Disk Test Report

root

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Abstract

This report is about the numerical simulation of a heated disk spinning in air at ambiant temperature.
It was generated using the Automatic Report Generator (ARG).

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Chapter 1

Introduction

The current implementation offers the ability to integrate text, VTK-generated visualizations, MatPlotLib plots, and other artifacts, in a LaTeX or Word document. PyLaTeX and Python-docx are used to glue of all this together.

Chapter 2

The Spinning Heated Disk Case

2.1 Model Meta-Information

This section provides an overview of the data set used for this analysis.

item	number
Exodus II files	1
element blocks	1
elements	7472
node fields	7
node sets	3
nodes	8499
side sets	7

Table 2.1: Topological properties of `disk_out_ref.ex2`

block ID	block name
1	Unnamed block ID: 1

Table 2.2: Element blocks of `disk_out_ref.ex2`

node set ID	node set name
1	Unnamed set ID: 1
2	Unnamed set ID: 2
3	Unnamed set ID: 3

Table 2.3: Node sets of `disk_out_ref.ex2`

side set ID	side set name
1	Unnamed set ID: 1
2	Unnamed set ID: 2
3	Unnamed set ID: 3
4	Unnamed set ID: 4
5	Unnamed set ID: 5
6	Unnamed set ID: 6
7	Unnamed set ID: 7

Table 2.4: Side sets of `disk_out_ref.ex2`

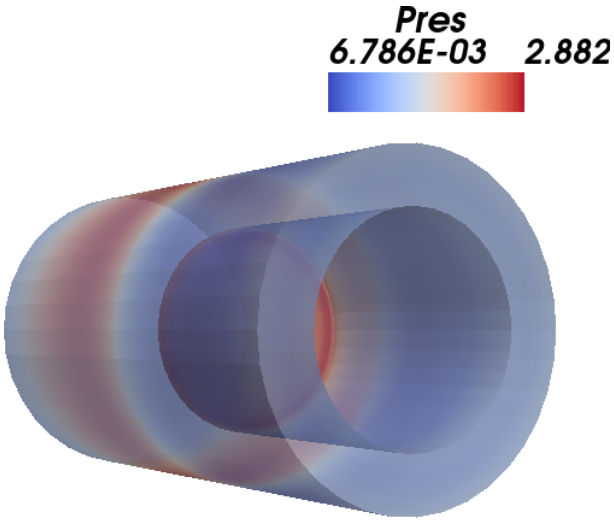
variable	type
AsH3	NODAL
CH4	NODAL
GaMe3	NODAL
H2	NODAL
Pres	NODAL
Temp	NODAL
V	NODAL

