT JPL

Thermal section has license for CFDESIGN ®

cfdesign® Finite Element Fluid Flow / Heat Transfer Solver ver 7.0, Blue Ridge Numerics, Inc.

cfdesign® is a low cost, quick turnaround, turn-key CFD code useful for parametric studies

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CFD CAPABILITIES AT JPL

cfdesign® can be used to model complex flow fields

- *Internal and external flows*
- *Free and forced convection*
- *Turbulence (k-e and RNG models)*
- *Compressible flows*
- *Reacting flows*
- *Very viscous flows*

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EXAMPLES OF CFD STUDIED PERFORMED AT JPL

- Combined internal/external flows of He / N2
- Internal Shear Flow Of a Rotating Tank
- Combined Free/Forced Convection in N2 balloon
- External Flow over RTG
- External Flow over RTG/Rover/Sensor, mock-up
- Numerous benchmarking studies

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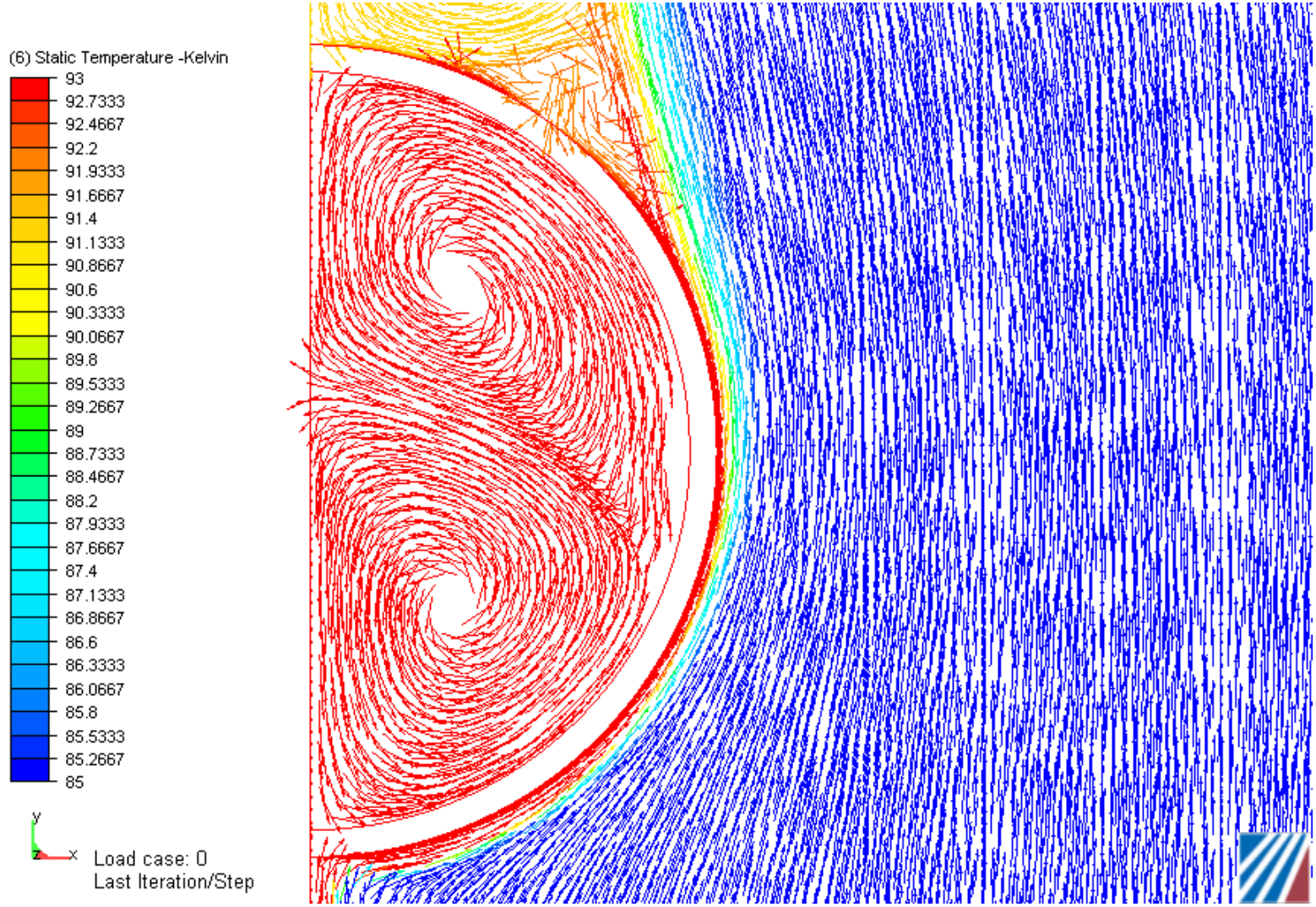
Internal flow of Helium, external flow of Nitrogen, Natural and Forced Convection Simulation



