



Ansys Fluent Simulation Report

| | |
|----------------|--------------------|
| Analyst | 88018 |
| Date | 5/22/2023 01:53 PM |

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System Information

| | |
|------------------------|--|
| Application | Fluent |
| Settings | 2d, double precision, pressure-based, realizable k-epsilon |
| Version | 23.1.0-10208 |
| Source Revision | c5ccf97574 |
| Build Time | Nov 28 2022 09:52:55 EST |
| CPU | AMD Ryzen 7 3700U with Radeon Vega Mobile |
| OS | Windows |

Geometry and Mesh

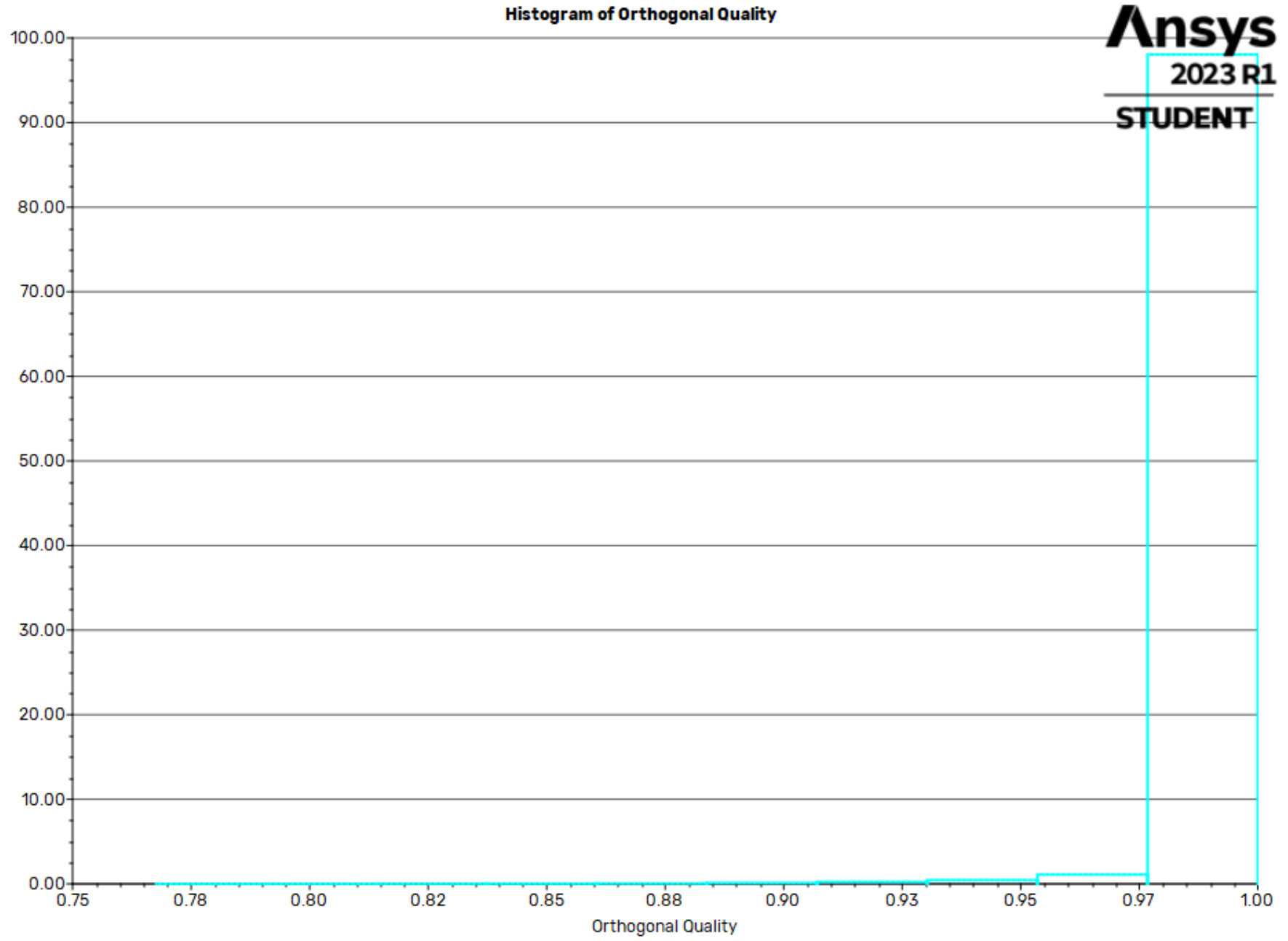
Mesh Size

| Cells | Faces | Nodes |
|-------|-------|-------|
| 19706 | 39813 | 20107 |

Mesh Quality

| Name | Type | Min Orthogonal Quality | Max Aspect Ratio |
|--------------|------------|------------------------|------------------|
| surface_body | Mixed Cell | 0.76761363 | 3.2208876 |

Orthogonal Quality



Simulation Setup

Physics

Models

| Model | Settings |
|-------|----------|
| Space | 2D |
| Time | Steady |

| Model | Settings |
|----------------|---------------------------------------|
| Viscous | Realizable k-epsilon turbulence model |
| Wall Treatment | Standard Wall Functions |

Material Properties

| | |
|----------------------|-------------------------|
| — Fluid | |
| — air | |
| Density | 1.225 kg/m ³ |
| Cp (Specific Heat) | 1006.43 J/(kg K) |
| Thermal Conductivity | 0.0242 W/(m K) |
| Viscosity | 1.7894e-05 kg/(m s) |
| Molecular Weight | 28.966 kg/kmol |
| — Solid | |
| — aluminum | |
| Density | 2719 kg/m ³ |
| Cp (Specific Heat) | 871 J/(kg K) |
| Thermal Conductivity | 202.4 W/(m K) |

Cell Zone Conditions

| | |
|-----------------------|-----|
| — Fluid | |
| — surface_body | |
| Material Name | air |
| Specify source terms? | no |
| Specify fixed values? | no |
| Frame Motion? | no |
| Laminar zone? | no |
| Porous zone? | no |

