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Test Case Series 1 (Overview of Intercalibration Results: A Model Comparison)

Thermal Performance Database Team

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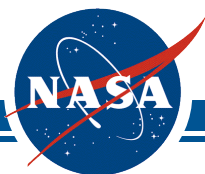
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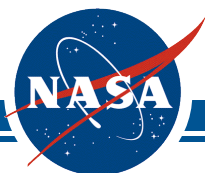


Overview of Intercalibration Results

A Model Comparison

4th Ablator Modeling Workshop
Albuquerque, NM, March 1st-3rd

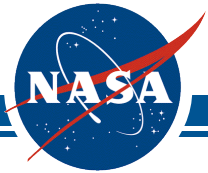
Thermal Performance Database Team
March 3, 2011



Presentation Overview

Thermal Performance Database

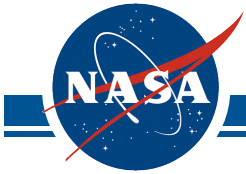
- Comparison of model results
 - 16 workshop participant models
 - Comparison against FIAT reference model
 - Nine outputs
 - TC1 – TC6
 - Char Thickness, Remaining Virgin Thickness, Blowing Rate
 - For each output two comparisons
 - Difference at 60 seconds
 - Average of difference over 60 seconds
- All comparisons (plots) are percent difference from FIAT reference model



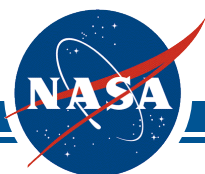
INTERCOMPARISON EXERCISE GOALS

Thermal Performance Database

- Gather existing ablation codes as best as we can
- Define a simple initial problem to start the intercomparison effort
- Provide the opportunity for people to solve possible numerical problems in their codes by comparing/interacting with others
- Look at agreements/disagreements and explain them
- Document the origin of the differences
- Define/discuss and agree on the next problem for the intercomparison for the 5th ablation modeling workshop
- Provide a tool for assessing the importance in the final prediction (used for design) of the different model assumptions
- Keep this community going



Model Comparisons at 60 Seconds



T_tc01 Temperature Percent Difference at 60s

Thermal Performance Database

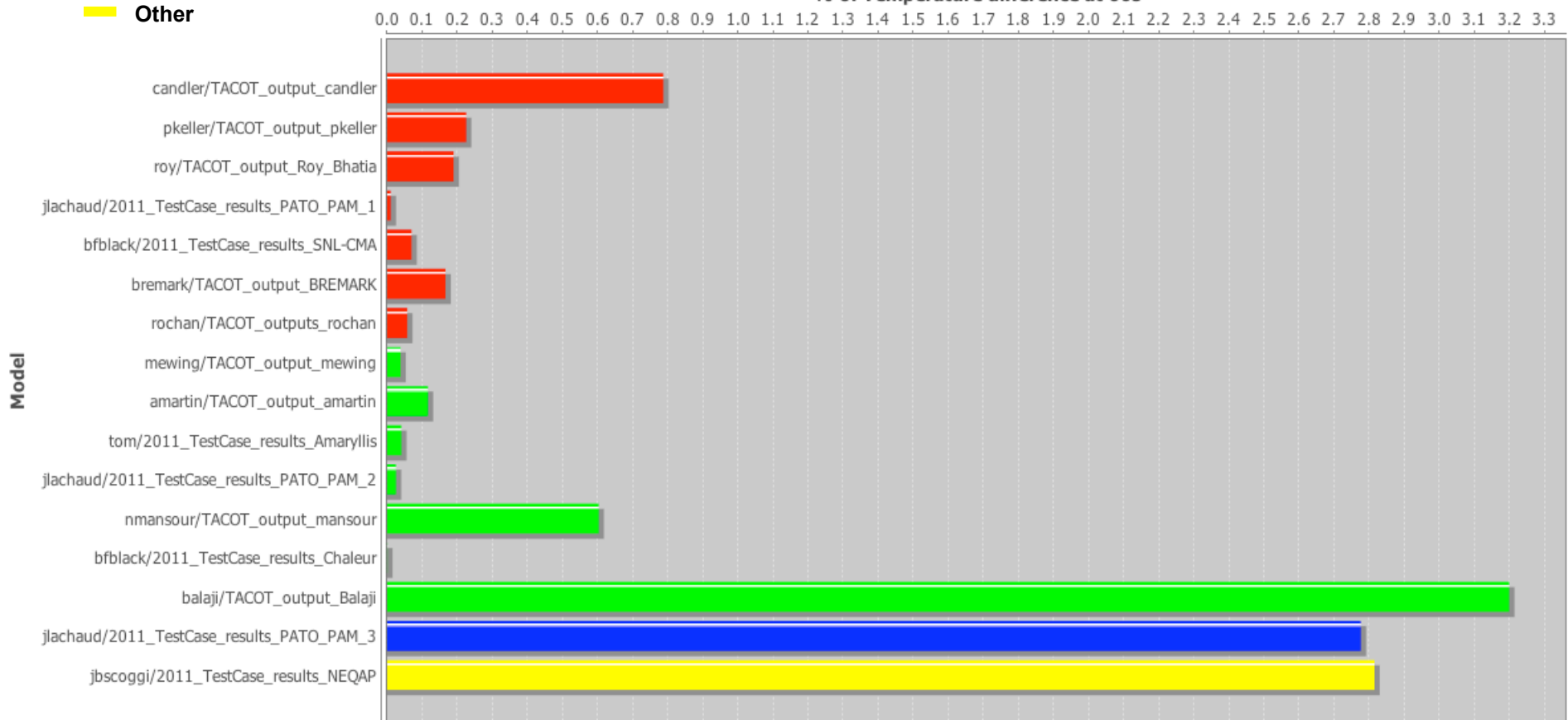
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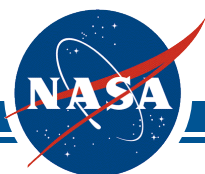
- 1
- 2
- 3
- Other