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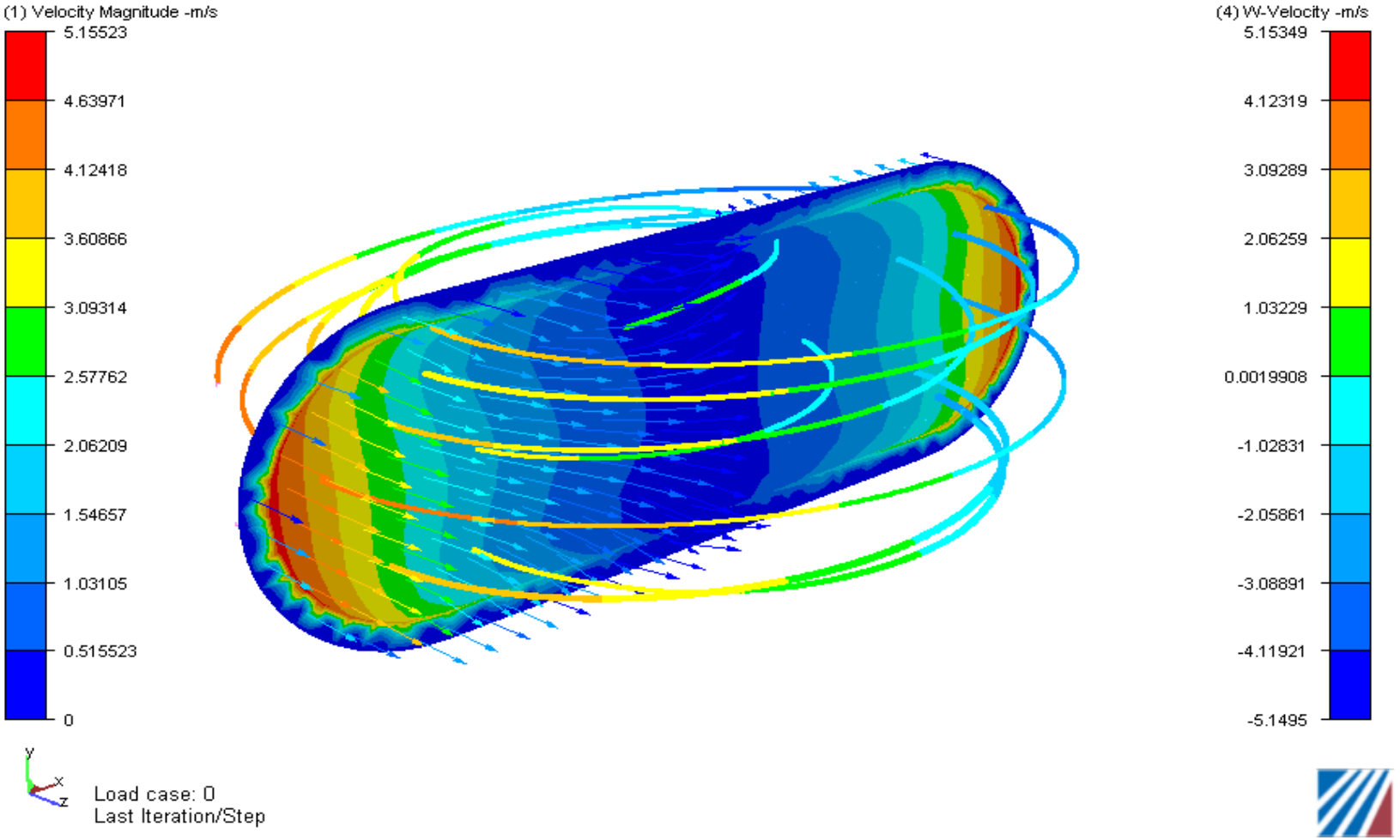
Internal Shear Flow Rotating Tank of Xeon CFD Simulation



