How is the error computed:

Relative residual:

$$\text{RR} = \frac{\|b - Ax\|}{\|b\|}$$

| Name | av. RR | Failure rate |
|---|---|---|
| TAMU 500 | | |
| CPU/GPU | $1.52 \cdot 10^{-7}$ | 0 % |
| Case 118 | | |
| CPU/GPU | $4.40 \cdot 10^{-6}$ | 0 % |
| RTS – 1 TP | | |
| CPU/GPU | $2.21 \cdot 10^{-7}$ | 0% |
| RTS – 2 TP | | |
| CPU/GPU | $3.74 \cdot 10^{-7}$ | 0% |
| ACTIVSg200 | | |
| CPU/GPU | $3.02 \cdot 10^{-7}$ | 0% |
| ACTIVSg2000 | | |
| CPU/GPU | $7.31 \cdot 10^{-7}$ | 0% |
| ACTIVSg10k | | |
| CPU/GPU | $1.16 \cdot 10^{-6}$ | 0% |
| ACTIVSg70k | | |
| CPU/GPU | $4.93 \cdot 10^{-7}$ | 0% |

Table 1: The error levels achieved in PaStiX. Failure rate is 0% for all the test cases.

All results presented in this document have been computed on one node of the PNNL marianas supercomputer. PaStiX computations can be split into nine basic phases:

1. Internal csc
2. Coeftab
3. Ordering
4. Symbolic factorization
5. Reordering
6. Mapping and scheduling
7. Factorization
8. Solve
9. Iterative refinement

| TAMU 500 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Method | Internal csc | Coeftab | Order | Symbol | Reorder | Map | Factor | Solve | Refine | Total |
| CPU | 0.0197 | 0.0092 | 0.4024 | 0.0041 | 0.0248 | 0.0051 | 0.0882 | 0.0085 | 0.0119 | 0.5739 |
| GPU | 0.0198 | 0.0093 | 0.4049 | 0.0041 | 0.0248 | 0.0052 | 0.0885 | 0.0085 | 0.012 | 0.5771 |

| Case 118 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Method | Internal csc | Coeftab | Order | Symbol | Reorder | Map | Factor | Solve | Refine | Total |
| CPU | 0.142 | 0.0489 | 3.042 | 0.0286 | 0.0896 | 0.0305 | 0.3887 | 0.0554 | 1.5238 | 5.3491 |
| GPU | 0.1481 | 0.0465 | 3.1728 | 0.0307 | 0.1082 | 0.0308 | 0.3969 | 0.0573 | 1.5777 | 5.5689 |

| RTS-1 TP | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Method | Internal csc | Coeftab | Order | Symbol | Reorder | Map | Factor | Solve | Refine | Total |
| CPU | 0.0005 | 0.0002 | 0.0099 | 0.0003 | 0.0008 | 0.0002 | 0.0035 | 0.0004 | 0.0001 | 0.0157 |
| GPU | 0.0005 | 0.0002 | 0.01032 | 0.0002 | 0.0006 | 0.0002 | 0.0033 | 0.0004 | 0.0001 | 0.0158 |

| RTS-2 TP | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Method | Internal csc | Coeftab | Order | Symbol | Reorder | Map | Factor | Solve | Refine | Total |
| CPU | 0.001 | 0.0004 | 0.02479 | 0.0004 | 0.0017 | 0.0005 | 0.0076 | 0.0008 | 0.0006 | .0379 |
| GPU | 0.001 | 0.0006 | 0.0253 | 0.0004 | 0.0014 | 0.0005 | 0.0076 | 0.0008 | 0.0006 | .0382 |

| ACTIVSg200 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Method | Internal csc | Coeftab | Order | Symbol | Reorder | Map | Factor | Solve | Refine | Total |
| CPU | 0.001 | 0.0004 | 0.0263 | 0.0003 | 0.0013 | 0.0004 | 0.0073 | 0.0007 | 0.0001 | 0.0377 |
| GPU | 0.001 | 0.0003 | 0.0213 | 0.0003 | 0.0015 | 0.0004 | 0.0066 | 0.0006 | 0.0001 | 0.0321 |

| ACTIVSg2000 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Method | Internal csc | Coeftab | Order | Symbol | Reorder | Map | Factor | Solve | Refine | Total |
| CPU | 0.0153 | 0.0085 | 0.3556 | 0.0048 | 0.0174 | 0.0073 | 0.0848 | 0.009 | 0.0048 | 0.5076 |
| GPU | 0.0146 | 0.0079 | 0.361 | 0.0046 | 0.0202 | 0.006 | 0.0856 | 0.0092 | 0.005 | 0.5142 |