Boundary Conditions

| | |
|--|-------------------------------|
| — Inlet | |
| — inlet | |
| Velocity Specification Method | Magnitude, Normal to Boundary |
| Reference Frame | Absolute |
| Velocity Magnitude [m/s] | 15 |
| Supersonic/Initial Gauge Pressure [Pa] | 0 |
| Turbulent Specification Method | Intensity and Viscosity Ratio |
| Turbulent Intensity [%] | 5 |
| Turbulent Viscosity Ratio | 10 |
| Note: Reinject particles do not change their injection association | -2036393696 |
| — Outlet | |
| — outlet | |
| Backflow Reference Frame | Absolute |
| Gauge Pressure [Pa] | 0 |
| Pressure Profile Multiplier | 1 |

| | |
|--|-------------------------------|
| Backflow Direction Specification Method | Normal to Boundary |
| Turbulent Specification Method | Intensity and Viscosity Ratio |
| Backflow Turbulent Intensity [%] | 5 |
| Backflow Turbulent Viscosity Ratio | 10 |
| Note: Rejected particles do not change their injection association | no |
| Backflow Pressure Specification | Total Pressure |
| Build artificial walls to prevent reverse flow? | no |
| Average Pressure Specification? | no |
| Specify targeted mass flow rate | no |
| — Wall | |
| — wall | |
| Wall Motion | Stationary Wall |
| Shear Boundary Condition | No Slip |
| Wall Roughness Height [m] | 0 |
| Wall Roughness Constant | 0.5 |
| — airfoil | |
| Wall Motion | Stationary Wall |
| Shear Boundary Condition | No Slip |
| Wall Roughness Height [m] | 0 |
| Wall Roughness Constant | 0.5 |

Reference Values

| | |
|-----------------------------------|-------------------------|
| Area | 1 m ² |
| Density | 1.225 kg/m ³ |
| Depth | 1 m |
| Enthalpy | 0 J/kg |
| Length | 1 m |
| Pressure | 0 Pa |
| Temperature | 288.16 K |
| Velocity | 15 m/s |
| Viscosity | 1.7894e-05 kg/(m s) |
| Ratio of Specific Heats | 1.4 |
| Yplus for Heat Tran. Coef. | 300 |