T_tc01 Temperature Difference at 60s

% of Temperature difference at 60s

3.3%





T_tc02 Temperature Percent Difference at 60s

Thermal Performance Database

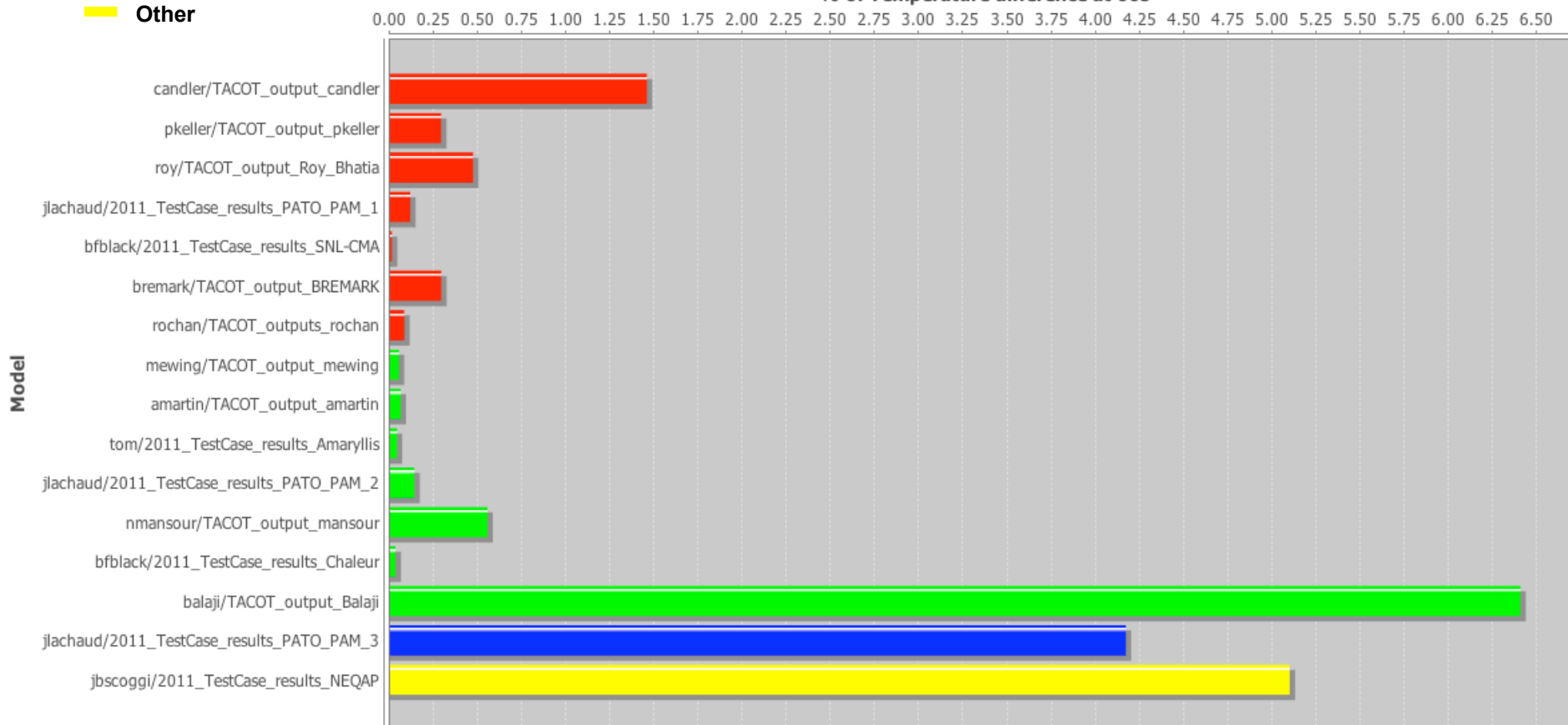
Model Type

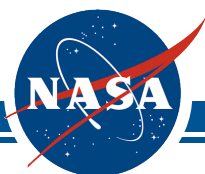
- 1
- 2
- 3
- Other

T_tc02 Temperature Difference at 60s

% of Temperature difference at 60s

6.50%





T_tc03 Temperature Percent Difference at 60s

Thermal Performance Database

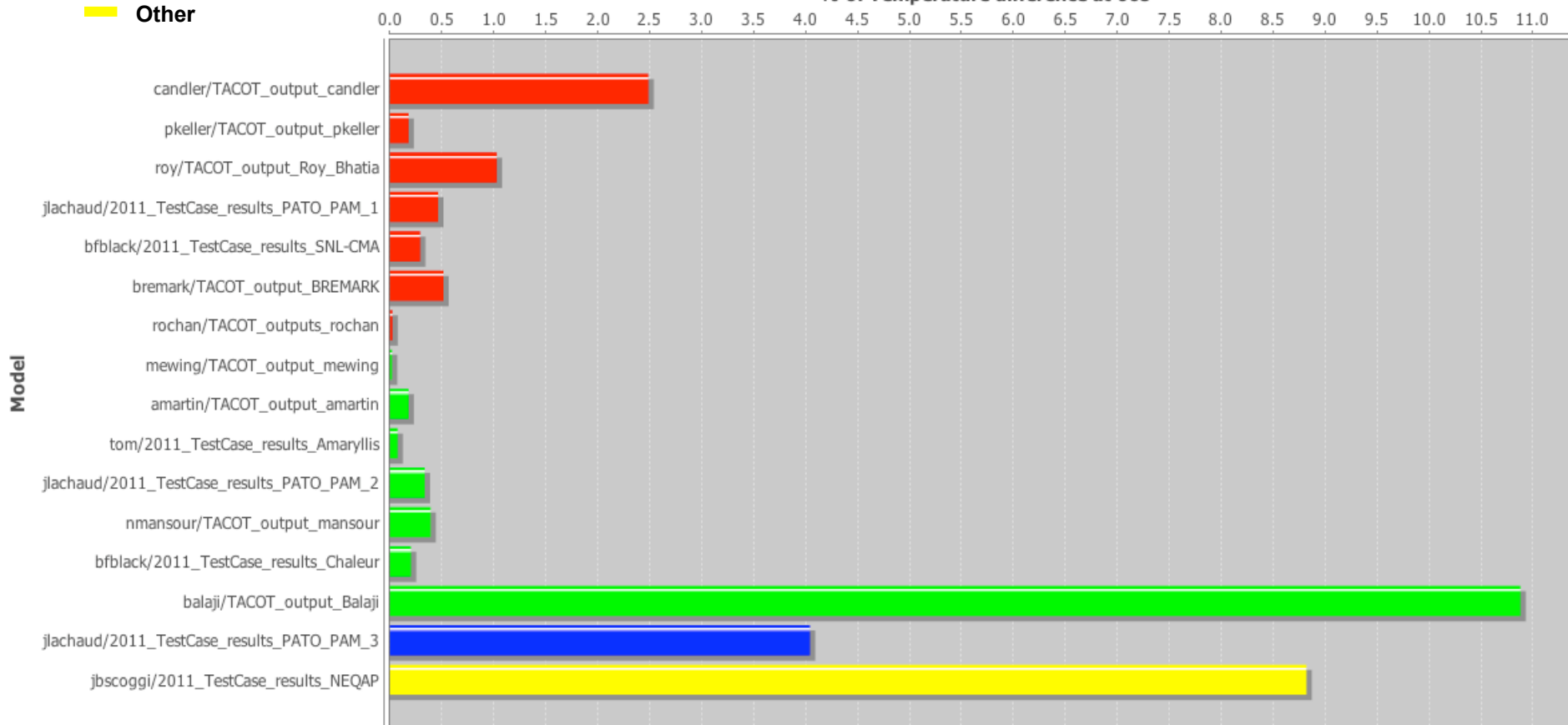
Model Type

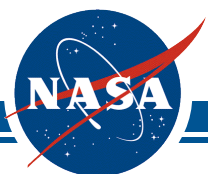
- 1
- 2
- 3
- Other

T_tc03 Temperature Difference at 60s

% of Temperature difference at 60s

11.0%





T_tc04 Temperature Percent Difference at 60s

Thermal Performance Database

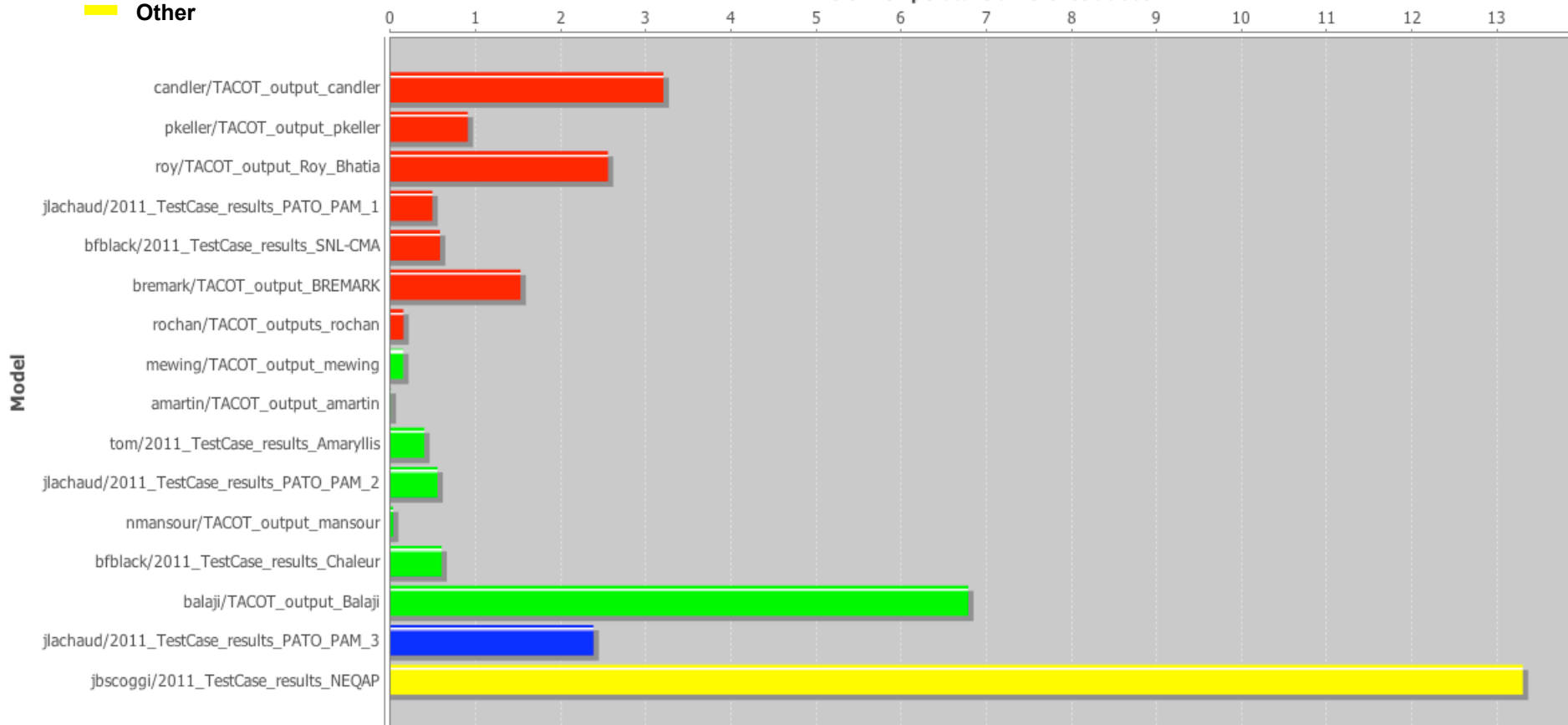
Model Type

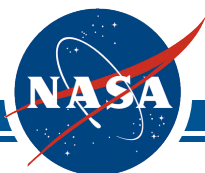
- 1
- 2
- 3
- Other

T_tc04 Temperature Difference at 60s

% of Temperature difference at 60s

13%





T_tc05 Temperature Percent Difference at 60s

Thermal Performance Database

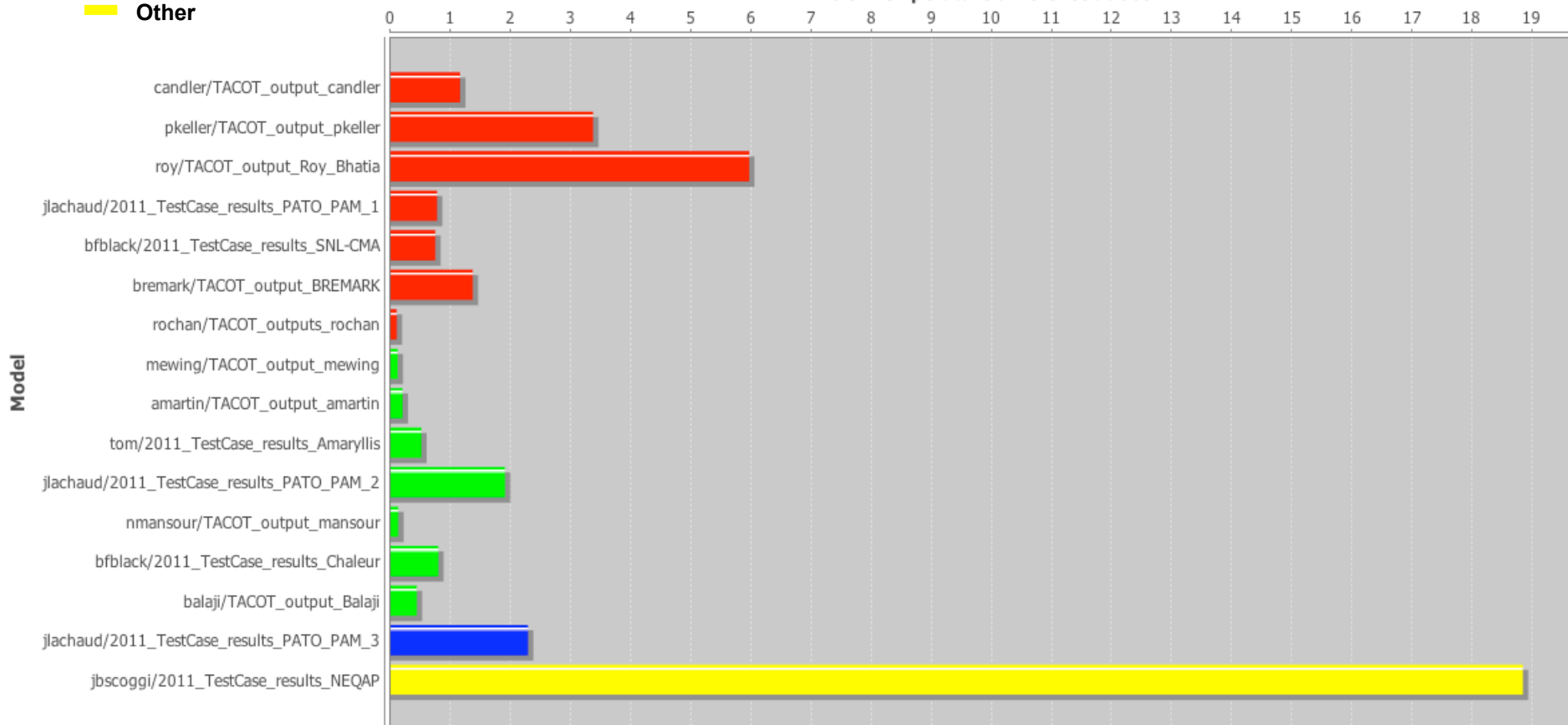
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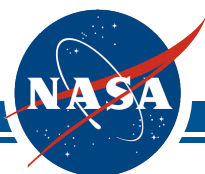
- 1
- 2
- 3
- Other

