Measuring GPU Power Consumption using NVIDIA Tools

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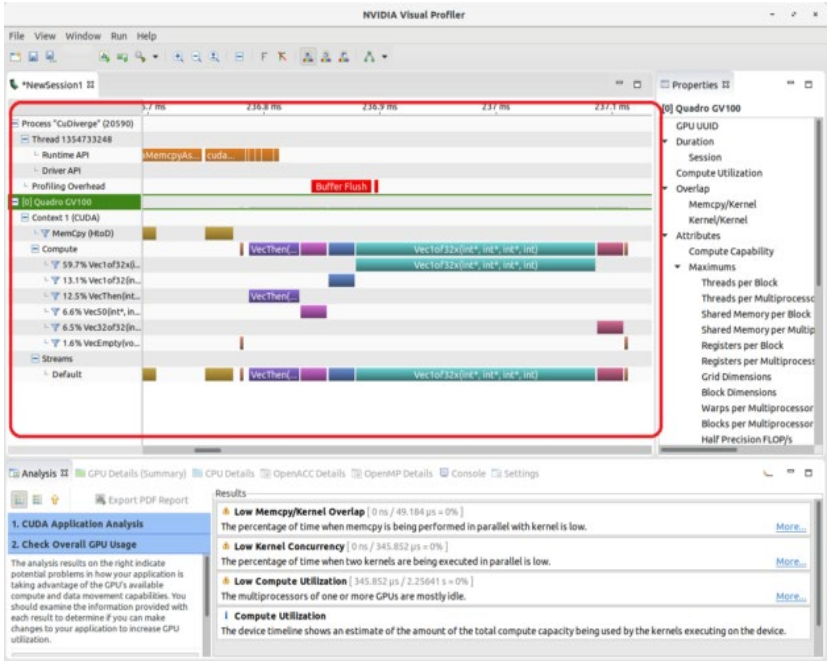
Contents

Background : Power Usage - HPCs

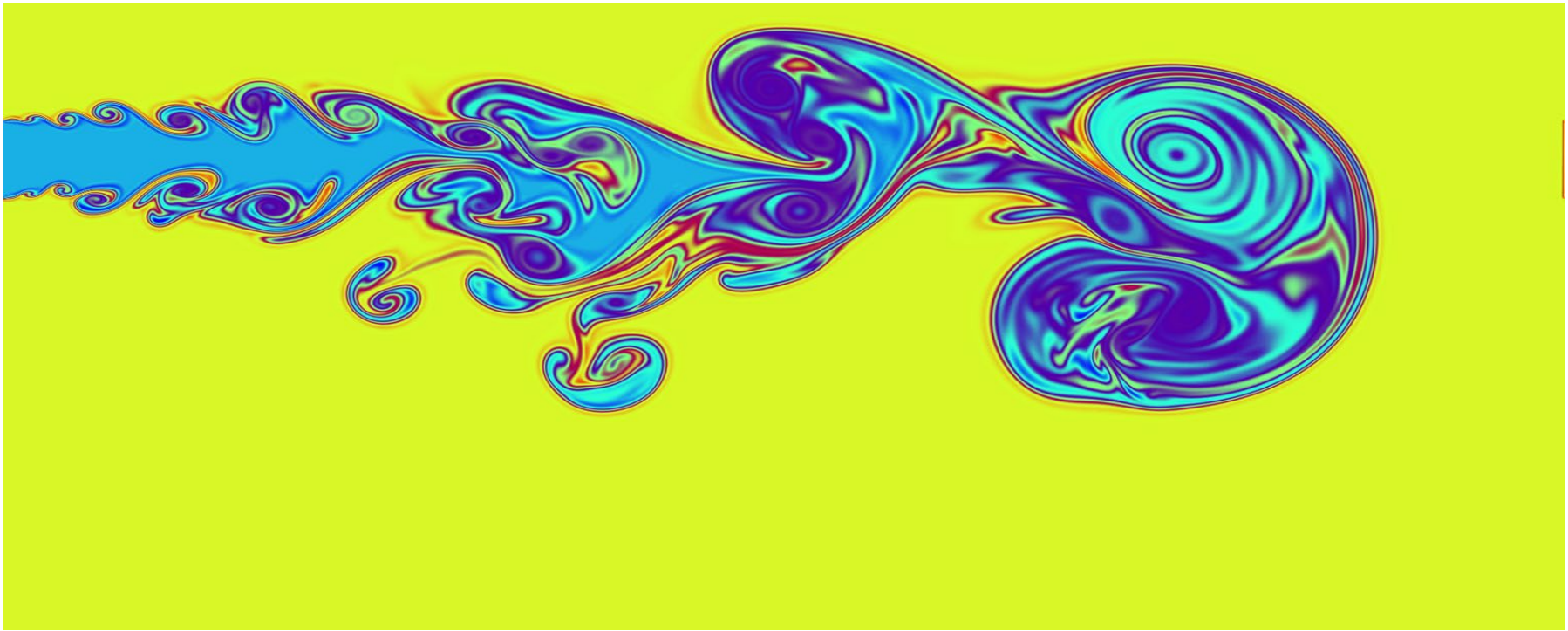
- Why should we care?
- HPC's consume massive amounts of resources
- There are no standard software packages to measure power consumption of GPUs
- A universal, reliable, standard manufacturer and architecture agnostic GPU power consumption package would make great strides in reducing these amounts
- Unfortunately, measuring the exact energy usage is often non-trivial because it requires interfacing with specialized hardware and understanding the measurement limitations
- Often estimates of energy usage use different assumptions and can be inconsistent even on similar hardware.