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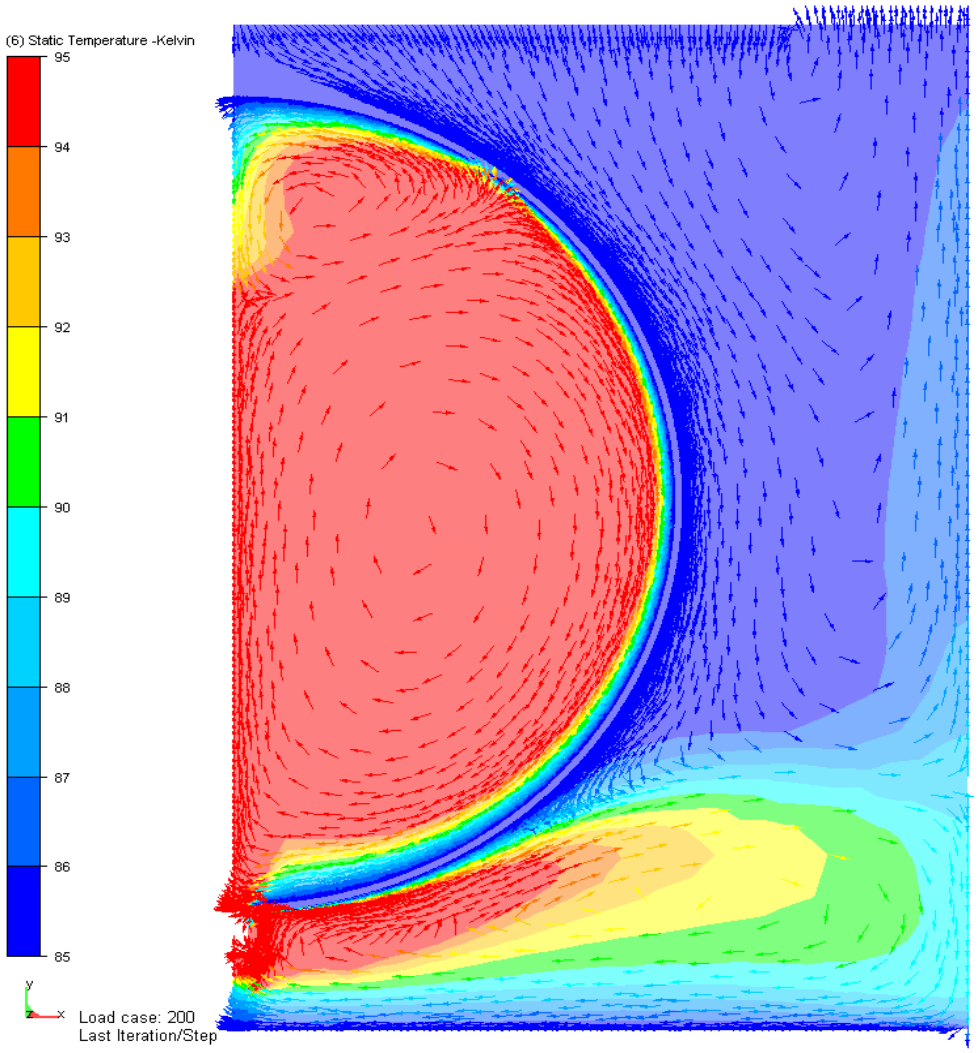
Hot N2 Balloon Forced/Free Convection Internal/External Flow CFD Simulation



