M3D-C1 ZOOM Meeting

03/14/2022

Upcoming Meetings

CS Issues

1. Mesh adaptation update
2. Software updates
3. NERSC Time
4. Changes to github master since last meeting
5. Regression tests
6. oom on cori-haswell

Physics Studies

1. Fixed boundary question
2. q-diagnostic question
3. Update on Soft beta limit study
4. RWTM in DIII-D and JET -- Strauss

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

In attendance

Steve Jardin
Adelle Wright
Chen Zhao
Hank Strauss
Jin Chen
P Sinha
Chang Liu
Anders Kleiner
Brendan Lyons
Jin Chen
Mark Shephard
Seegyoung Seol
Morteza

Upcoming Meetings

- Sherwood April 4-6 Santa Rosa, CA (in person)
  - CTTS Sunday April 3 –
    - Nate, Brendan, Adelle, me (in person)
    - Strauss (remote)
- ITPA: MHD, Disruptions, Control April 4-8 (remote)
- Runaway Electron Modeling, May 2-6 Garching (in person)
  - Abstract deadline April 10
- IAEA Technical Meeting on Plasma Disruptions and their Mitigation 19-22 July
  - In person at ITER HQ in France
  - Abstract submission by May 31

Mesh adaptation update

March 7 email:

I wanted to give you a quick update on the status of the 3D mesh adaptation. I am now able to run an adapt after a solve step and reconstruct the 3D mesh along with all the required fields for the next solve step (attached is a picture showing the adapted mesh and psi field value on each of the planes for the pellet example in the regression tests).

The solution on the next time step after adapting proceeds up to the point of computing "kprad_ionize". More specifically it fails here (https://github.com/PrincetonUniversity/M3DC1/blob/1795042ea7839513a69fd775b03c74d1ad8ec04d/unstructured/kprad_m3dc1.f90#L602) where it tries to do a matrix solve with the following PETSC error:

PCSetUp_BJacobi() line 93 in ../petsc-3.13.5_real/src/ksp/pc/impls/bjacobi/bjacobi.c Too many blocks given

I was wondering if anyone had any suggestions on what might be causing an error like that.

Thanks,
Morteza

Software updates

Seegyoung: Friday March 11 (to Chang Liu)
Lately, I made changes to the mesh partitioning programs to remove the model file from the input argument.

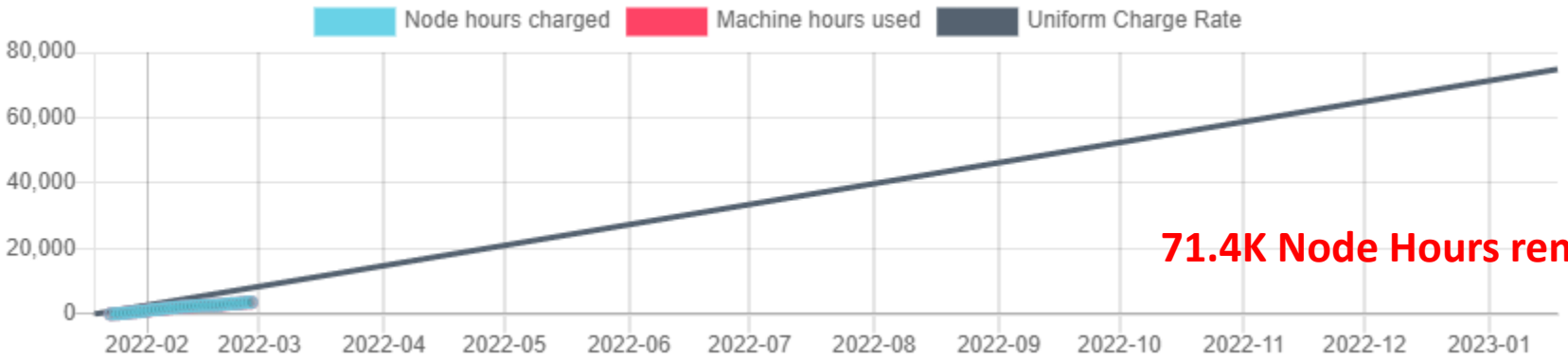
While I was working on Traverse, I found that you have installed your own PUMI used by traverse_gpu.mk. In order to update the mesh partitioning tools of your PUMI, please do the following: ……

J. Chen: Sunday March 13
pumi and scorec libs are updated on centos7 and the changes are committed. All regtests passed

J. Chen Monday March 14
Updated on Cori-Haswell and Cori_knl as well. All regtests passed

NERSC Time

mp288



71.4K Node Hours remaining!