NVIDIA SMI/NVPROF

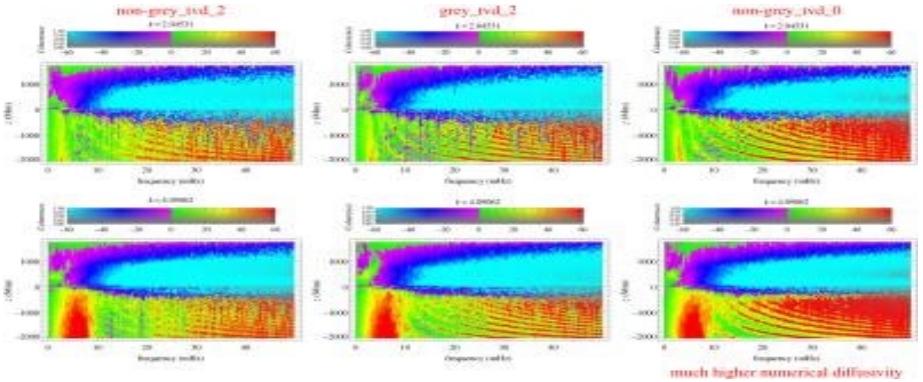
```
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 440.118.02   Driver Version: 440.118.02   CUDA Version: 10.2     |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|===============================+======================+======================|
|   0  Tesla P100-PCIE...  Off  | 00000000:00:04.0 Off |                    0 |
| N/A   47C    P0    34W / 250W |  11661MiB / 16280MiB |      0%      Default |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                       GPU Memory |
|  GPU       PID   Type   Process name                             Usage      |
|=============================================================================|
|    0     14229      C   /usr/bin/python3                            897MiB |
|    0     21047      C   /usr/bin/python3                            897MiB |
+-----------------------------------------------------------------------------+
```