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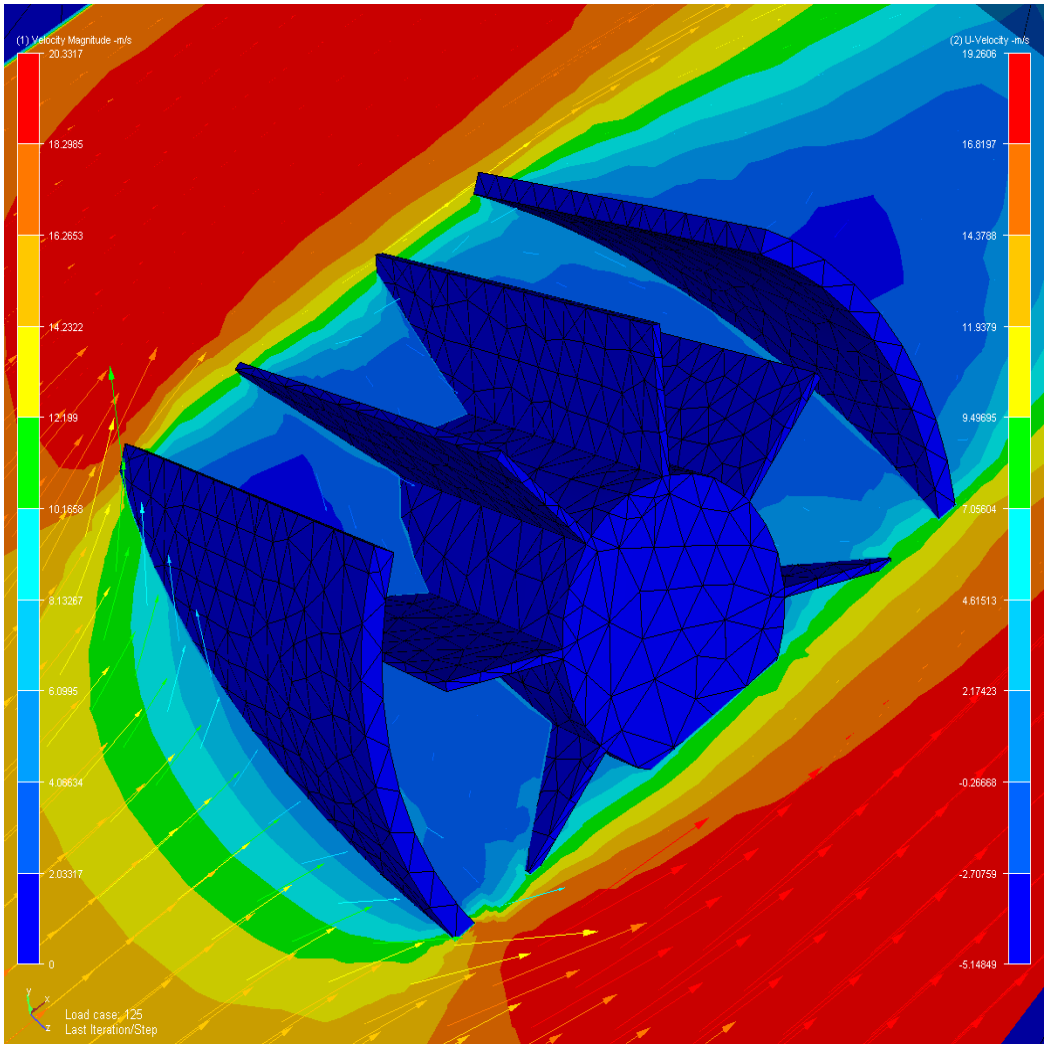
External Flow over RTG, Forced/Free Convection, k-e Turbulence Model, Radiation Heat Transfer CFD Simulation



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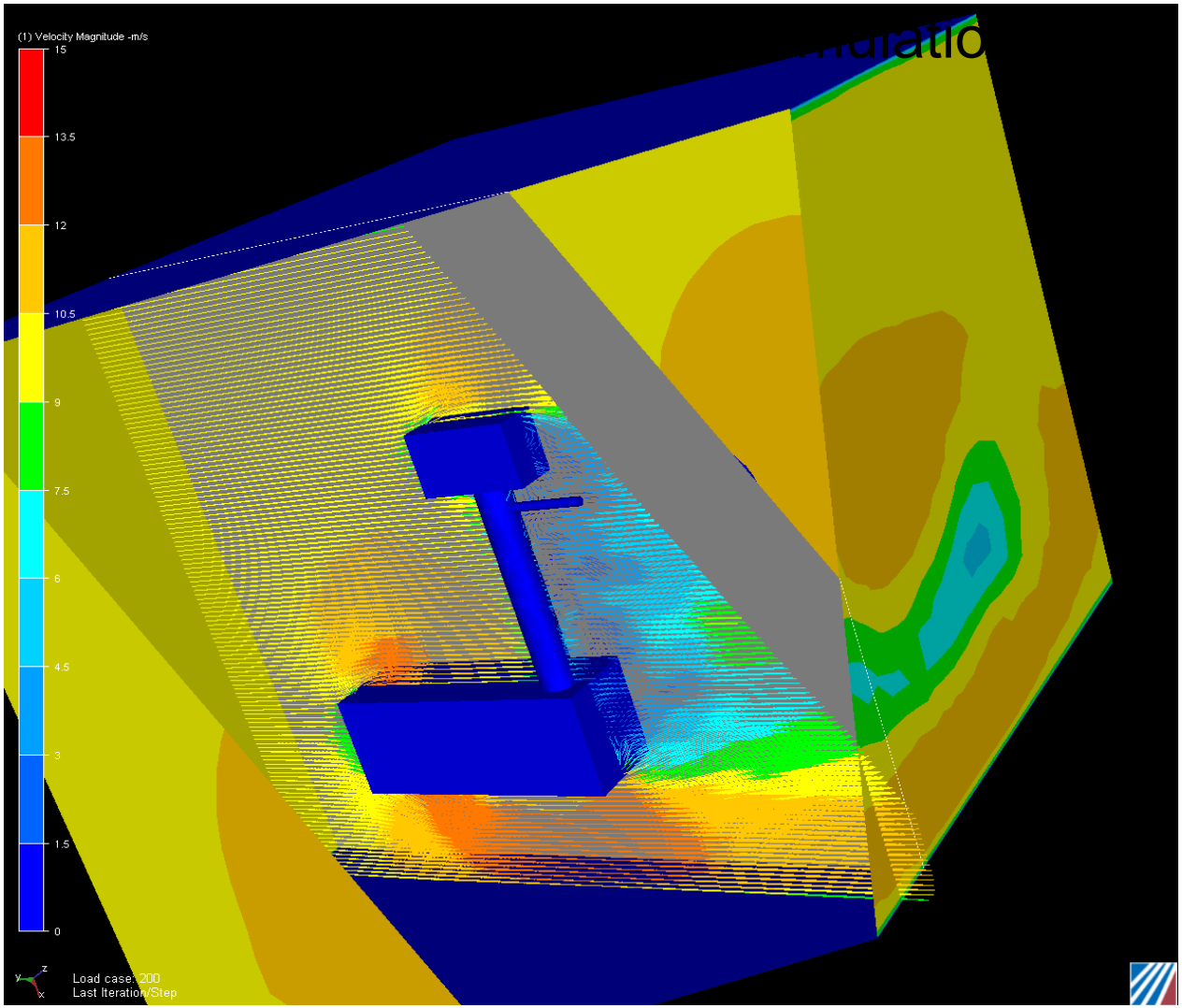
External Flow over Rover/Sensor Mock up;