T_tc05 Temperature Difference at 60s

% of Temperature difference at 60s

19%





T_tc06 Temperature Percent Difference at 60s

Thermal Performance Database

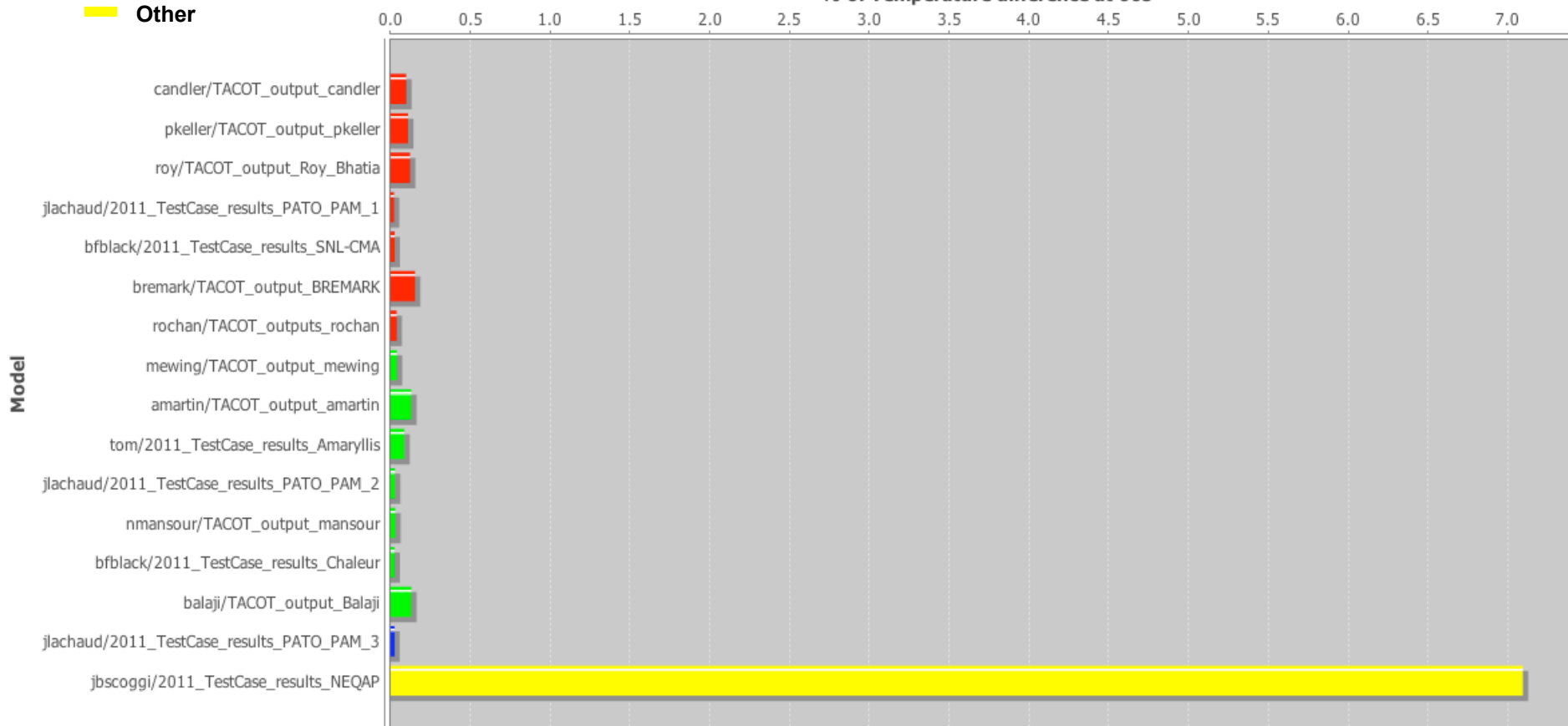
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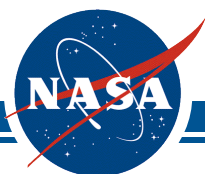
- 1
- 2
- 3
- Other

T_tc06 Temperature Difference at 60s

% of Temperature difference at 60s

7.0%





T_tc06 Temperature Percent Difference at 60s

Thermal Performance Database

Zoom

T_tc06 Temperature Difference at 60s

% of Temperature difference at 60s

0.16%

0.00 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.10 0.11 0.12 0.13 0.14 0.15 0.16

Model

candler/TACOT_output_candler

pkeller/TACOT_output_pkeller

roy/TACOT_output_Roy_Bhatia

jlachaud/2011_TestCase_results_PATO_PAM_1

bfbblack/2011_TestCase_results_SNL-CMA

bremark/TACOT_output_BREMARK

rochan/TACOT_outputs_rochan

mewing/TACOT_output_mewing

amartin/TACOT_output_amartin

tom/2011_TestCase_results_Amaryllis

jlachaud/2011_TestCase_results_PATO_PAM_2

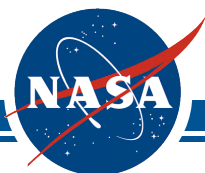
nmansour/TACOT_output_mansour

bfbblack/2011_TestCase_results_Chaleur

balaji/TACOT_output_Balaji

jlachaud/2011_TestCase_results_PATO_PAM_3

jbscoggi/2011_TestCase_results_NEQAP



Char Thickness Percent Difference at 60s

Thermal Performance Database

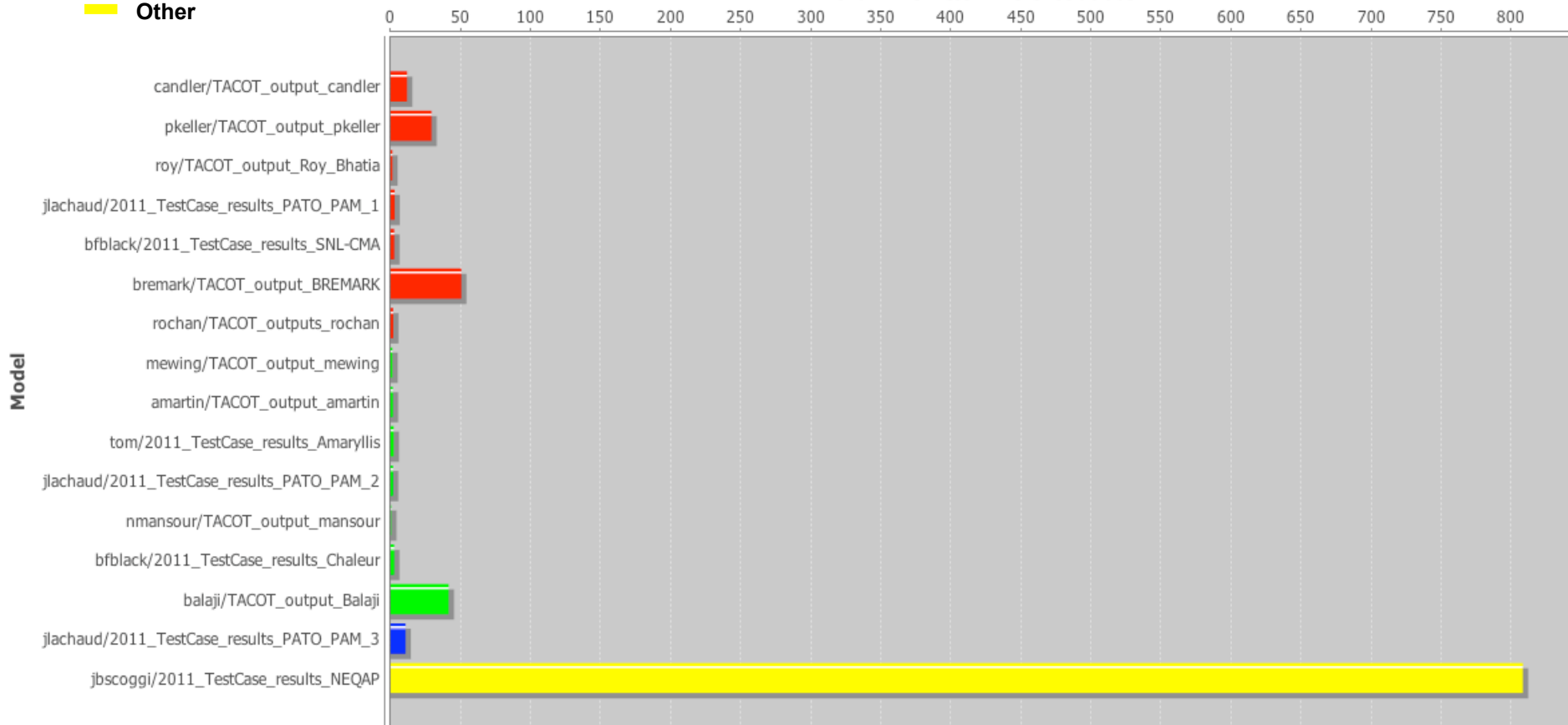
Model Type

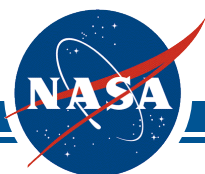
- 1
- 2
- 3
- Other

Char Thickness Difference at 60s

Char Thickness Difference at 60s

800%





Char Thickness Percent Difference at 60s

Thermal Performance Database

Zoom

Char Thickness Difference at 60s

Char Thickness Difference at 60s

52.5%

0.0 2.5 5.0 7.5 10.0 12.5 15.0 17.5 20.0 22.5 25.0 27.5 30.0 32.5 35.0 37.5 40.0 42.5 45.0 47.5 50.0 52.5