- New award period began Jan 19
- We are NESAP Tier 2 for Pearlmutter. . Phase-I w GPUs We have been given a repo m3984 with a small allocation. Presently we are not being charged.
- N9ES-N2 M3D-C1: J. Chen , C. Liu, S. Seol are early users

Changes to github master since 02/07/22

Nate Ferraro:
03/01/22: Corrected filename issue when plotting with /wall_regions

Jin Chen:
03/13/22 : pumi & scorec libs updated on centos and greene

Adelle Wright:
03/03/22: Add read and initialize with MGRID in ST=1
03/03/22: Minor fix MGRID
03/04/22: ST: Added option to set Zernike interpolation order in C1input

Seegyoung Seol
03/11/22: adding pumi config.sh for PPPL

Local Systems

- PPPL centos7(03/11/22)
  - 7 jobs PASSED
- PPPL greene (03/11/22)
  - 5 jobs PASSED
- STELLAR (03/11/22)
  - 7 regression tests **PASSED** on stellar
- TRAVERSE(02/28/22)
  - 7 regression tests **PASSED** on (01/24/22)
  - 7 regression tests **FAILED** on (03/11/22)

Other Systems

- Cori-KNL (03/14/2022)
  7 regression tests **PASSED**

- Cori-Haswell (03/11/2022)
  7 regression tests **PASSED**

- Perlmutter (03/11/2022)
  - 6 regression tests **PASSED**
  - NCSX failed (twice) “missing options_block_jacobi.type_mumps”
  - pellet failed first time, then passed

OOM on cori_haswell

Trying to run a production job on cori_haswell

- Debug run of 10 timesteps works fine
- Submit production run, dies with oom at step 37
- Resubmit, dies with oom at step 33
- How is this possible?

Final printout

Advancing Fields
-- Reuse Preconditioner
slurmstepd: error: Detected 1 oom-kill event

/global/cfs/cdirs/mp288/Jardin/m3dnl/NSTX/120446

Fixed-boundary question

From Brendan Lyons (3/8/22)

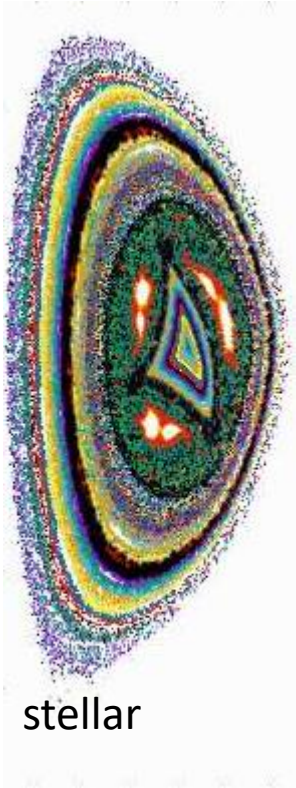
Would M3D-C1 work with a fixed-boundary equilibrium input, say from CHEASE or the like? In a fixed-boundary simulation, I'm not sure how it would properly read data outside the LCFS.

Seems like it would work in free boundary though since we just use p' and FF’.