Free/Forced convection, k-e Turbulence, Radiation



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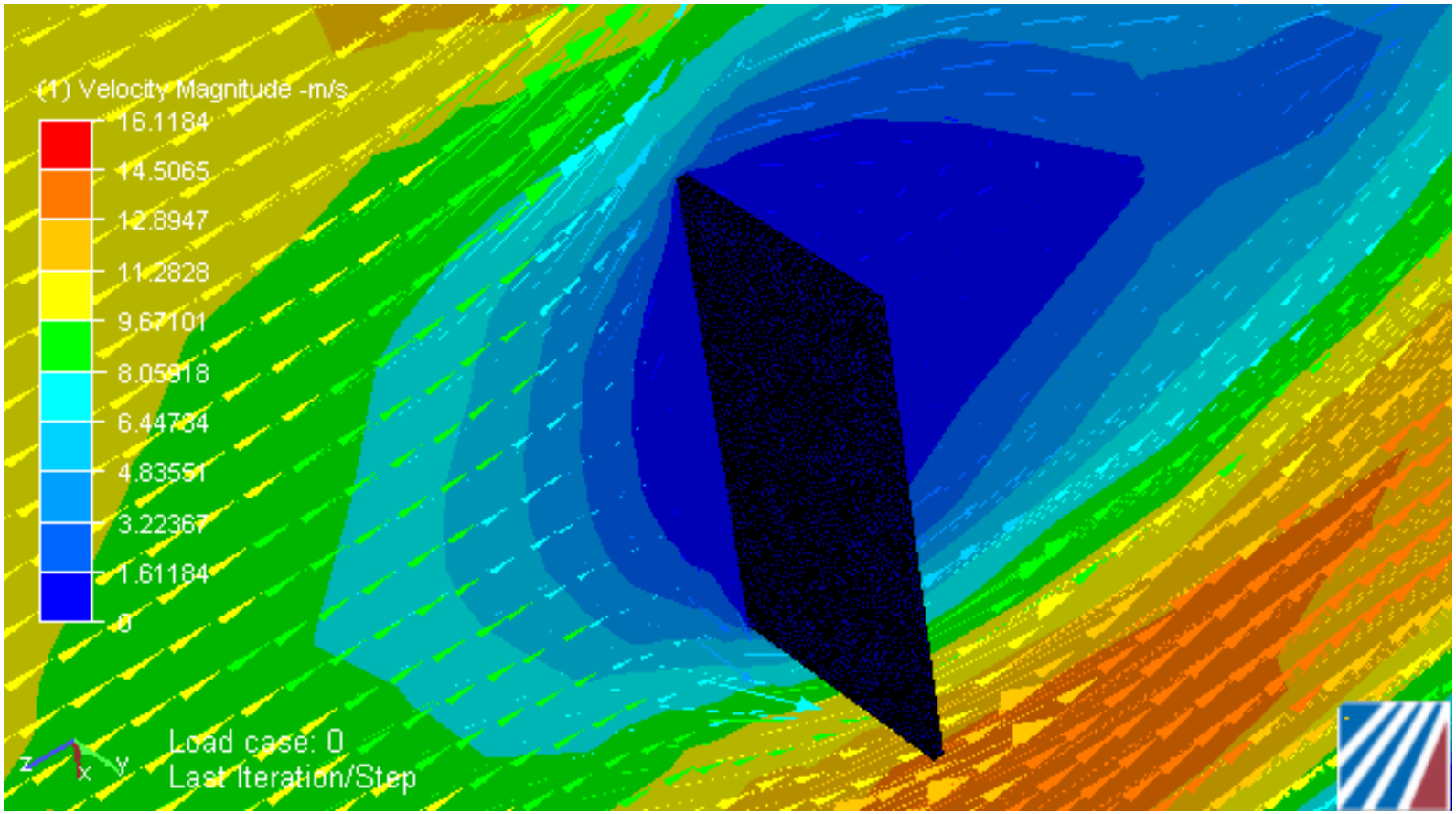
External flow over a vertical plate, CFD Benchmarking Simulation