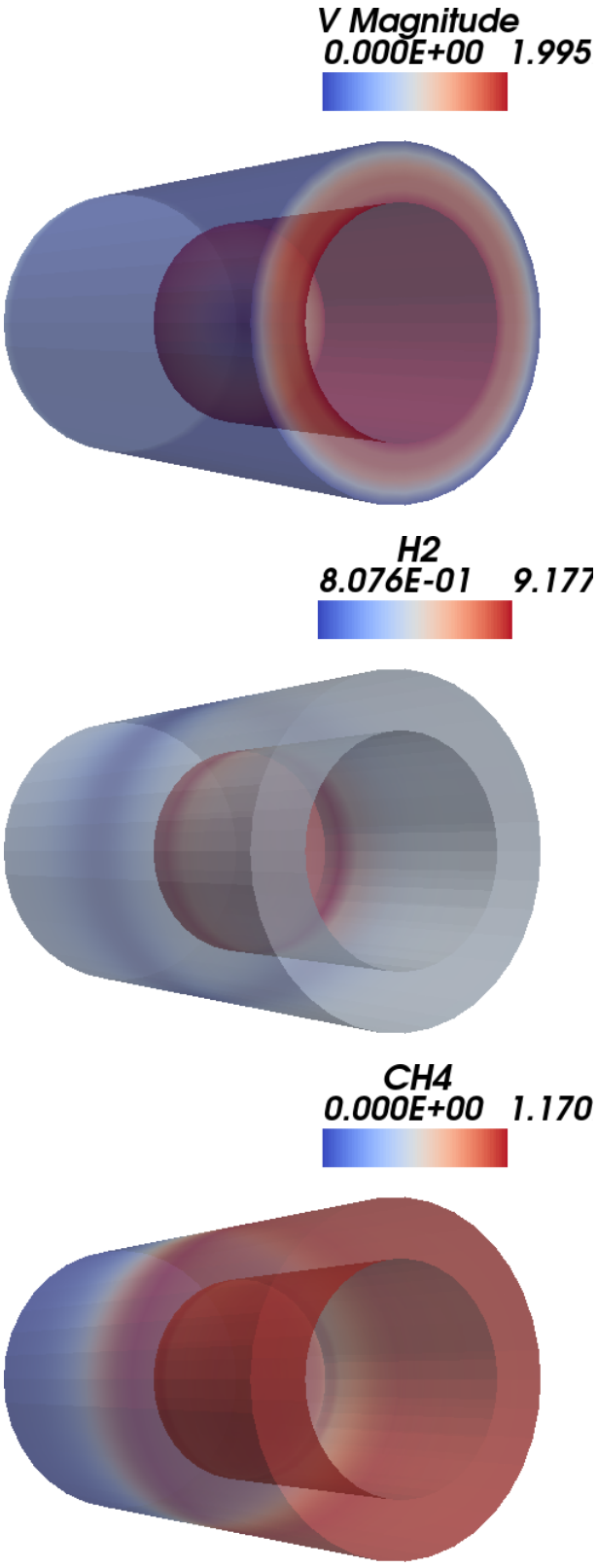
Table 2.5: Variables of `disk_out_ref.ex2`

2.2 Visualizations of Some Available Attributes

2.2.1 Surface Renderings

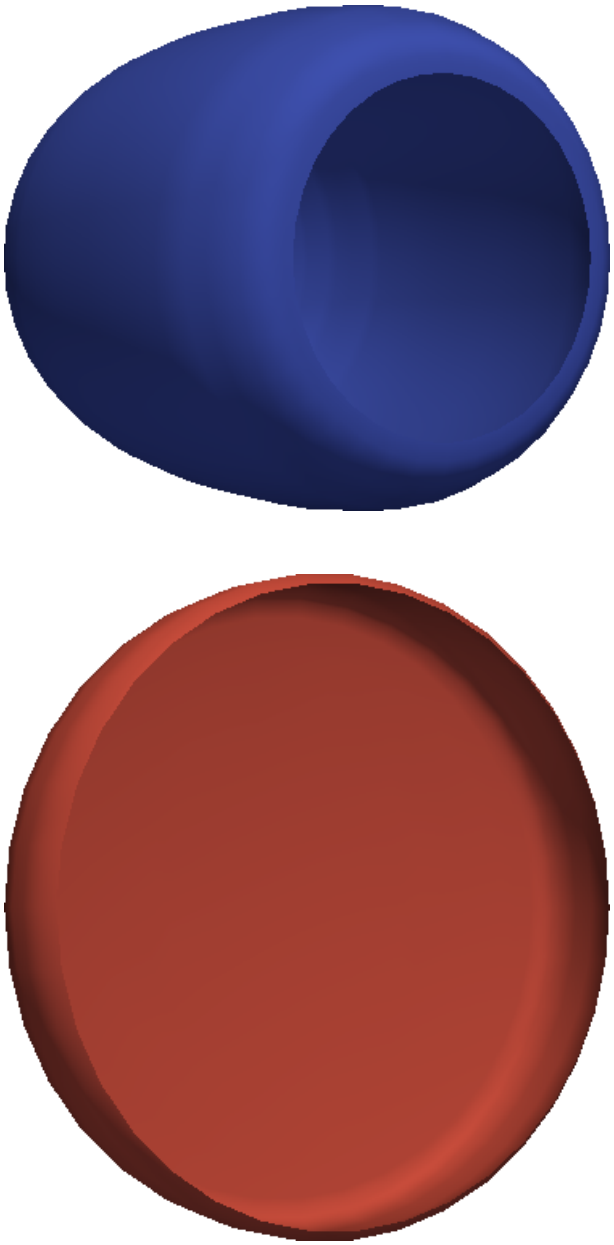
We begin by presenting some surface renderings of the data set for several of its scalar or vector attributes.