Solver Settings

| | |
|--|------|
| — Equations | |
| Flow | True |
| Turbulence | True |
| — Numerics | |
| Absolute Velocity Formulation | True |
| — Pseudo Time Explicit Relaxation Factors | |
| Density | 1 |
| Body Forces | 1 |

| | |
|--|---------------------|
| Turbulent Kinetic Energy | 0.75 |
| Turbulent Dissipation Rate | 0.75 |
| Turbulent Viscosity | 1 |
| Explicit Momentum | 0.5 |
| Explicit Pressure | 0.5 |
| — Pressure-Velocity Coupling | |
| Type | Coupled |
| Pseudo Time Method (Global Time Step) | True |
| — Discretization Scheme | |
| Pressure | Second Order |
| Momentum | Second Order Upwind |
| Turbulent Kinetic Energy | First Order Upwind |
| Turbulent Dissipation Rate | First Order Upwind |
| — Solution Limits | |
| Minimum Absolute Pressure [Pa] | 1 |
| Maximum Absolute Pressure [Pa] | 5e+10 |
| Minimum Temperature [K] | 1 |
| Maximum Temperature [K] | 5000 |
| Minimum Turb. Kinetic Energy [m ² /s ²] | 1e-14 |
| Minimum Turb. Dissipation Rate [m ² /s ³] | 1e-20 |
| Maximum Turb. Viscosity Ratio | 100000 |

Run Information

| | |
|-------------------------------|----------------|
| Number of Machines | 1 |
| Number of Cores | 1 |
| Case Read | 18.707 seconds |
| Iteration | 5.653 seconds |
| AMG | 3.329 seconds |
| Virtual Current Memory | 0.167938 GB |
| Virtual Peak Memory | 0.592636 GB |
| Memory Per M Cell | 3.05451 |

Solution Status

Iterations: 30

| | Value | Absolute Criteria | Convergence Status |
|-------------------|--------------|-------------------|--------------------|
| continuity | 0.0008501368 | 0.001 | Converged |
| x-velocity | 2.184378e-06 | 0.001 | Converged |
| y-velocity | 2.71e-07 | 0.001 | Converged |

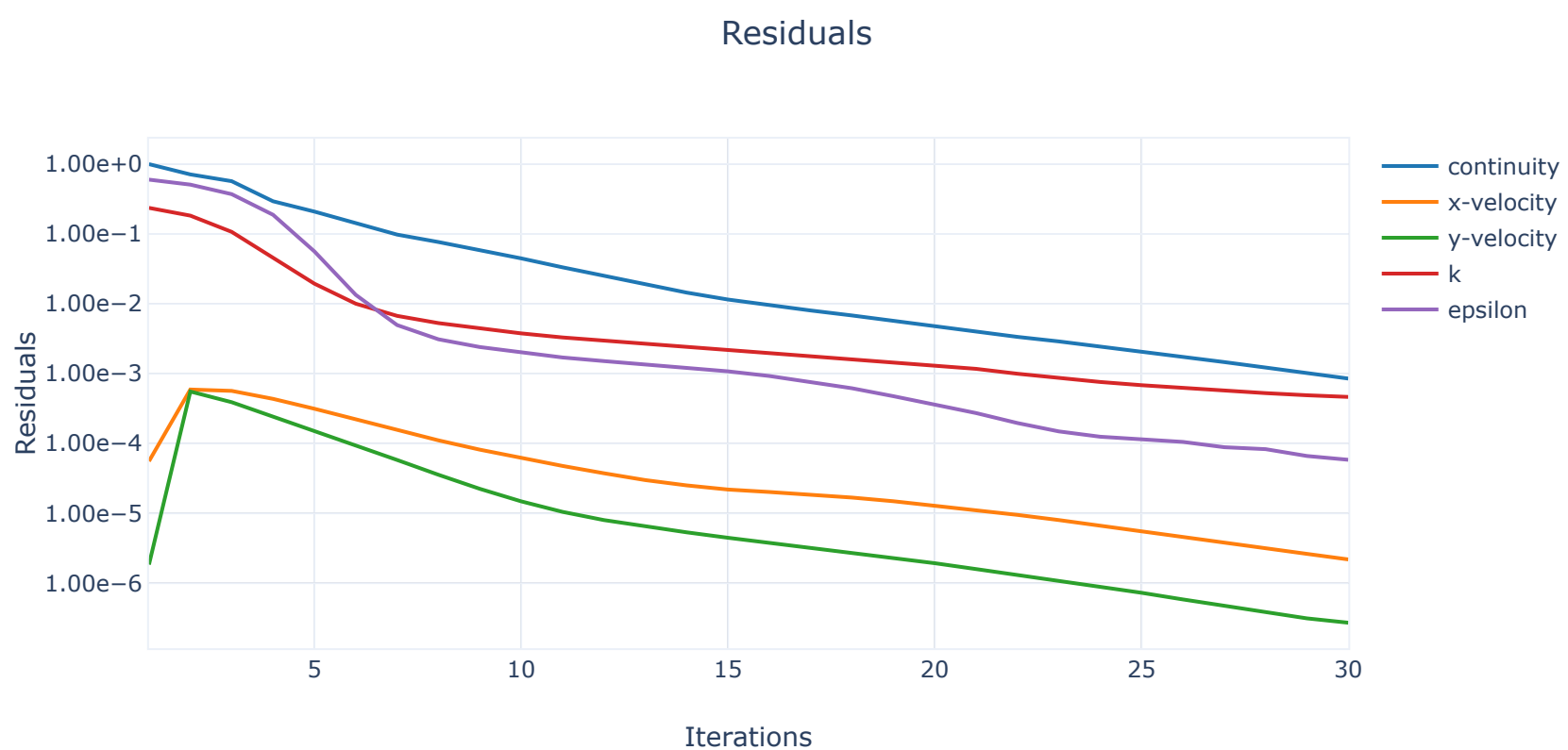
| | Value | Absolute Criteria | Convergence Status |
|----------------|--------------|-------------------|--------------------|
| k | 0.000463871 | 0.001 | Converged |
| epsilon | 5.836997e-05 | 0.001 | Converged |

