M3D-C1 ZOOM Meeting

07/31/2023

Upcoming Meetings

CS Issues

1. Adaptation update --RPI
2. Reduced precision SuperLU …Jin Chen
3. NERSC Time
4. Changes to github master since last meeting
5. Regression tests
6. MIT SPARC cluster

Physics Studies

1. 2D RE simulation
2. Helical Current Paths in Conductors
3. Attempt to read a geqdsk from TRANSP
4. Anything else

NOTE: Mark Adams multigrid seminar in on Aug 10, not Aug 8

In attendance

Steve Jardin
Saurabn Saxena
Chang Liu
Jin Chen
Brendan Lyons
Cesar Clauser
Priyanjana Sinha
Chen Zhao
Nate Ferraro
Adelle Wright
Hank Strauss
MG-Yoo

Usman Riaz
Seegyoung Seol

She

Upcoming Meetings

ITPA(MHD)	Sept 19-22	General Atomics
IAEA	Oct 16-21	London, UK
APS	Oct 30 – Nov 1	Denver, CO
AAPPS-DPP	Nov 12-17	Nagoya, JP

Adaption Update

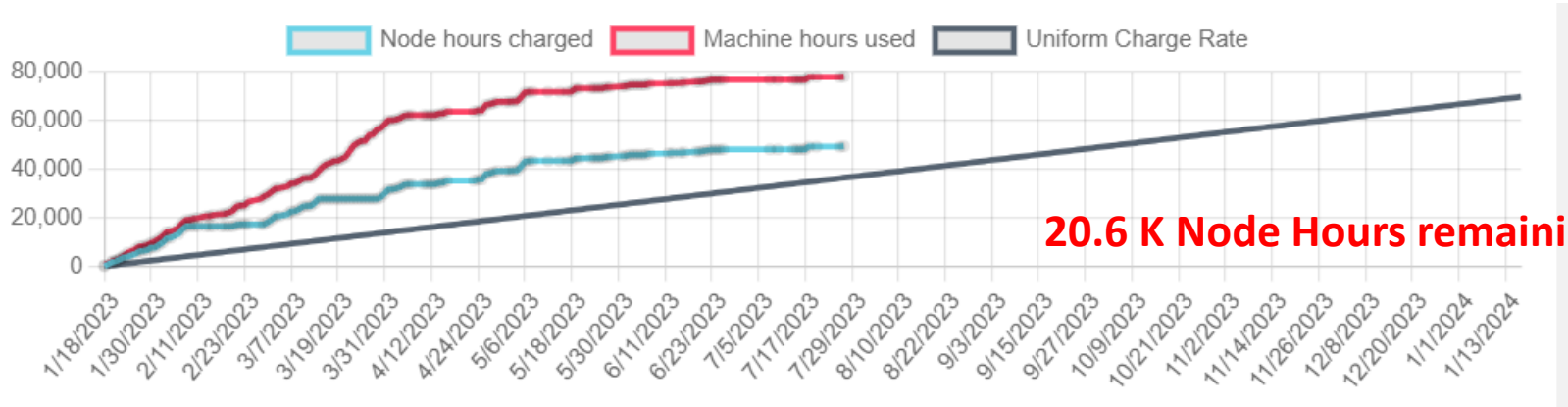
RPI?

Reduced Precision SuperLU

I reran a large Perlmutter_cpu case (256-L/Run10 with the new PETSc directive
-pc_precision single”
and saw essentially no change in running time or GMRES iterations

NERSC Time 2023

mp288



20.6 K Node Hours remaining!

- MP288 usage rate is a bit high but leveling off
- Also, 6K k GPU node hours remaining.
- I have contacted DOE to see the likelihood of getting more time – no time available now but more may become available at next clawback

Changes to github master --after 2023-07-10 (1 of 2)

Nate Ferraro:
07/11/23: Removed some vestigial debug output
07/26/23: Implemented CZ's change to time_step.f90 removing call to runaway_advance

Jin Chen
07/18/23: update stellar.mk
07/22/23: update traverse-nvhpc.mk
07/20/23: update perlmutter_cpu.mk
07/21/23: update mit_gcc.mk
07/24/23: update centos7.mk, remove obsolete files
07/26/23: update modules/traverse/m3dc1/devel-nvhpc
07/27/23: update Perlmutter_cpu.mk

Seegyoung Seol
07/10/23: meshgen updated to support MIT
07/11/23: fixing cross-device mesh file ver mismatch on MIT
07/11/23: m3dc1_meshgen for Stellar updated
07/13/23: removing sim config files

Usman Riaz
07/11/23: Fixed a minor issue in a test file

Changes to github master --after 2023-07-10 (2 of 2)

Min-Gu Yoo:

07/18/23: Feature/initial guess (#64)

- New input parameter: isolve_with_guess
- Implement solve_with_guess
- Implement newsolve_with_guess (for scorec matrix)

newsolve_with_guess subroutine takes an additional non-zero vector input to be used an in initial guess for KSPSolv
In step_split, for each newsolve, previous step's value is selected as the initial guess input.
It needs to be checked if the initial guess values are selected correctly.