V Magnitude
0.000E+00 1.995
H2
8.076E-01 9.177
CH4
0.000E+00 1.170

2.2.2 Isocontours

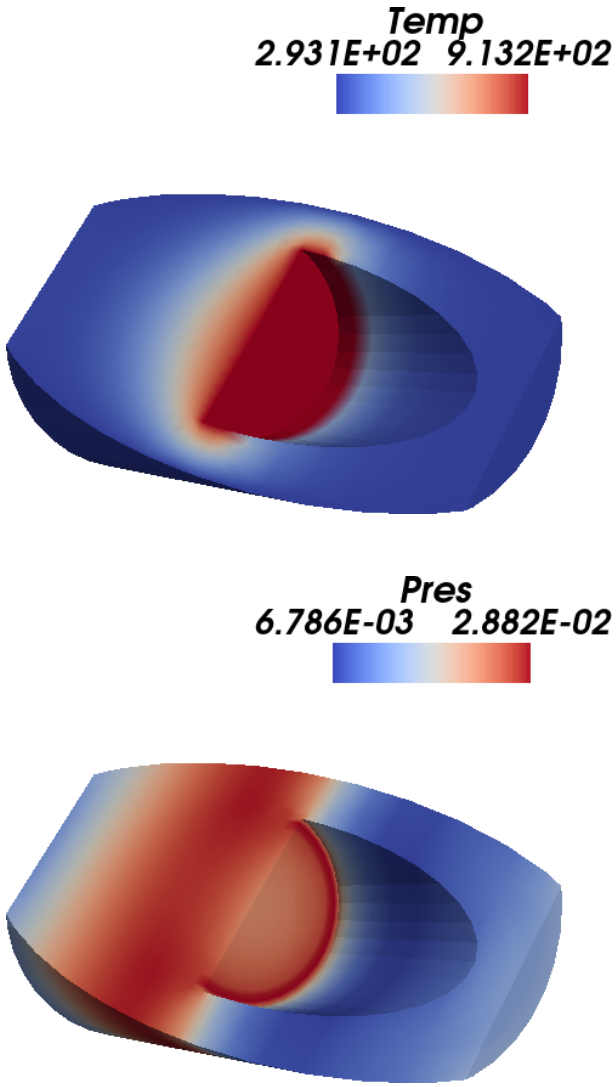
We now look at two different isocontours for the temperature values contained in this data set.



Note that, unlike surface renderings, isocontouring only makes sense for point-centered, scalar attributes. If the variable is cell-centered instead, it must be interpolated before iso-contours can be computed. As a result, interpolation errors will occur.
We chose two isocontour values that are close enough from the minimum and maximum values for that attribute, because we want to highlight: - the heated disk; - the cooler air mass surrounding it.
In a more refined implementation of this generator, we could specificy a range of values so several contours can be shown in the same image.

2.2.3 Clips

We finish by clipping the dataset with a plane, and surface rendering the result.



Chapter 3

Results

This chapter describes key results of the analysis workflow instance.

3.1 Quantities of Interest -- Margin

3.1.1 Requirements

1. Tensile yield stress is 20000 psi
2. Required factor of safety is 3.

3.1.2 Calculated Performance

- The calculated maximum nodal projected Mises stress is 7904.79 psi.
- The calculated normalized margin of maximum von Mises stress is -0.062.