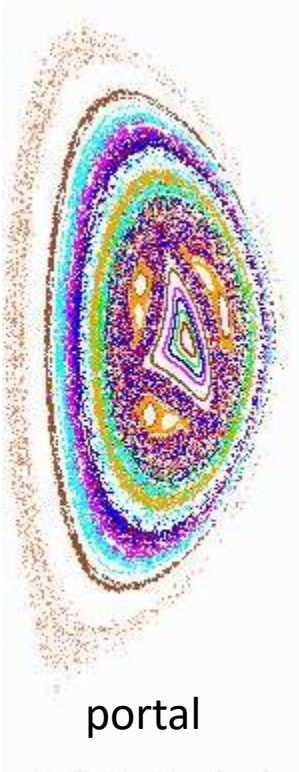
From Nate Ferror(3/8/22)

I recommend talking to Andreas Kleiner about this. He has been working with the MAST-U folks and has made some progress with using equilibrium data from MAST-U.

Question regarding q-diagnostic

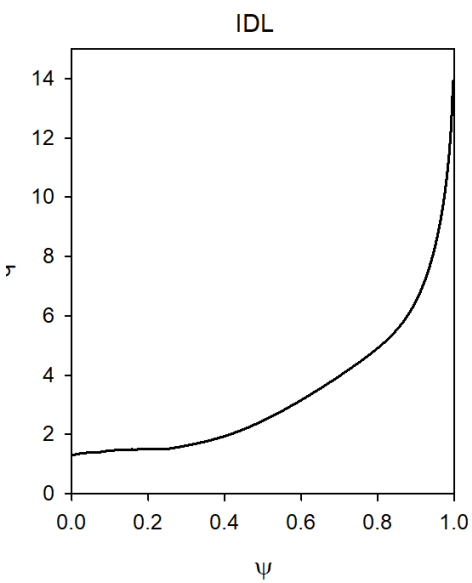


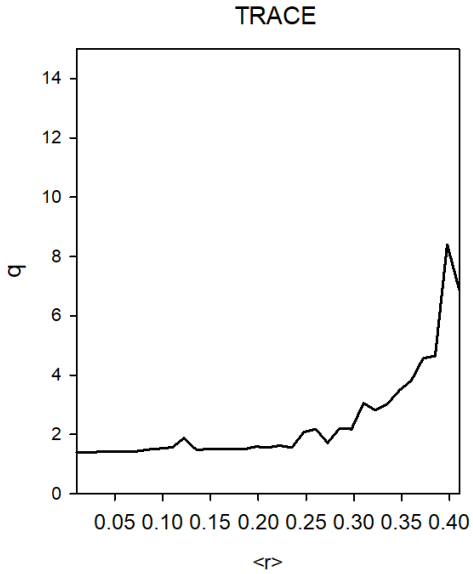
stellar



portal

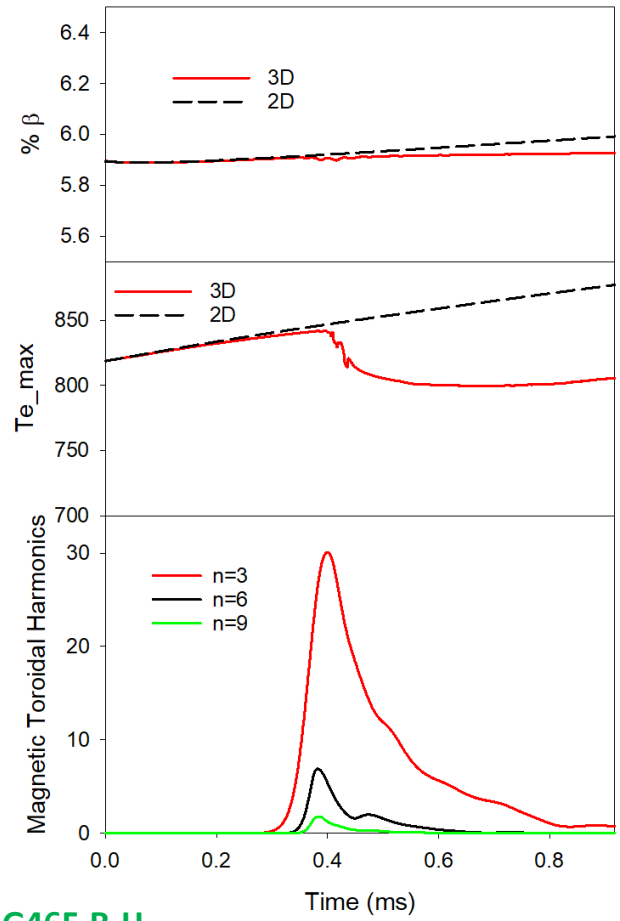
G46F4-H2 slice 60, t=6000

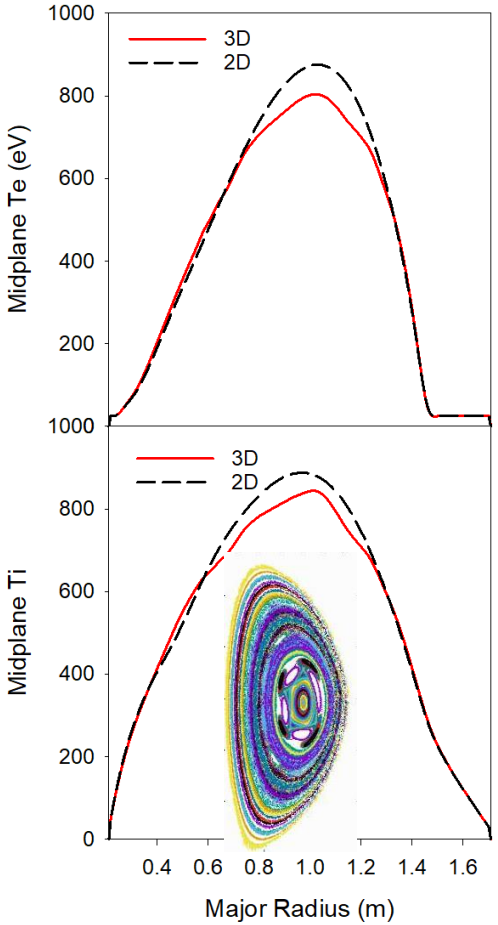




Q: Are either of these q-profiles meaningful?

Near stationary state sequence with rotation





- BS=1 case with low heating power and torque drive
- $\kappa_{\perp}$ = 1.e-5, $\kappa_{||}$ = 10 (Te only)
- Strengths of sources chosen to make 3D case approximately stationary
- Comparison of 2D and 3D case with same transport coefficients shows affects of 3D instability
- In 3D, β is slightly lower and Te(0) is significantly lower
- Te more affected than Ti

G46F-R-H

RWTM in DIII-D and JET

Hank Strauss to update

That’s All I have

Anything Else ?