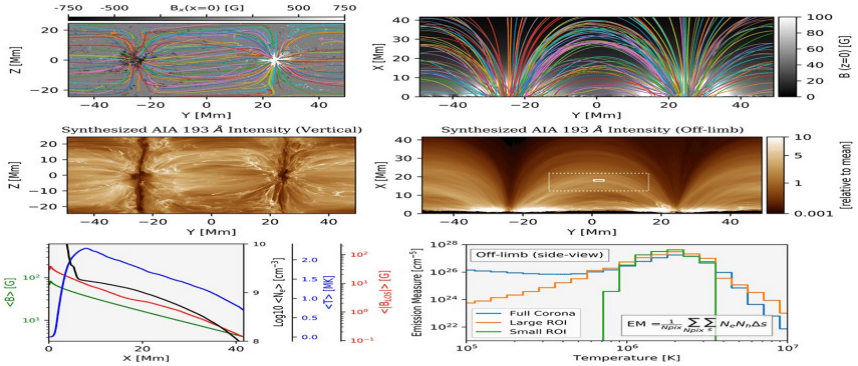


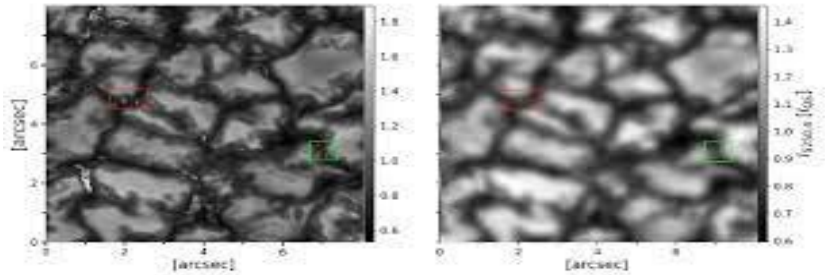
Miniweather

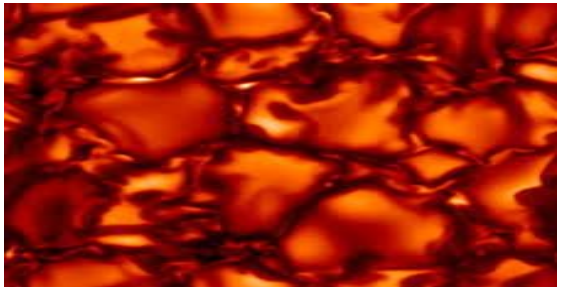


MuRAM Use Cases









Design:
Procedure for running GPU_Power on Casper

Application	GPU_Power	GPU_Power_Parse.py
• Run the application on Casper cluster • Retrieve hostname of the node where the application is running • ssh to the node where the application is running	• Shell script that utilizes NVIDIA's SMI to capture power consumption • Run the GPU_Power script right after application has started	• Python regex script to parse GPU_Power output text file from the run and print the summary of power measurements

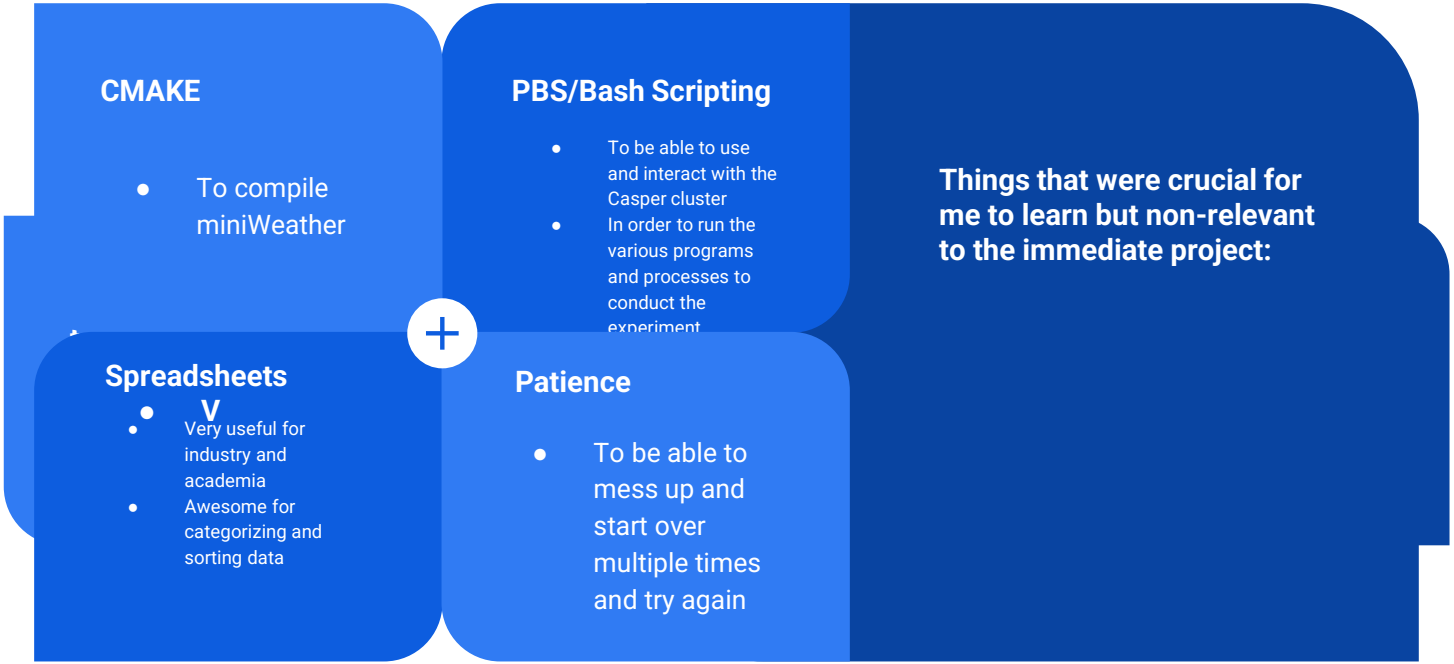
Process of Academic Research:

- Re-evaluating my pre-conceived notion of what it means to conduct academic research
- Encountering hurdles & frustrations in the course of research
- Evaluation of my research conduction over the summer and how it can be improved

Lessons & Techniques Learned:

- Conducting research in computing for me is a marathon, not a sprint
- Patience is key in academic research
- Learning both formal and informal methods of Professional Development
- General reorientation of life goals

Lessons & Techniques Learned:



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