Model

candler/TACOT_output_candler

pkeller/TACOT_output_pkeller

roy/TACOT_output_Roy_Bhatia

jlachaud/2011_TestCase_results_PATO_PAM_1

bfbblack/2011_TestCase_results_SNL-CMA

bremark/TACOT_output_BREMARK

rochan/TACOT_outputs_rochan

mewing/TACOT_output_mewing

amartin/TACOT_output_amartin

tom/2011_TestCase_results_Amaryllis

jlachaud/2011_TestCase_results_PATO_PAM_2

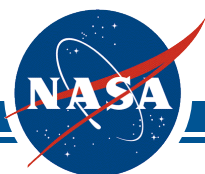
nmansour/TACOT_output_mansour

bfbblack/2011_TestCase_results_Chaleur

balaji/TACOT_output_Balaji

jlachaud/2011_TestCase_results_PATO_PAM_3

jbscoggi/2011_TestCase_results_NEQAP



Remaining Virgin Thickness Percent Diff. at 60s

Thermal Performance Database

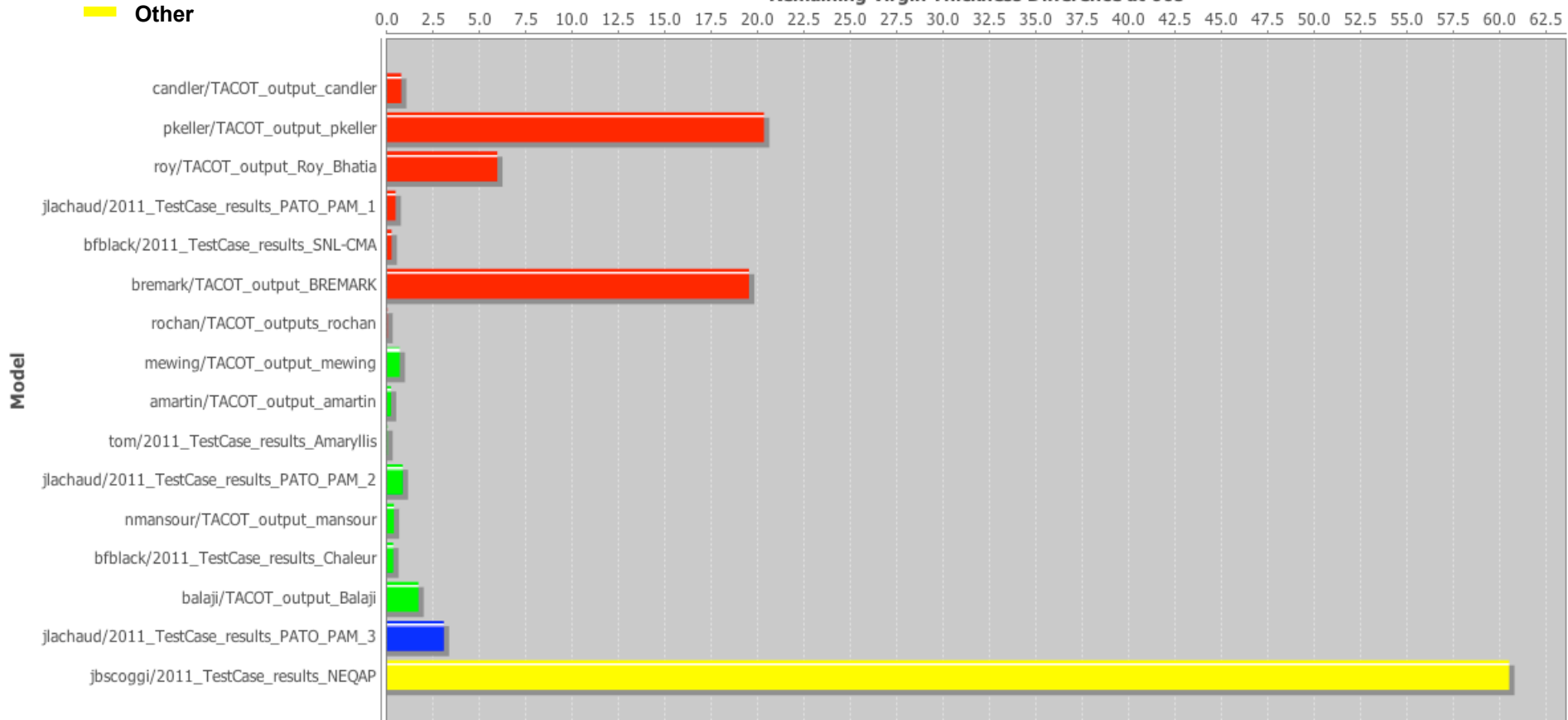
Model Type

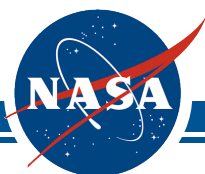
- 1
- 2
- 3
- Other

Remaining Virgin Thickness Difference at 60s

Remaining Virgin Thickness Difference at 60s

62.5%





Remaining Virgin Thickness Percent Diff. at 60s

Thermal Performance Database

Zoom

Remaining Virgin Thickness Difference at 60s

Remaining Virgin Thickness Difference at 60s

21%

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Model

candler/TACOT_output_candler

pkeller/TACOT_output_pkeller

roy/TACOT_output_Roy_Bhatia

jlachaud/2011_TestCase_results_PATO_PAM_1

bfbblack/2011_TestCase_results_SNL-CMA

bremark/TACOT_output_BREMARK

rochan/TACOT_outputs_rochan

mewing/TACOT_output_mewing

amartin/TACOT_output_amartin

tom/2011_TestCase_results_Amaryllis

jlachaud/2011_TestCase_results_PATO_PAM_2

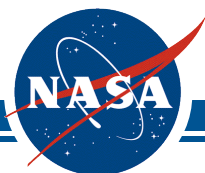
nmansour/TACOT_output_mansour

bfbblack/2011_TestCase_results_Chaleur

balaji/TACOT_output_Balaji

jlachaud/2011_TestCase_results_PATO_PAM_3

jbscoggi/2011_TestCase_results_NEQAP



Pyro. Gas Blowing Percent Difference at 60s

Thermal Performance Database

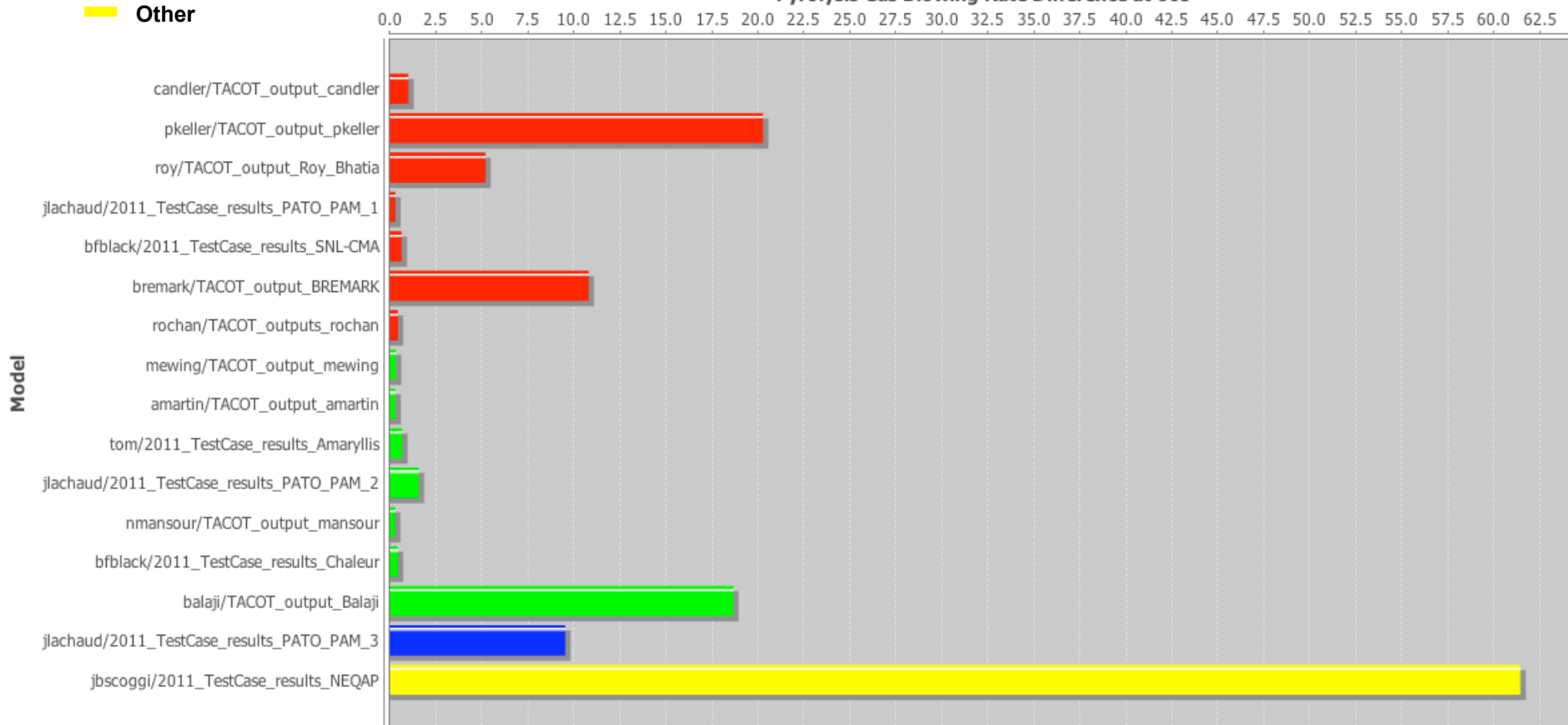
Model Type

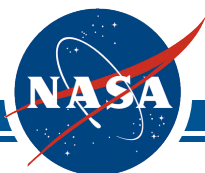
- 1
- 2
- 3
- Other

Pyrolysis Gas Blowing Rate Difference at 60s

Pyrolysis Gas Blowing Rate Difference at 60s

62.5%





Pyro. Gas Blowing Percent Difference at 60s

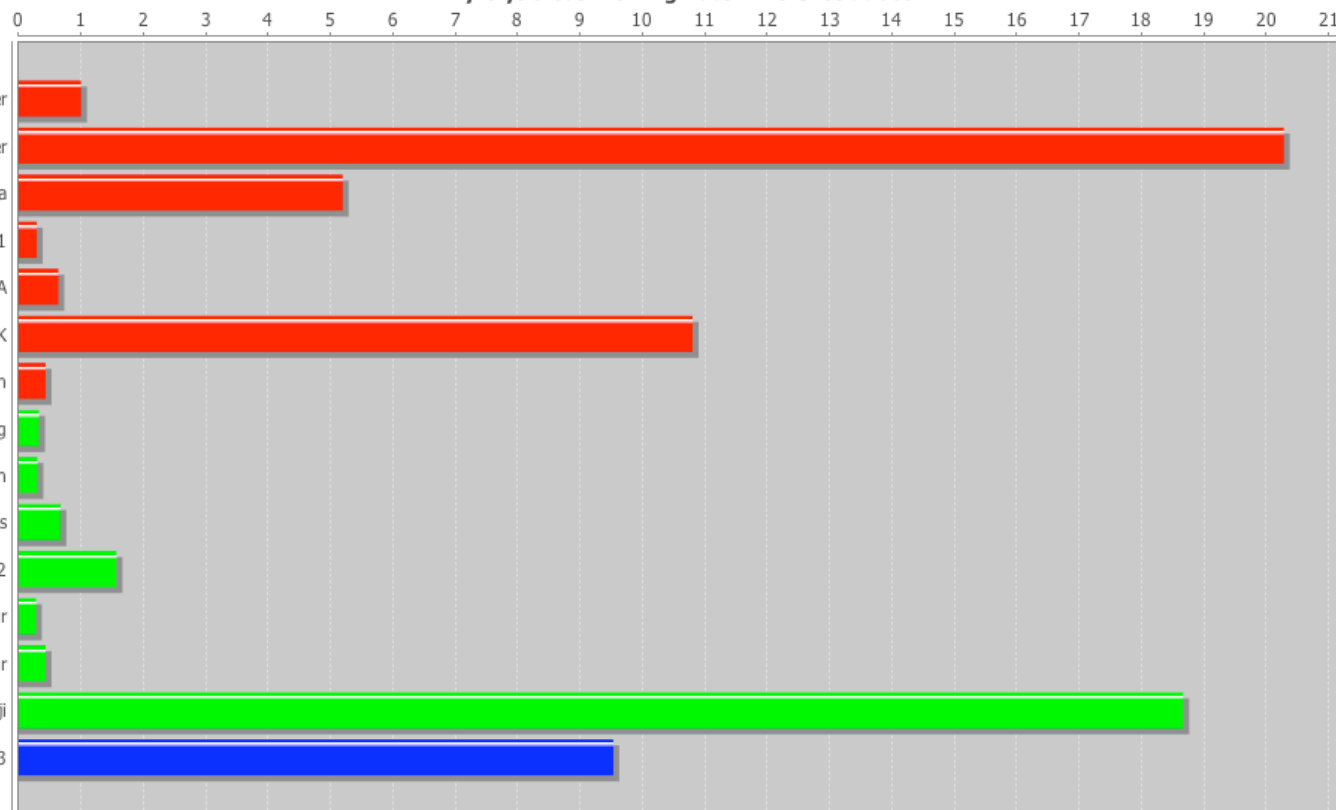
Thermal Performance Database

Zoom

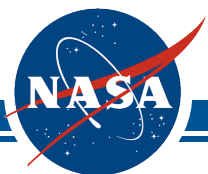
Pyrolysis Gas Blowing Rate Difference at 60s