| ACTIVSg10k | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Method | Internal csc | Coeftab | Order | Symbol | Reorder | Map | Factor | Solve | Refine | Total |
| CPU | 0.0907 | 0.0338 | 1.6269 | 0.0225 | 0.0703 | 0.0345 | 0.3239 | 0.0481 | 0.7391 | 2.9897 |
| GPU | 0.0966 | 0.0363 | 1.6772 | 0.0224 | 0.0845 | 0.0344 | 0.3302 | 0.0487 | 0.739 | 3.0693 |

| ACTIVSg70k | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Method | Internal csc | Coeftab | Order | Symbol | Reorder | Map | Factor | Solve | Refine | Total |
| CPU | 0.8378 | 0.2742 | 13.4336 | 0.1793 | 0.5734 | 0.3912 | 2.366 | 0.4065 | 0.2232 | 18.6851 |
| GPU | 0.8222 | 0.268 | 13.4487 | 0.1771 | 0.6525 | 0.38 | 2.371 | 0.3989 | 0.2205 | 18.7389 |

Table 2: PaStiX performance on the CPU and on the GPU.

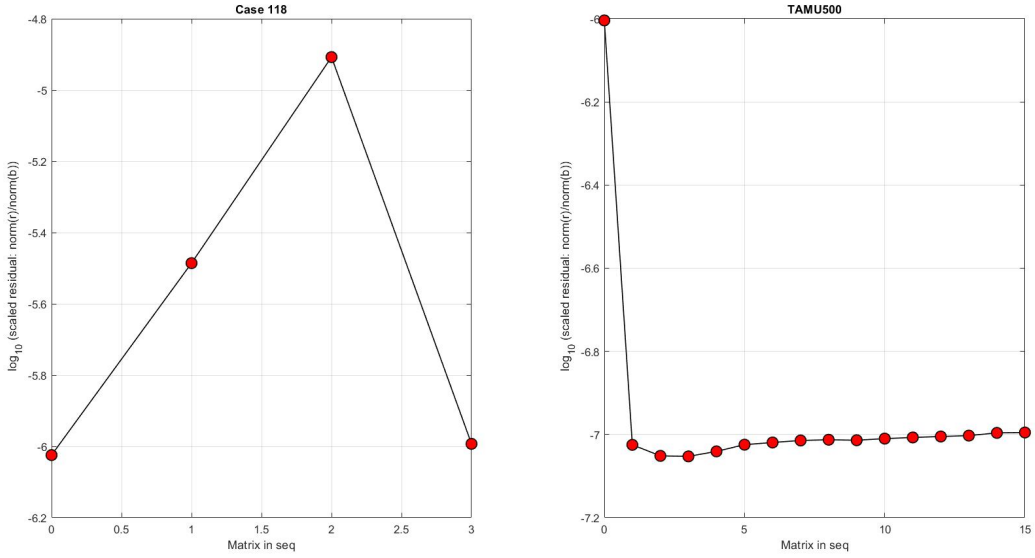


Figure 1: RR for Case 118 (left) and TAMU500 (right)