Report Definitions

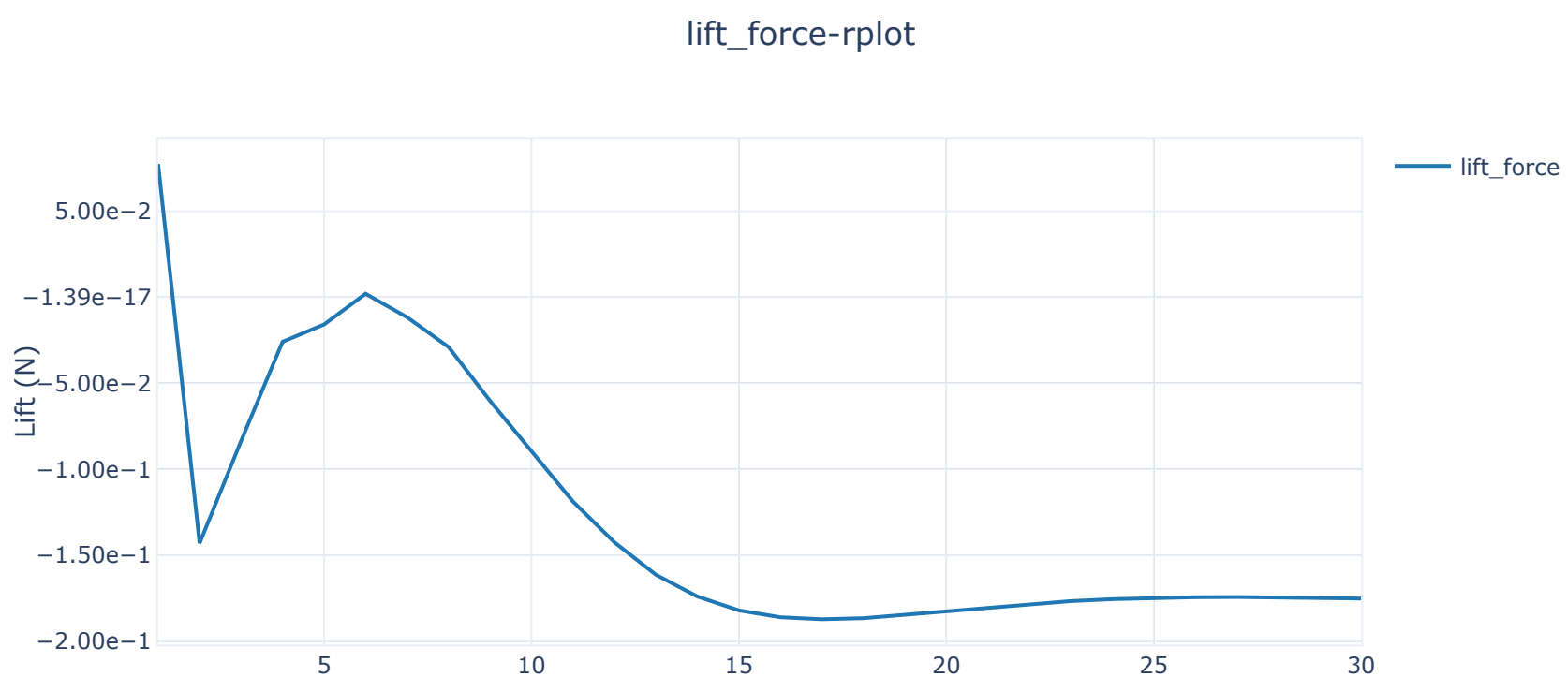
| | | |
|------------------|--------------|---|
| drag_force | 1.967453 | N |
| cd | 0.0142763 | |
| lift_coefficient | -0.001270661 | |
| lift_force | -0.1751129 | N |

