### M3D-C1 ZOOM Meeting 01/24/2022

#### **CS** Issues

- 1. Perlmutter status
- 2. Mesh adaptation update
- 3. NERSC Time
- 4. Changes to github master since last meeting
- 5. Regression tests
- 6. Python postprocessor demo -- Kleiner

**Physics Studies** 

- 1. 2D ITER Pellet Run
- 2. RE formation with pellets Zhao
- 3. Update on Soft beta limit study

#### Note: meeting minutes posted on m3dc1.pppl.gov

# In attendance

Steve Jardin Adelle Wright Dingyun Liu Hank Strauss Nate Ferraro P Sinha Chang Liu Anders Kleiner Brendan Lyons Jin Chen Chen Zhao

Mark Shephard Seegyoung Seol Morteza Siboni

# **Perlmutter status**

- ST=1 compiling fails due to netcdf...Jin
- Existence of "module load m3dc1/devel-Perlmutter "?? --Nate
- Problem with installing PETSc with NVIDIA...Seegyoung

# Mesh adaptation update

- Pellet case .... Brendan
- Interest in Soft-Beta-Limit case ?

# **NERSC** Time

#### mp288



- New award period began Jan 19
- We are NESAP Tier 2. . Phase-I w GPUs We have been given a repo m3984 with a small allocation
- N9ES-N2 M3D-C1: J. Chen , C. Liu, S. Seol are early users

# New FY22 allocation (started Jan 19)

Project name: mp288 CPU Node Hours Award: 75,000 GPU Node Hours Award: 7,000 Archive Storage Award (TB): 157 Project CFS Award (TB): 20

One "CPU Node Hour" is the equivalent of 400 "NERSC Hours" 75000 CPU Node Hours → 30 M NERSC Hours !!!

- → For 2022, the Machine Charge Factors are:
- → Perlmutter CPU Nodes: 1.0
- → Cori KNL Nodes: 0.20
- → Cori Haswell Nodes: 0.34

and the charge units are "CPU Node Hours"

# Changes to github master since 01/10/22

Nate Ferraro:

**01/21/22**: Updated adapt regtest on centos7 and greene to use "ts0-adapted.smb" as adapted mesh filename

**01/13/22:** added option /wall\_region to plot wall regions in plot\_field.pro

01/13/22: Updated output version number

01/12/22: output wall region info to hdf5

#### **Brendan Lyons:**

**01/21/22**: Implemented velocity boundary conditions with multiple fields inoslip\_pol = 2 and inonormalflow=2

Steve Jardin:

**01/17/22:** set gamma\_gr = 0 at NTIME=0 so adapt regtest will pass on some systems

# **Local Systems**

- PPPL centos7(01/24/22)
  - 7 jobs PASSED
- PPPL greene (01/24/22)
  - 5 jobs PASSED
- STELLAR (01/21/22)
  - 7 regression tests PASSED on stellar
  - adapt field energies off by 0.02%
  - Number of triangles 6513 (not 6551)
- TRAVERSE(01/24/22)
  - 7 regression tests PASSED

# **Other Systems**

- Cori-KNL (01/22/2022)
  7 regression tests PASSED
- Cori-Haswell (01/22/2022)
  7 regression tests PASSED
- Perlmutter (01/08/2022)
  - ST=1 version doesn't compile: Unable to open netdf.mod
  - "make all" does not work
  - Executables not found in PATH
- MARCONI
  - All regression tests PASSED on MARCONI (J. Chen, 9/04/20)

# **Python Demo**

- A link to the python documentation at ..../unstructured/python/Documentation.pdf was added to NEWDOC
- Andreas will give a demo

# ITER 2D Pellet run with inoslip\_pol=2



Unstable from the start: Instability not dependent on: amuc, dt, hyperi,hyperv,denm,inocurrent\_pol, inocurrent\_tor

# ITER 2D Pellet Run with inoslip\_pol=1 (denm=2.59E-5)



# **3D Simulation of RE generation with neon pellet**

Chen Zhao to present.

# **Update on Soft Beta Limit Study**



# **Trend is similar to experiments on NSTX**



- M3D-C1: Central temperature decreases with  $\beta$ •
- Exp data: Central transport increases with  $\beta$ •

# **M3DC1** shows similar scaling with $B_T$ as experiment



### More realistic: Start with stable equilibrium and apply heating power: First in 2D



5.8%

### Summary of 0 < t < 3000 $\tau_{\text{A}}$



3000 < t < 6000



# That's All I have

Anything Else ?

# Next Meeting in 2 weeks: Feb 7

# **Update on Soft-Beta-Limit Study**

0.8 cm

0.4 cm





These are close-ups in center of grid (near magnetic axis)

# **Result of Convergence Study**



Solution for jphi still very noisy in region 0.5 < R < 0.9, even for the finest grid with 0.2 cm in center

### **Grid was not refined where J gets jagged** 0.8 cm 0.2 cm



Now producing better grids that are refined where the current gets jagged