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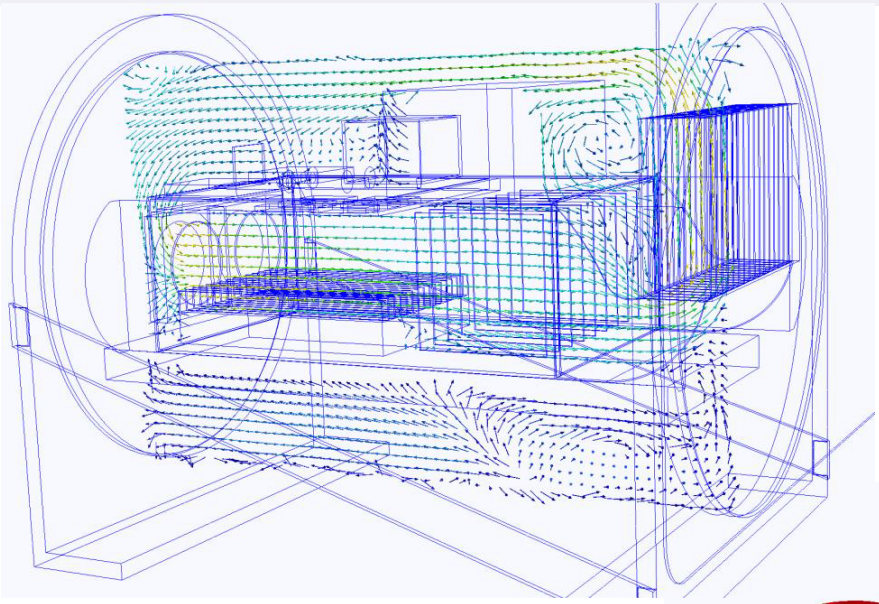
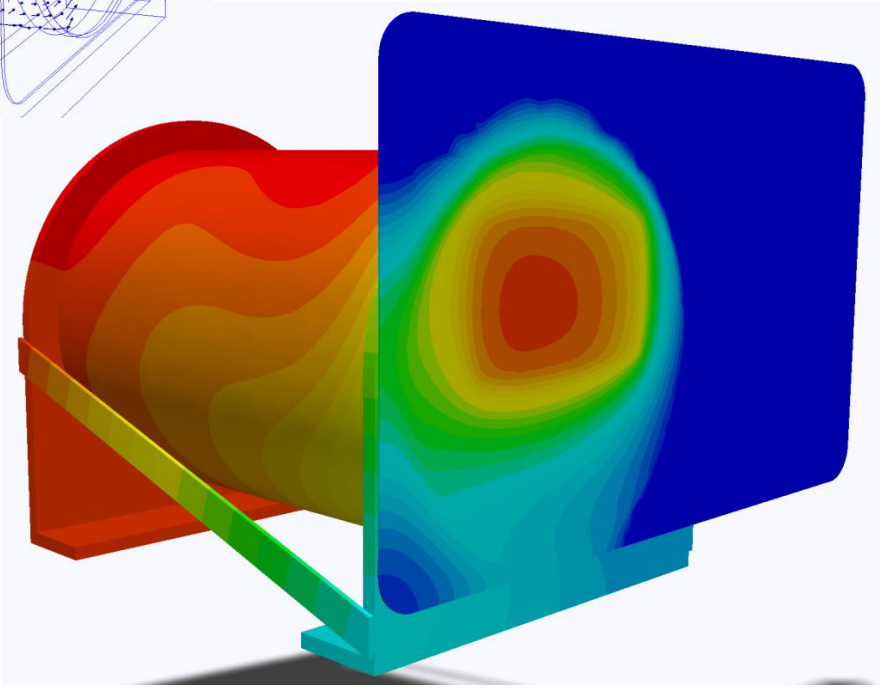
OPALS Project using CFDesign from TFAWS 2013 Meeting