Plots

Residuals



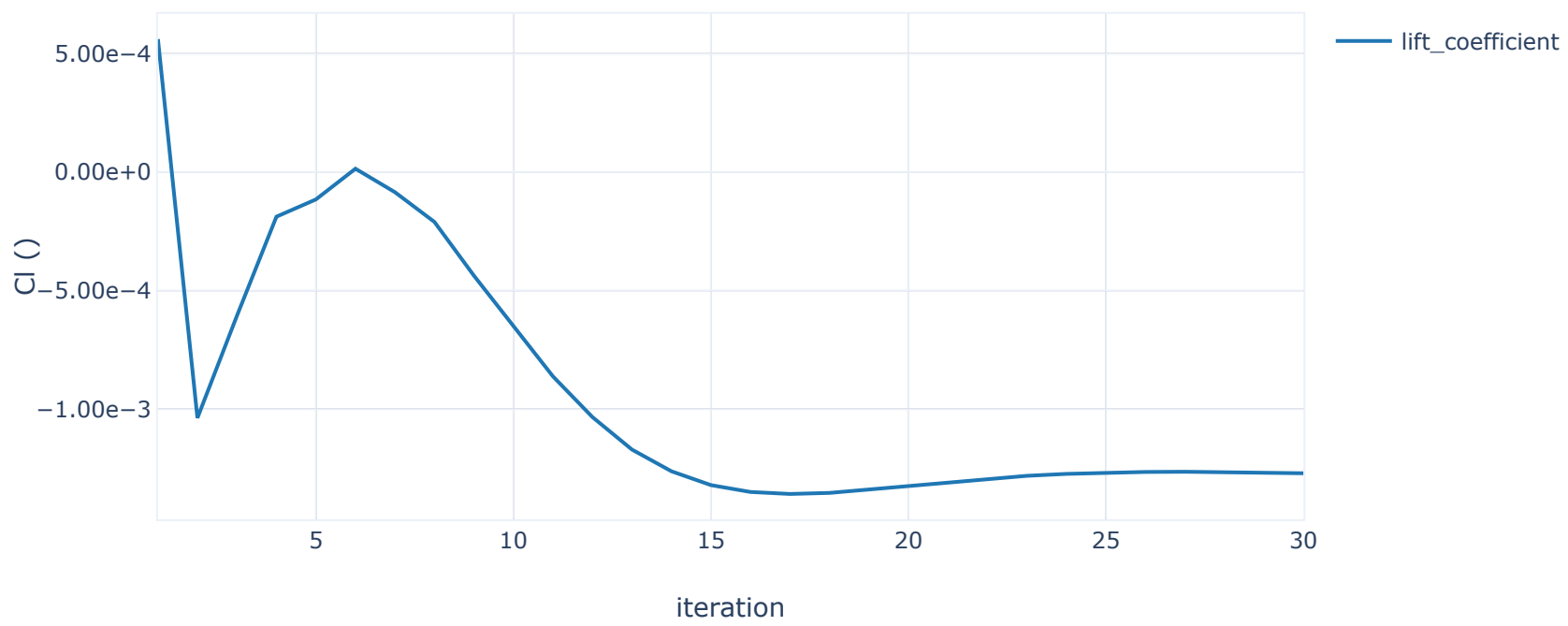
lift_force-rplot



iteration

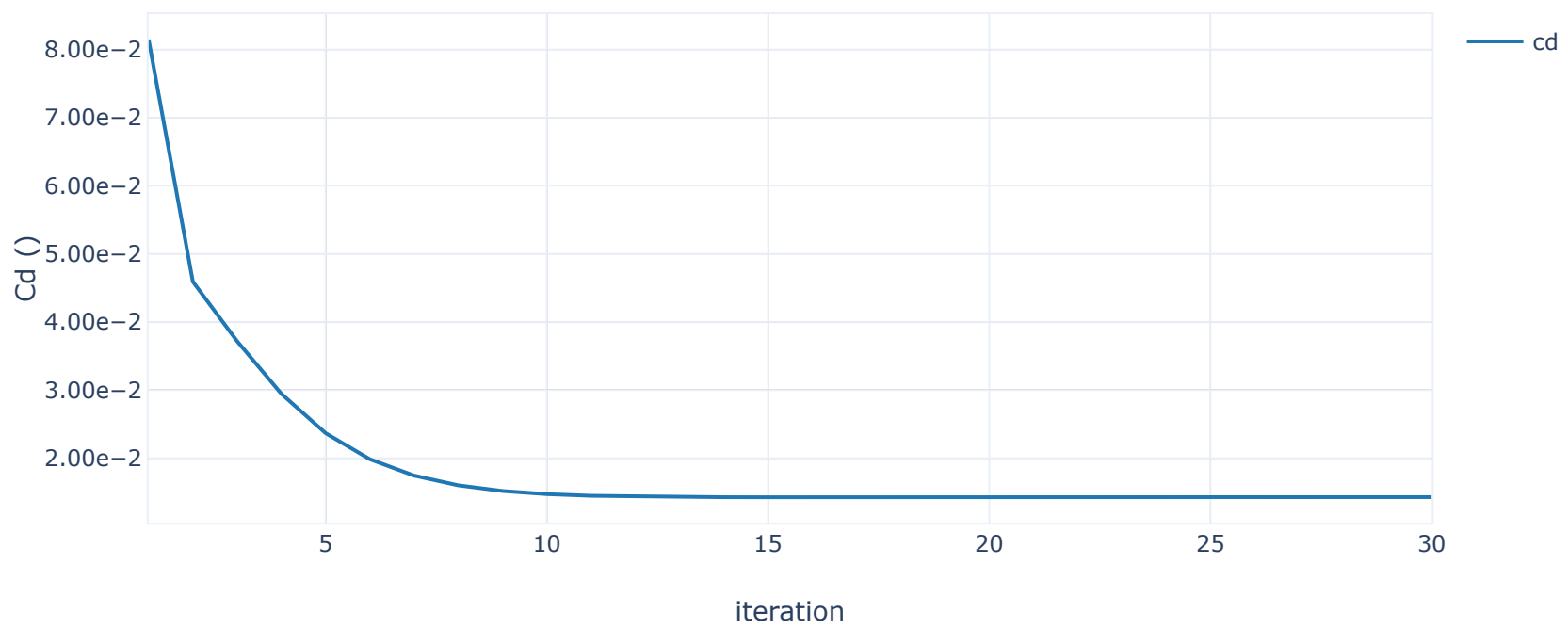
lift_coefficient-rplot

lift_coefficient-rplot



cd-rplot

cd-rplot



drag_force-rplot

drag_force-rplot