Pyrolysis Gas Blowing Rate Difference at 60s

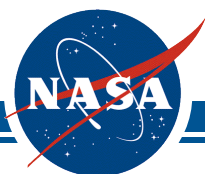
21%



jbscoggi/2011_TestCase_results_NEQAP



Model Comparisons Over 60 Seconds



Average T_tc01 Temperature Percent Difference

Thermal Performance Database

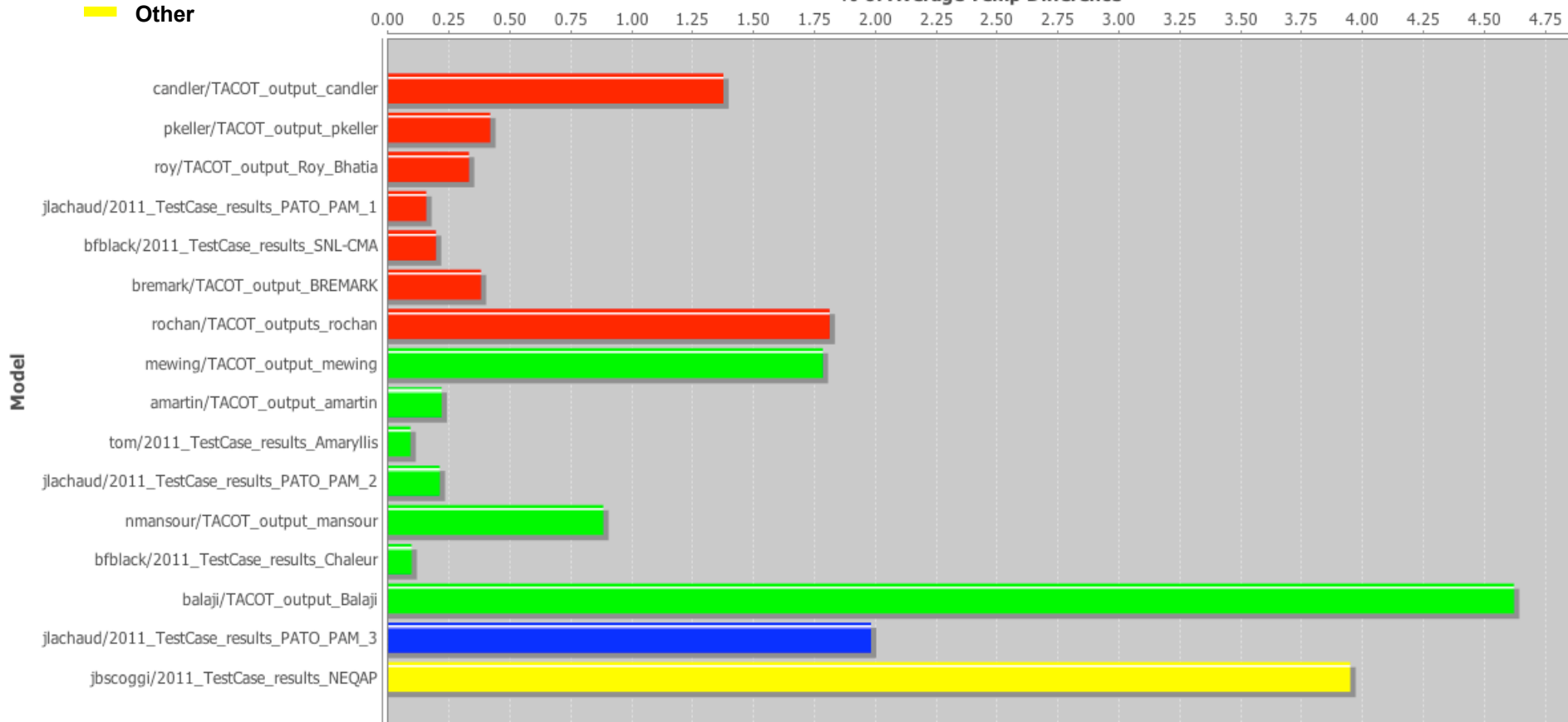
Model Type

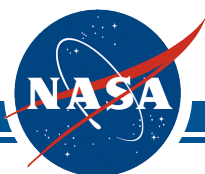
- 1
- 2
- 3
- Other

Average T_tc01 Temperature Difference

% of Average Temp Difference

4.75%





Average T_tc02 Temperature Percent Difference

Thermal Performance Database