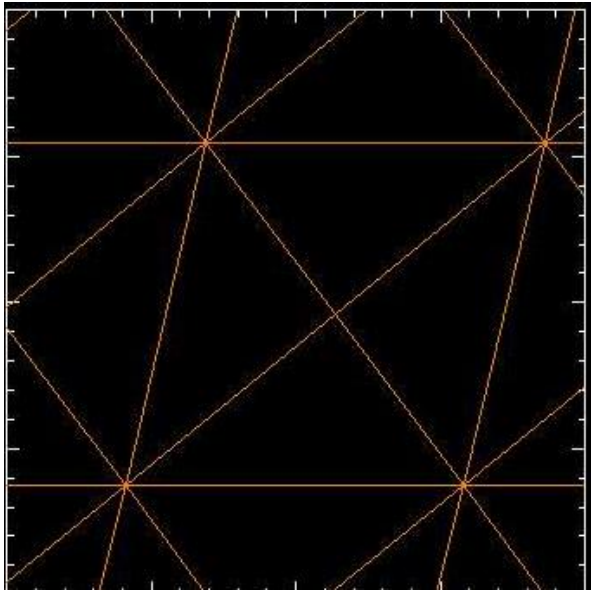
Next Meeting in 2 weeks

In attendance

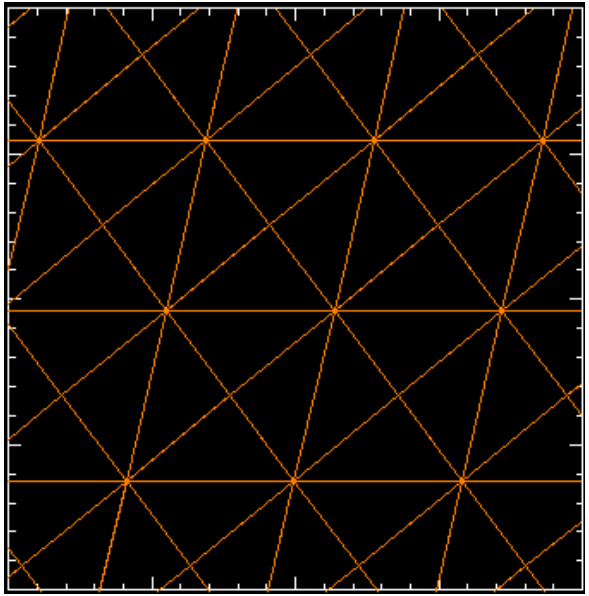
Steve Jardin
Adelle Wright
Dingyun Liu
Hank Strauss
Nate Ferraro
P Sinha
Chang Liu
Anders Kleiner
Brendan Lyons
Jin Chen
Chen Zhao
Cesar Clauser
Mark Shephard
Seegyoung Seol
Usman Riaz