CD-Adapco STAR CCM+

Thermal section has license for CD-Adapco STAR-CCM+ CFD code

STAR CCM+ is industry standard, finite volume based CFD, heat transfer code with the following multi-physics capabilities

- Two phase flow (boiling and condensation)
- Electronics cooling (internal fans)
- Turbomachinery
- Combustion
- Variety of turbulence models
- Battery modeling (cell and pack level)

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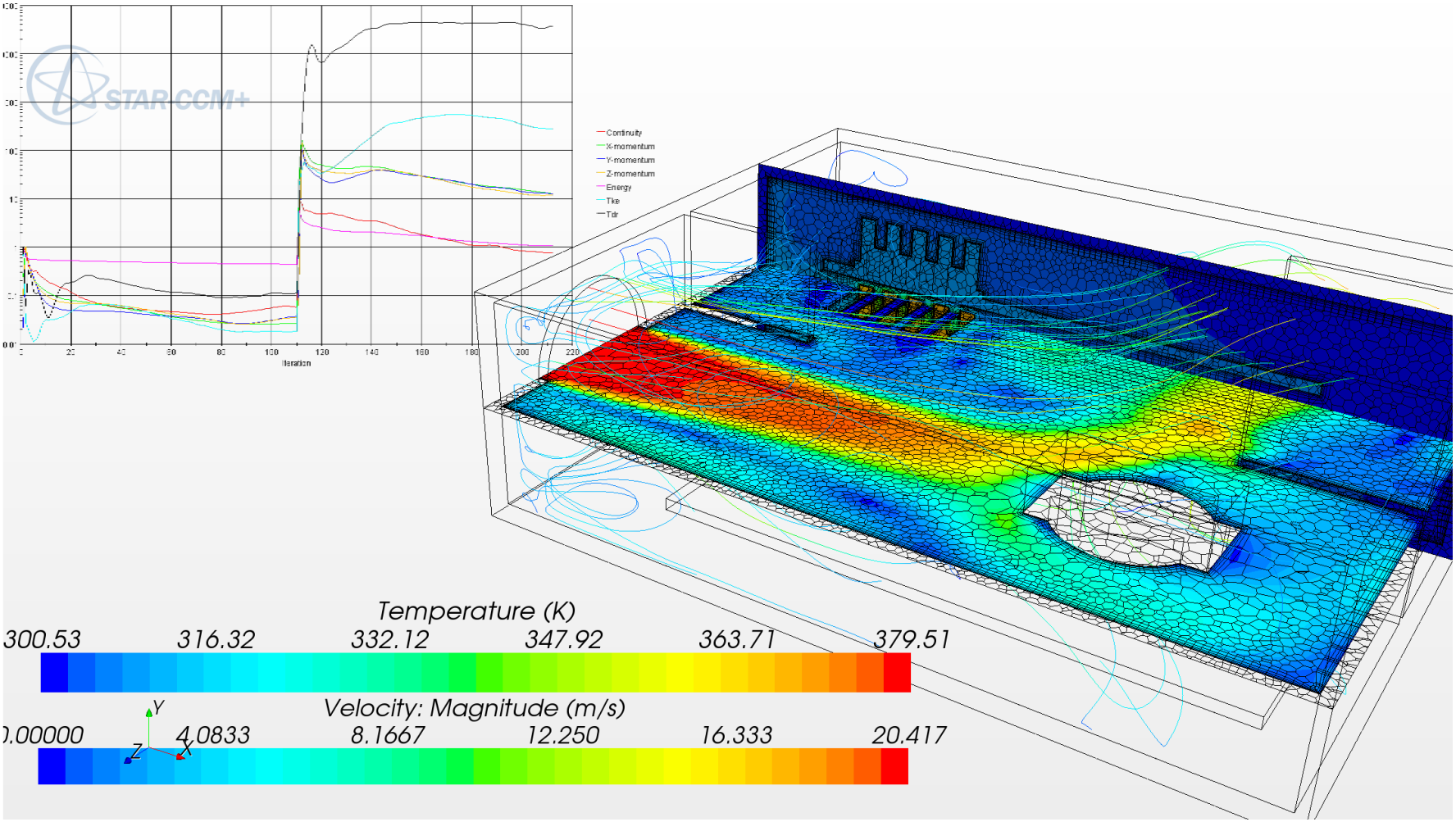
CD-Adapco STAR CCM+ Electronics Cooling Example