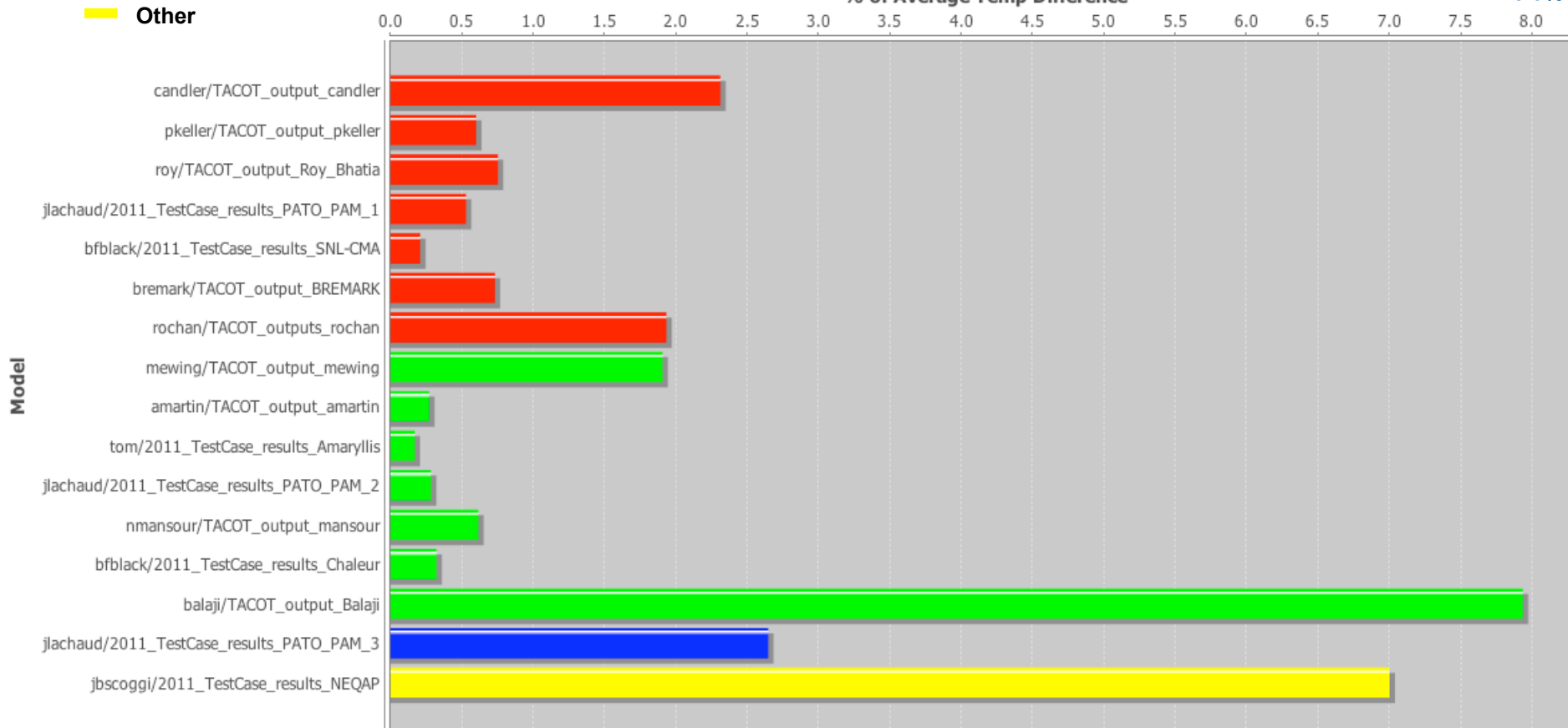
Model Type

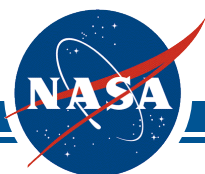
- 1
- 2
- 3
- Other

Average T_tc02 Temperature Difference

% of Average Temp Difference

8.0%





Average T_tc03 Temperature Percent Difference

Thermal Performance Database

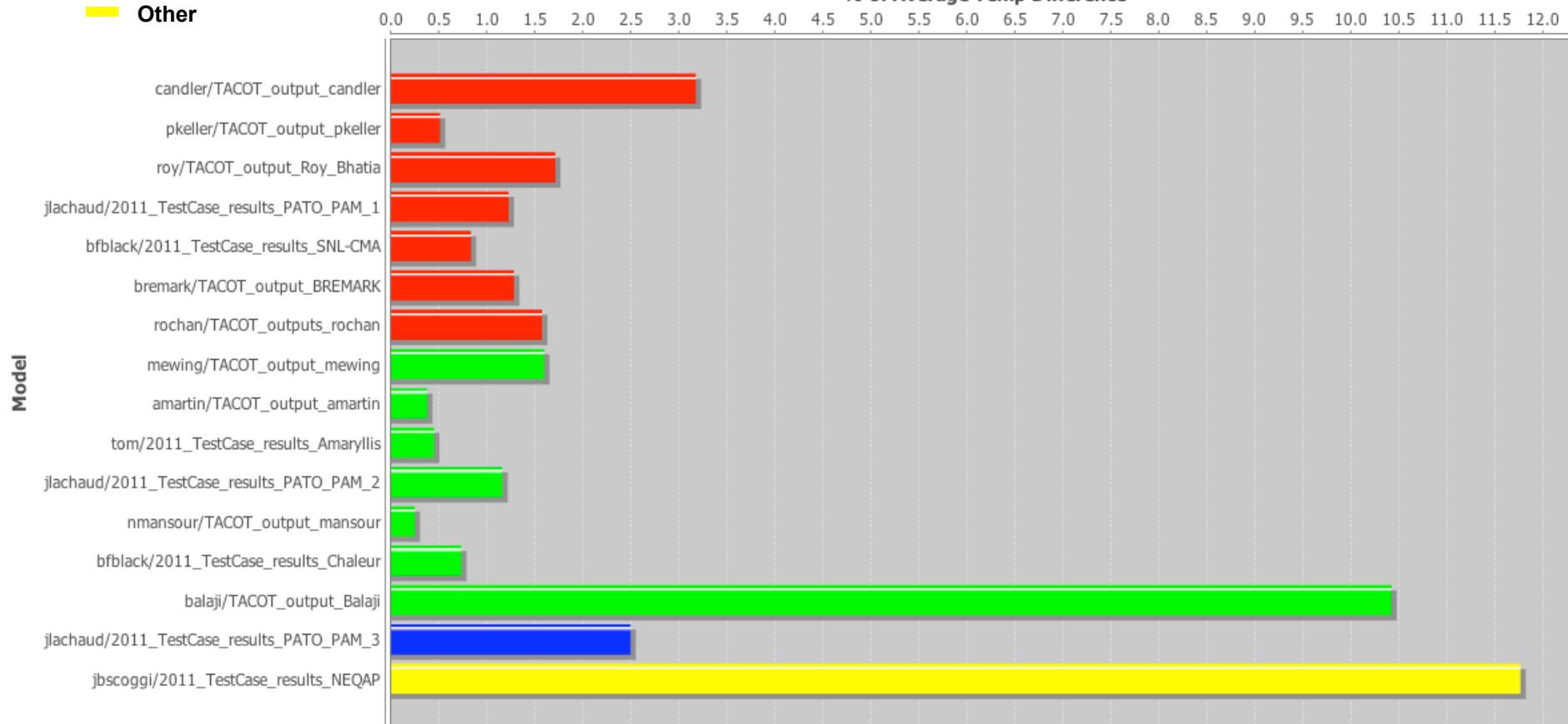
Model Type

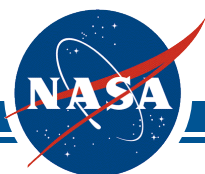
- 1
- 2
- 3
- Other

Average T_tc03 Temperature Difference

% of Average Temp Difference

12.0%





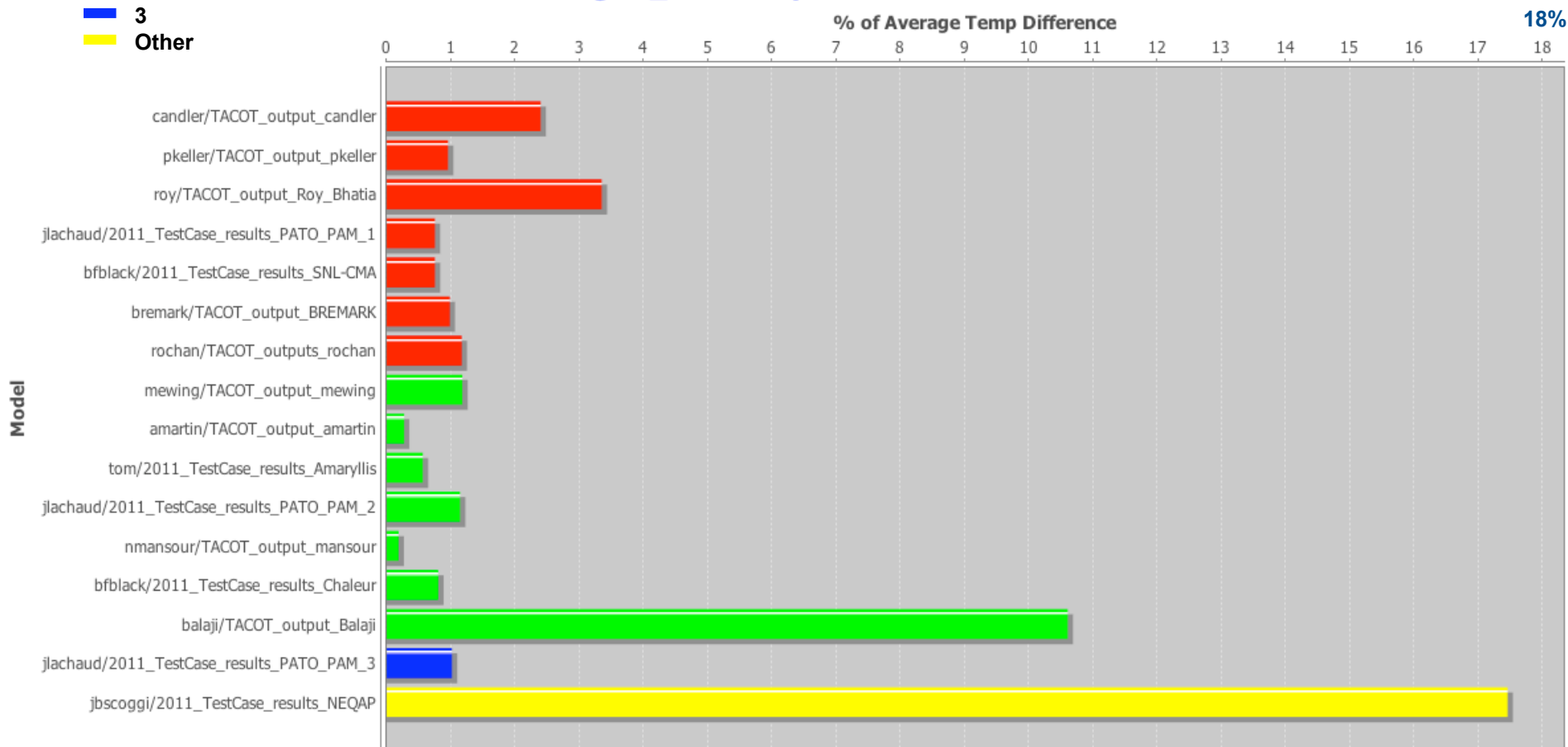
Average T_tc04 Temperature Percent Difference