Update on Soft-Beta-Limit Study

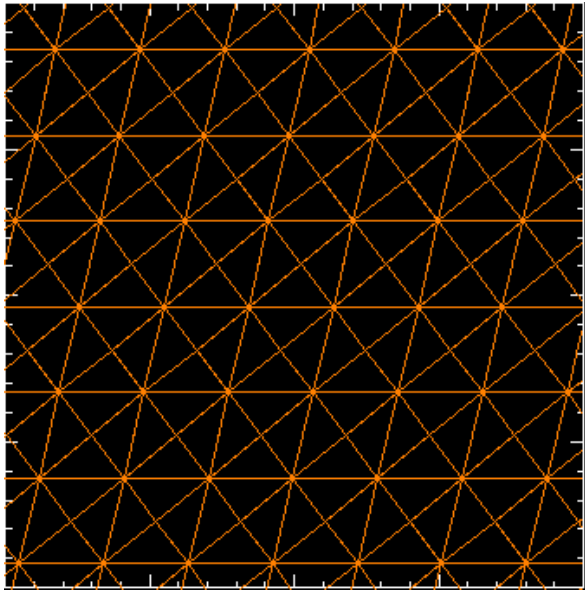
0.8 cm



0.4 cm

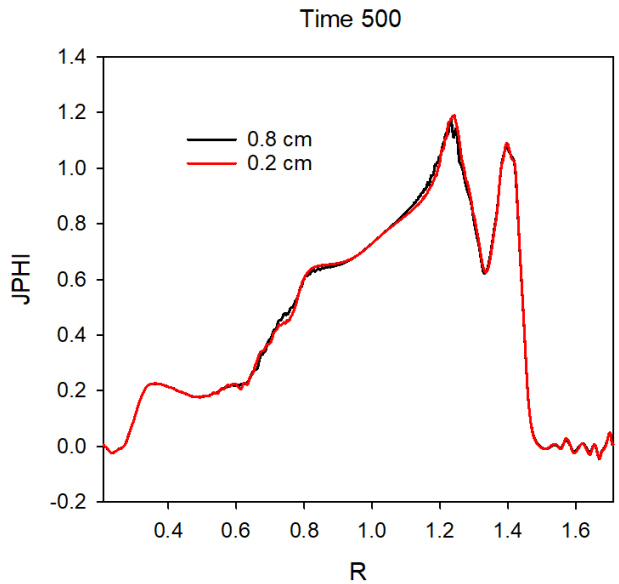


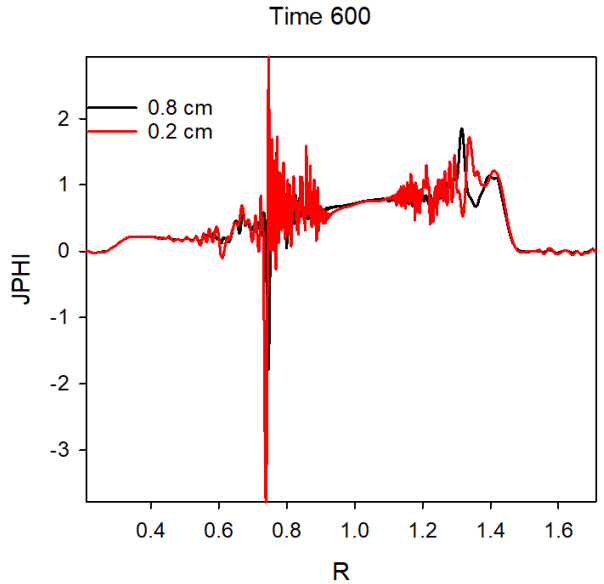
0.2 cm



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

Result of Convergence Study

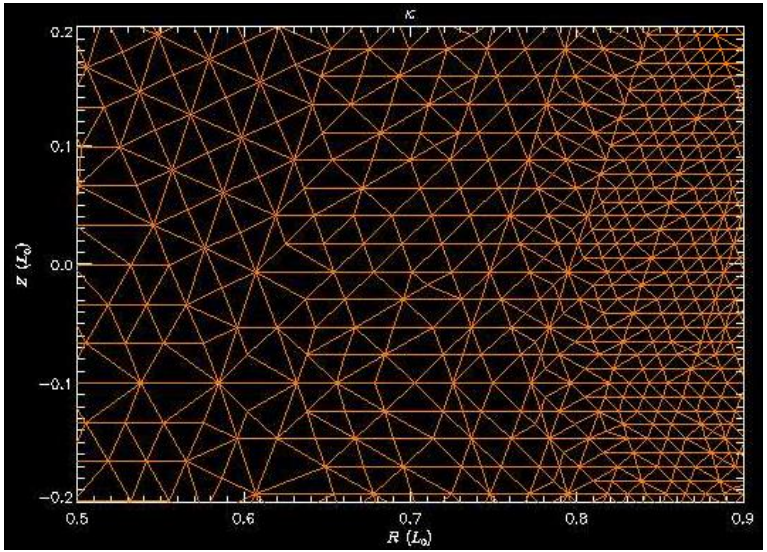




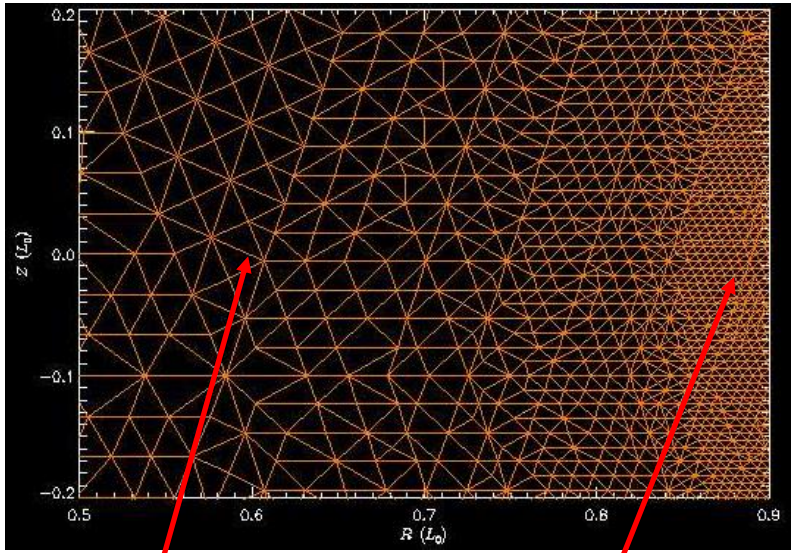
Solution for jphi still very noisy in region 0.5 < R < 0.9, even for the finest grid with 0.2 cm in center

Grid was not refined where J gets jagged

0.8 cm



0.2 cm



Resolution increased here

But not here

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