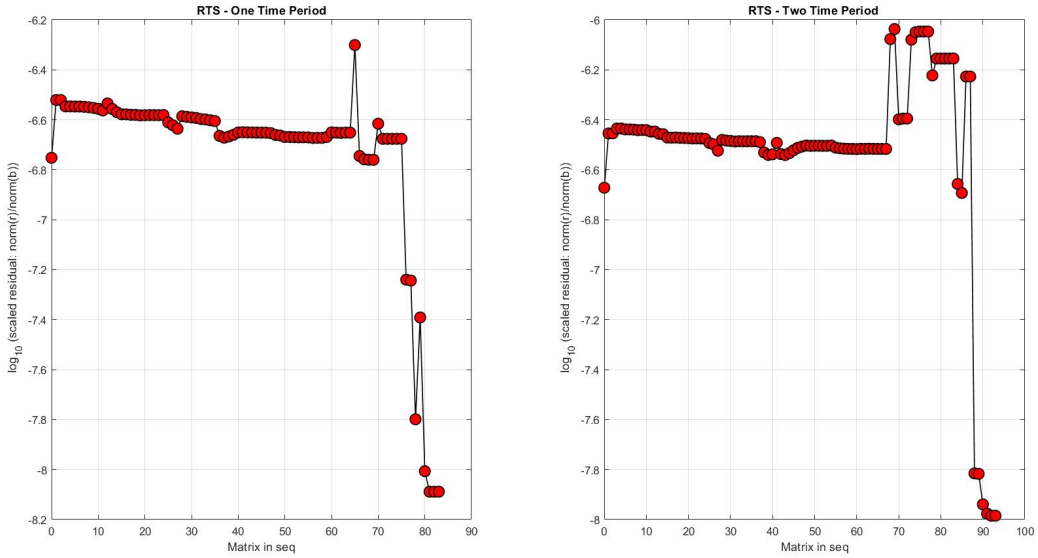


Figure 2: RR for RTS 1 TP (left) and (right) RTS 2 TP

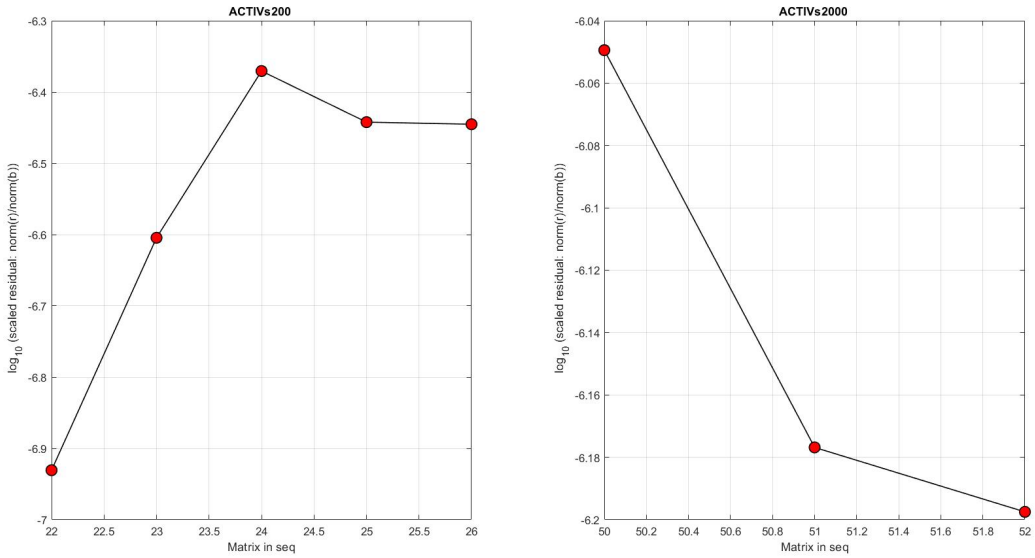


Figure 3: RR for ACTIVs200 (left) and ACTIVs2000 (right)

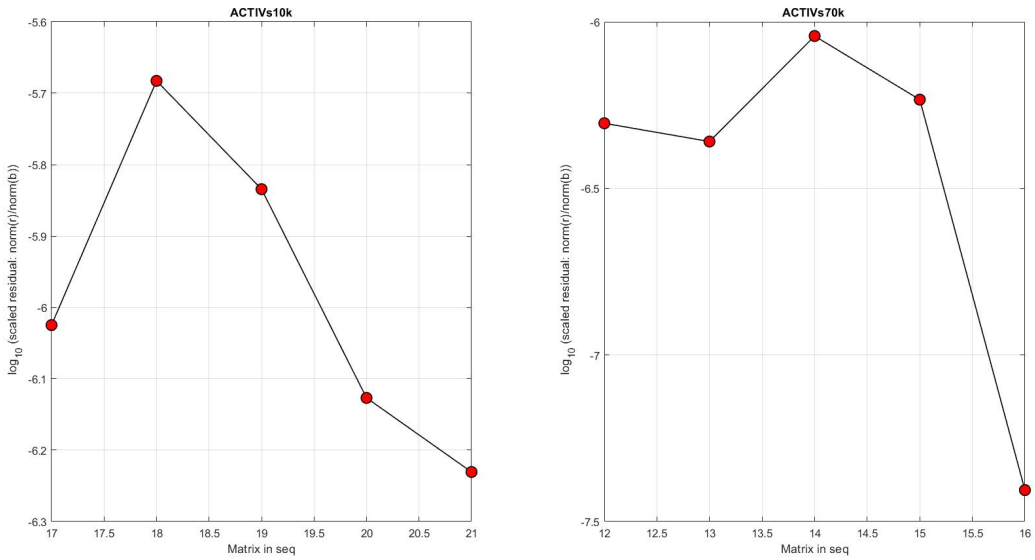


Figure 4: RR for ACTIVs10k (left) and ACTIVs70k (right)