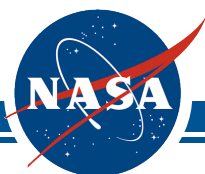
Thermal Performance Database

Model Type

- 1
- 2
- 3
- Other

Average T_tc04 Temperature Difference





Average T_tc05 Temperature Percent Difference

Thermal Performance Database

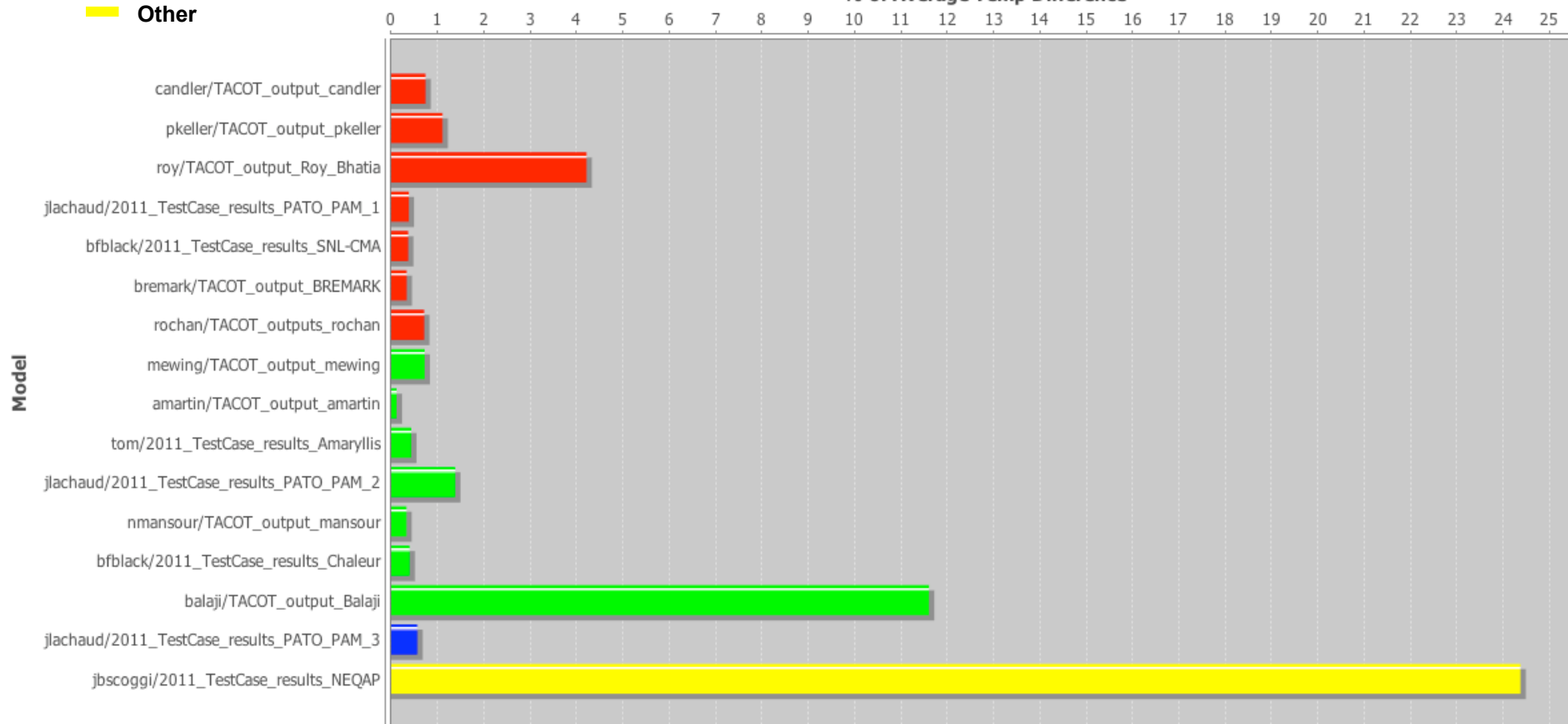
Model Type

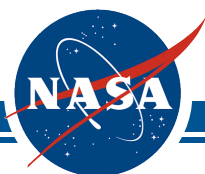
- 1
- 2
- 3
- Other

Average T_tc05 Temperature Difference

% of Average Temp Difference

25%





Average T_tc06 Temperature Percent Difference

Thermal Performance Database

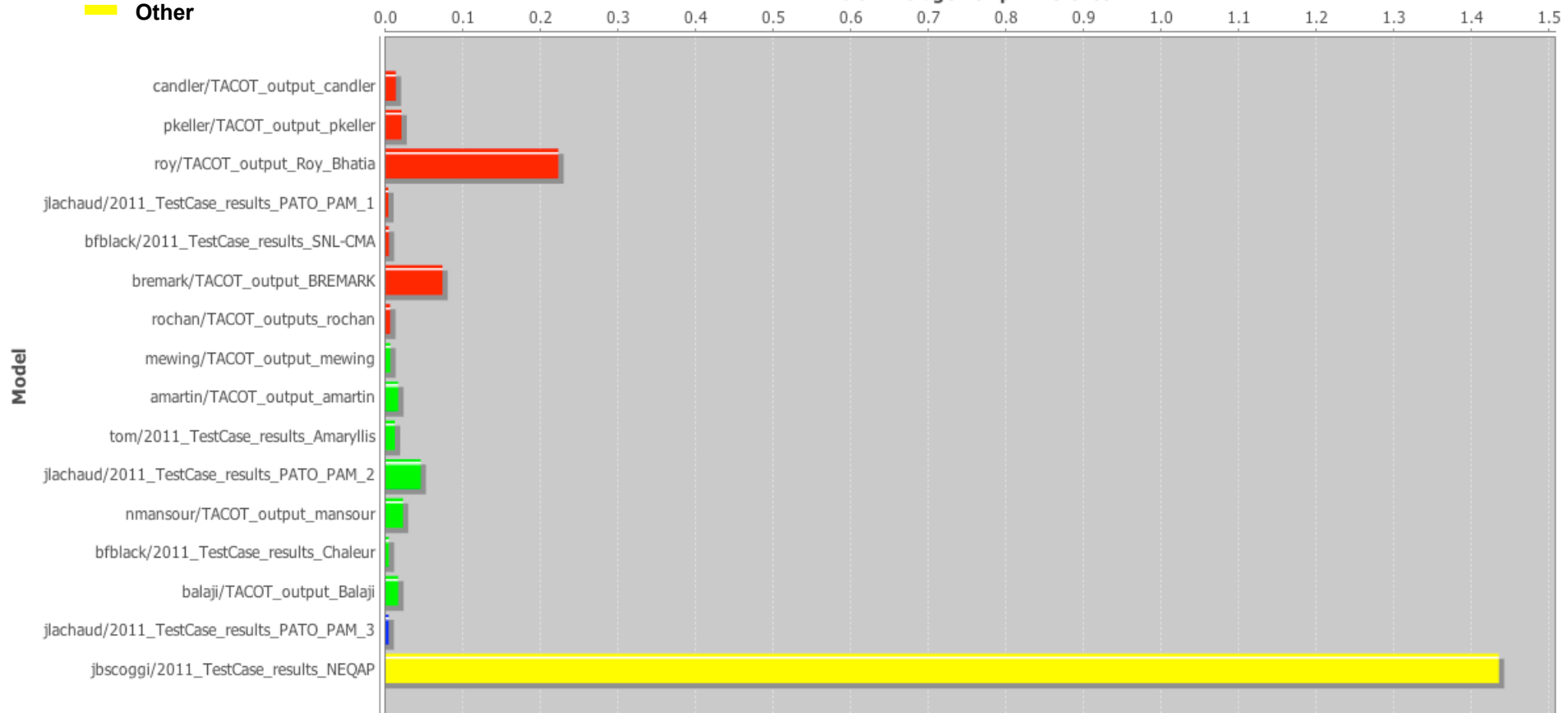
Model Type

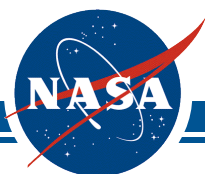
- 1
- 2
- 3
- Other

Average T_tc06 Temperature Difference

% of Average Temp Difference

1.5%





Average T_tc06 Temperature Percent Difference

Thermal Performance Database

Zoom

Average T_tc06 Temperature Difference

% of Average Temp Difference

0.23%

0.00 0.01 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09 0.10 0.11 0.12 0.13 0.14 0.15 0.16 0.17 0.18 0.19 0.20 0.21 0.22 0.23

Model

candler/TACOT_output_candler

pkeller/TACOT_output_pkeller

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jlachaud/2011_TestCase_results_PATO_PAM_2

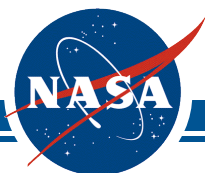
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balaji/TACOT_output_Balaji

jlachaud/2011_TestCase_results_PATO_PAM_3

jbscoggi/2011_TestCase_results_NEQAP



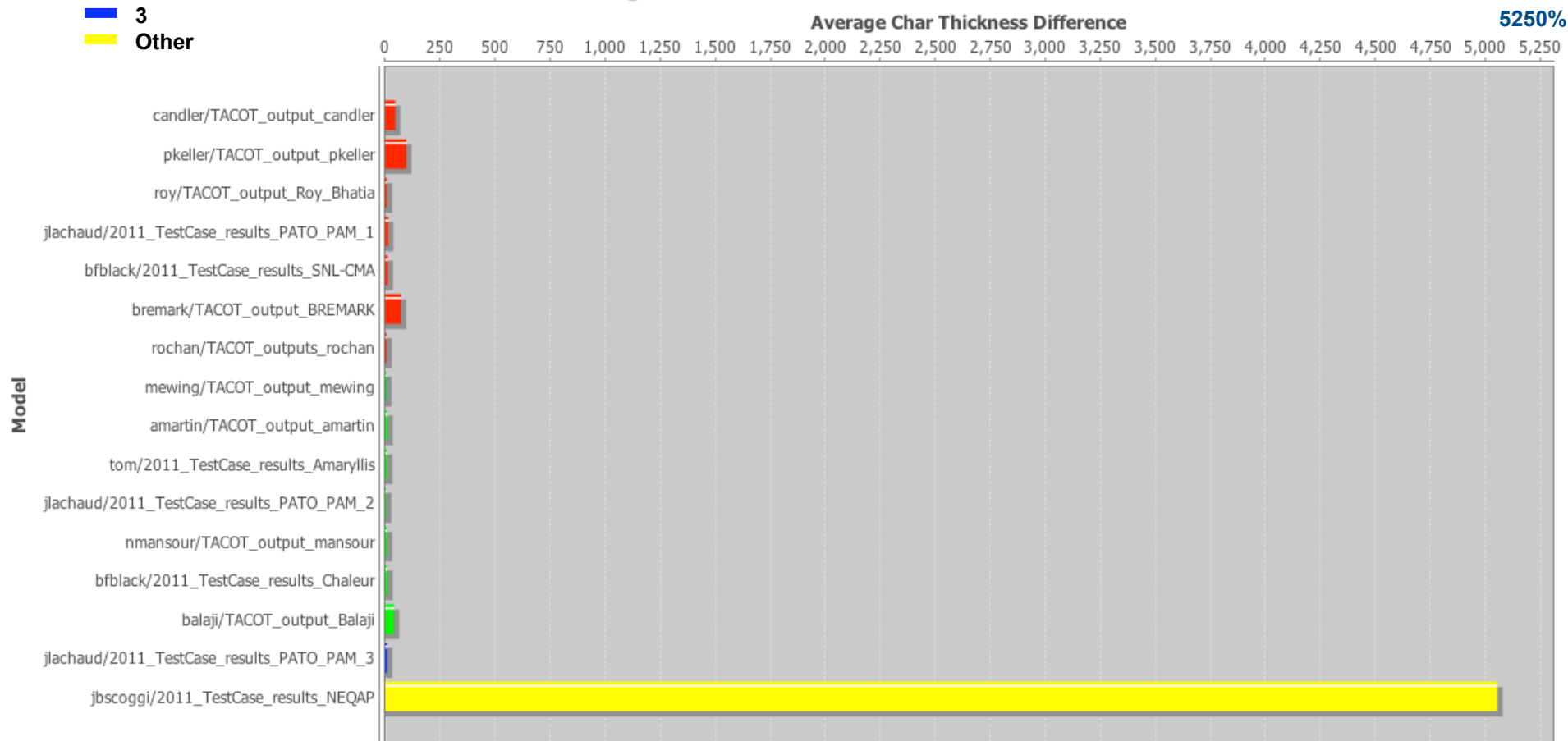
Average Char Thickness Percent Difference