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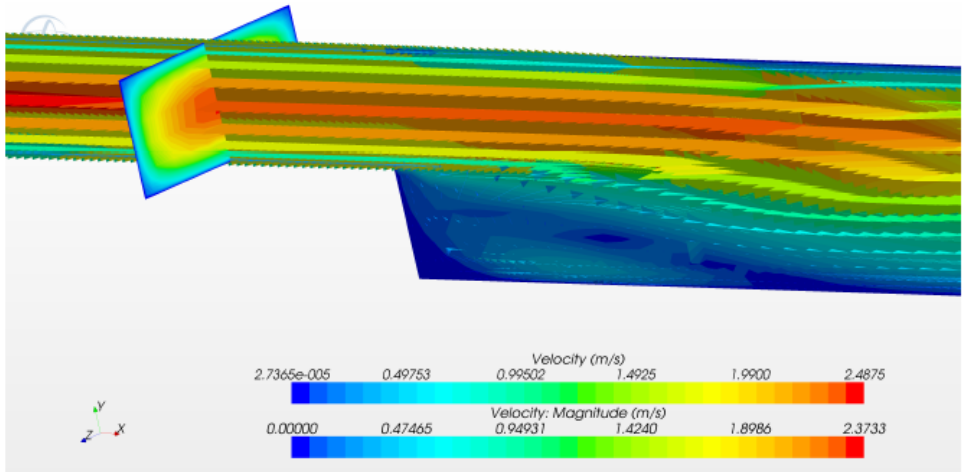
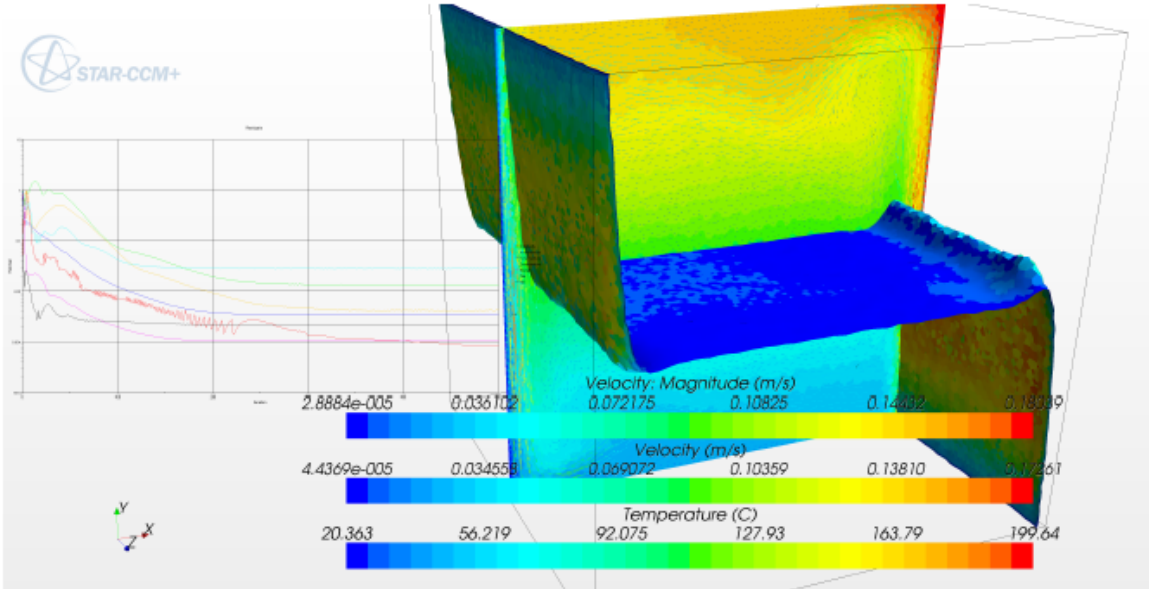
CD-Adapco STAR CCM+ Benchmark Problems





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Acknowledgments

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