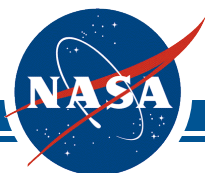
Thermal Performance Database

Model Type

- 1
- 2
- 3
- Other

Average Char Thickness Difference





Average Char Thickness Percent Difference

Thermal Performance Database

Zoom

Average Char Thickness Difference

Average Char Thickness Difference

100%

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

Model

candler/TACOT_output_candler

pkeller/TACOT_output_pkeller

roy/TACOT_output_Roy_Bhatia

jlachaud/2011_TestCase_results_PATO_PAM_1

bfbblack/2011_TestCase_results_SNL-CMA

bremark/TACOT_output_BREMARK

rochan/TACOT_outputs_rochan

mewing/TACOT_output_mewing

amartin/TACOT_output_amartin

tom/2011_TestCase_results_Amaryllis

jlachaud/2011_TestCase_results_PATO_PAM_2

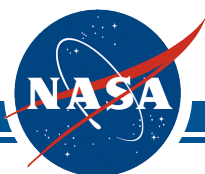
nmansour/TACOT_output_mansour

bfbblack/2011_TestCase_results_Chaleur

balaji/TACOT_output_Balaji

jlachaud/2011_TestCase_results_PATO_PAM_3

jbscoggi/2011_TestCase_results_NEQAP



Average Remaining Virgin Thickness

Thermal Performance Database

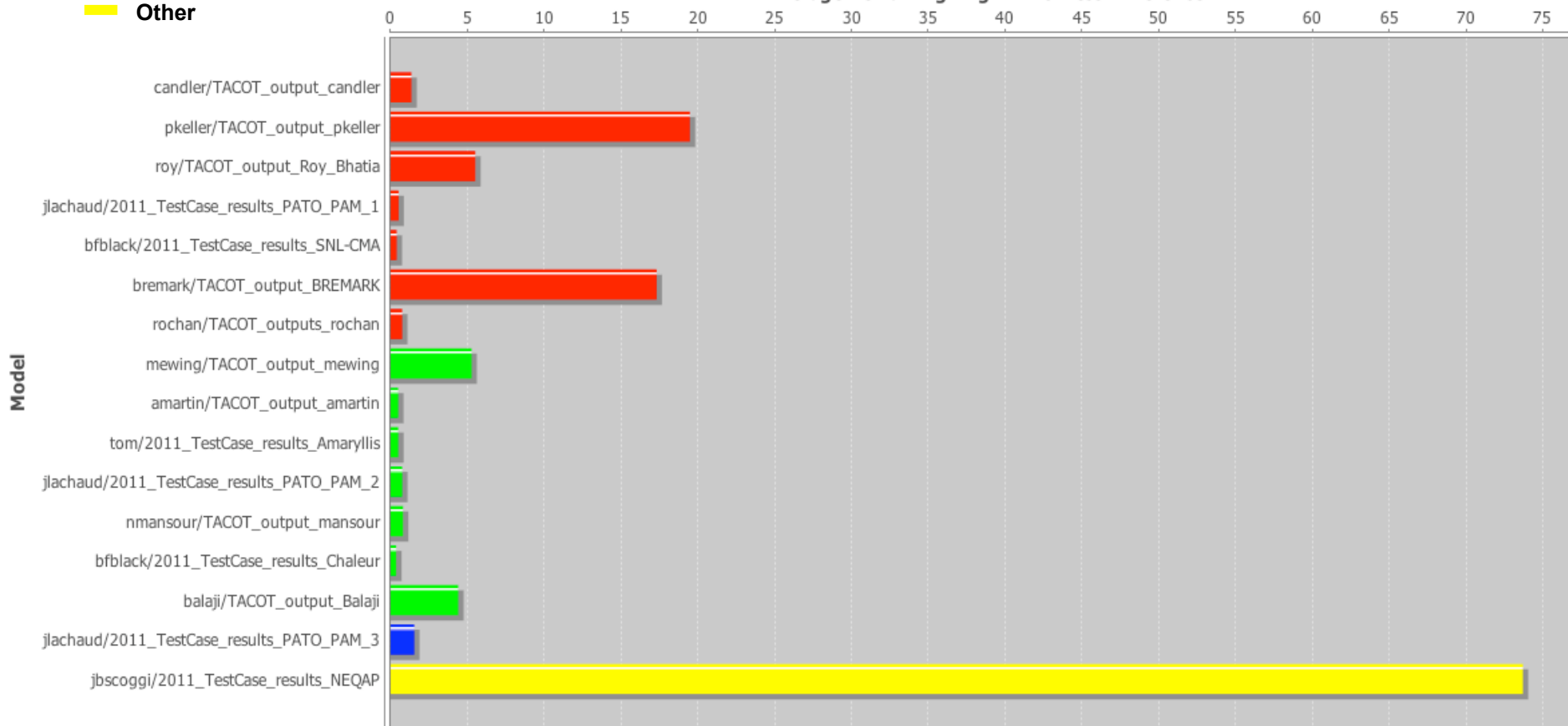
Model Type

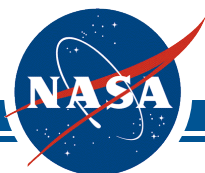
- 1
- 2
- 3
- Other

Average Remaining Virgin Thickness Difference

Average Remaining Virgin Thickness Difference

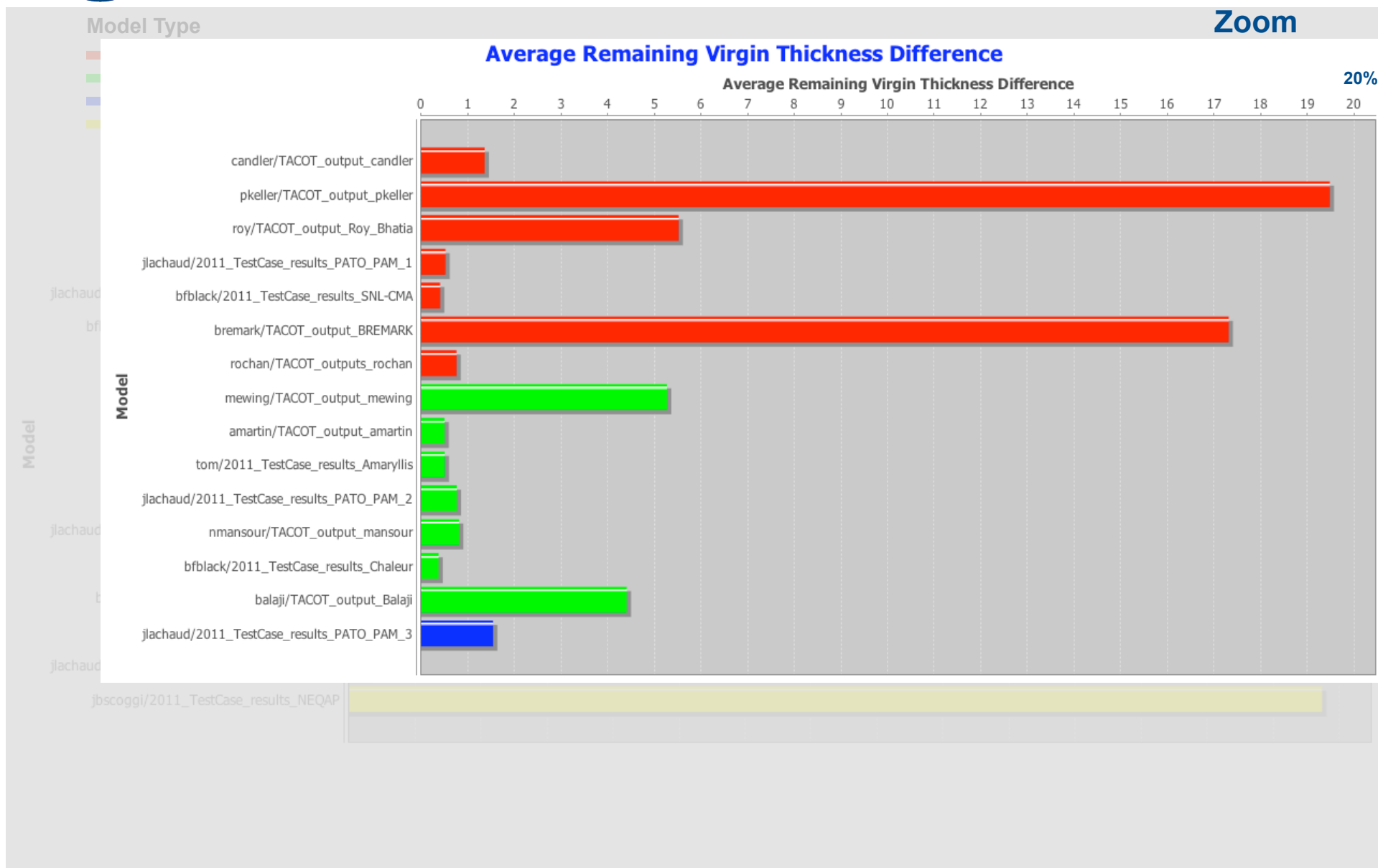
75%

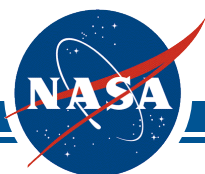




Average Remaining Virgin Thickness

Thermal Performance Database





Average Pyro. Gas Blowing Percent Difference

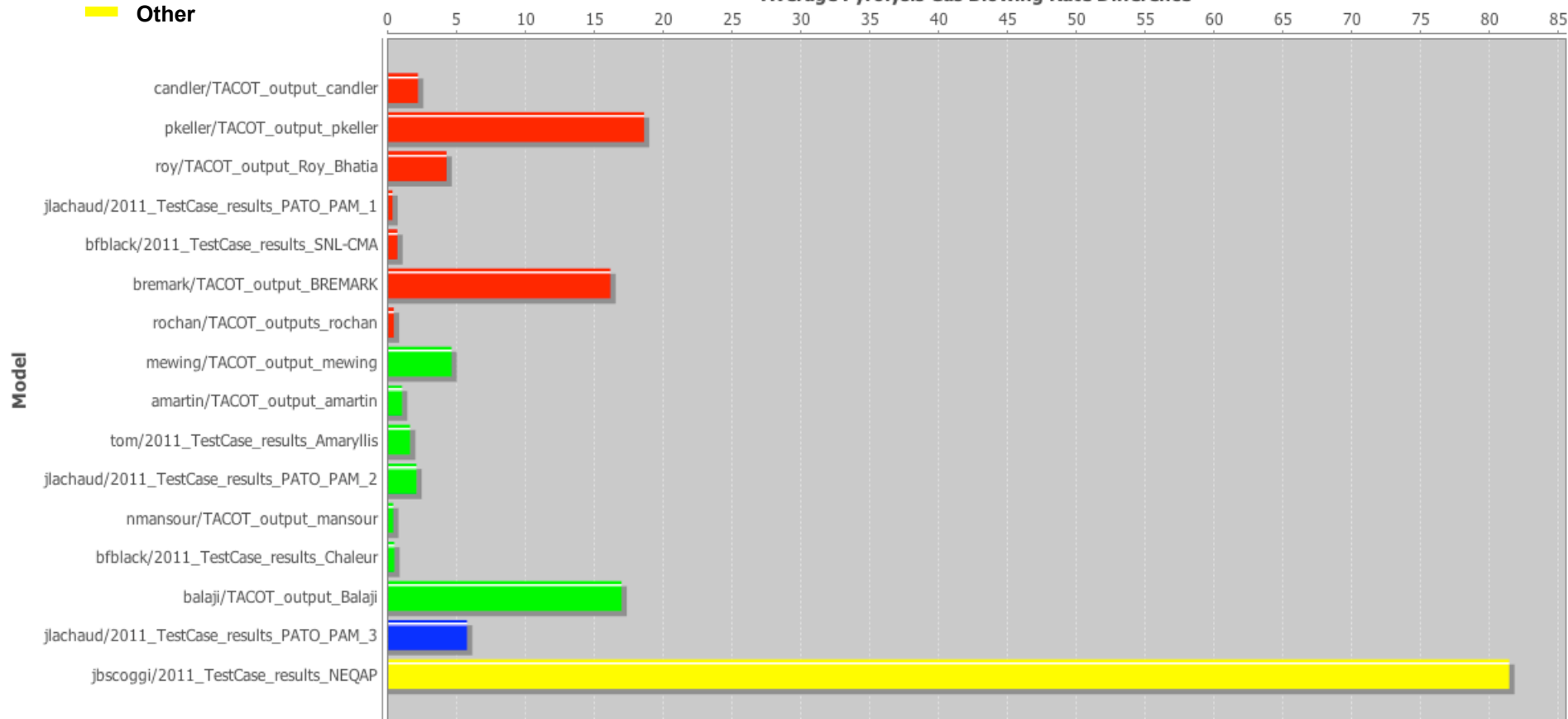
Thermal Performance Database

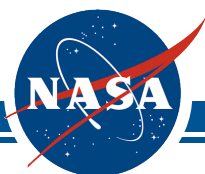
Model Type

- 1
- 2
- 3
- Other

Average Pyrolysis Gas Blowing Rate Difference

Average Pyrolysis Gas Blowing Rate Difference





Average Pyro. Gas Blowing Percent Difference

Thermal Performance Database

Zoom

Average Pyrolysis Gas Blowing Rate Difference

Average Pyrolysis Gas Blowing Rate Difference

19%