- Define kprad_n_prev and use newsolve_with_guess in kprad_advec
- New configuration file of stellar-intelmpi-complex-config
- Set temporary SCOREC_DIR in stellar.mk for compiling unstructured src file

On the stellar cluster, lib files in "projects/M3DC1/scorec/202306" are copied into "/home/myoo/M3D_BUILD"
In addition, the following lib files are newly compiled and added into "/home/myoo/M3D_BUILD":
libm3dc1_scoreca libm3dc1.scorec_complex.a
When compiling unstructured src files, they see lib files in "/home/myoo/M3D_BUILD" so that they can find new"*_guess_*" functions/routines correctly.

- Define and allocate kprad_n_prev only if isolve_with_guess==1
- Reset initial guess to Zero if ksptype is "preonly"

Local Systems

- PPPL centos7(07/28/23)
  - 7 jobs PASSED
- PPPL greene (07/28/23)
  - 5 jobs PASSED
- STELLAR (07/28/23)
  - 7 regression tests **PASSED** on stellar
- TRAVERSE-nvhpc (07/30/23)
  - All jobs **PASSED** for Jin Chen. My jobs in queueu

NERSC

- Perlmutter_cpu (07/31/23)
  - 6 jobs **PASSED**
  - adapt **FAILED** with a Segmentation violation

- Perlmutter_gpu (07/31/2023)
  - 4 jobs **PASSED**
  - NCSX, KPRAD_2D **FAILED** with very small differences
  - adapt **FAILED** with a Segmentation violatio

MIT SPARC cluster

Cesar Clauser email 7/14/23

There is an error that appears in the log files of all my runs (at least on the ones in the sparc cluster):

Error: phantom edge!

This error appears thousands of times after the GS solver.

Seegyoung Seol email 7/24/23:

I installed "check_mesh" in /orcd/nese/psfc/001/software/scorec/gcc12.2.0-openmpi4.1.4/petsc3.19.2/bin/check_smb

This program investigates an input mesh and prints any invalid aspects of the mesh. At the end, the mesh size (# global, local, and owned entities per dimension) is printed.

Based on "check_mesh", your mesh is valid. The message "phantom edge" is printed by .f90 so someone from PPPL has to confirm the condition for that print statement is valid.

2D RE Simulation

Cesar Clauser email 7/26/23

I've been trying to run a 2D nonlinear simulation with runaways (RE). I started from equilibrium and induced a TQ via increased \kappa_perp. The simulation without RE ran well, but when adding RE it goes numerically unstable at very early stages.

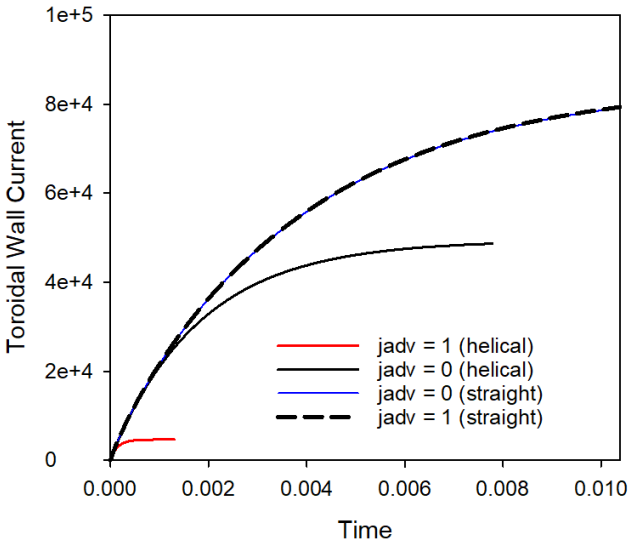
7/27/23

I created a new branch called "runaways-opt"
The idea is to have runaways field always, but if "irunaway==0" then every contribution should be zero.
This will allow to turn runaways on later in the simulation, at a restart time.

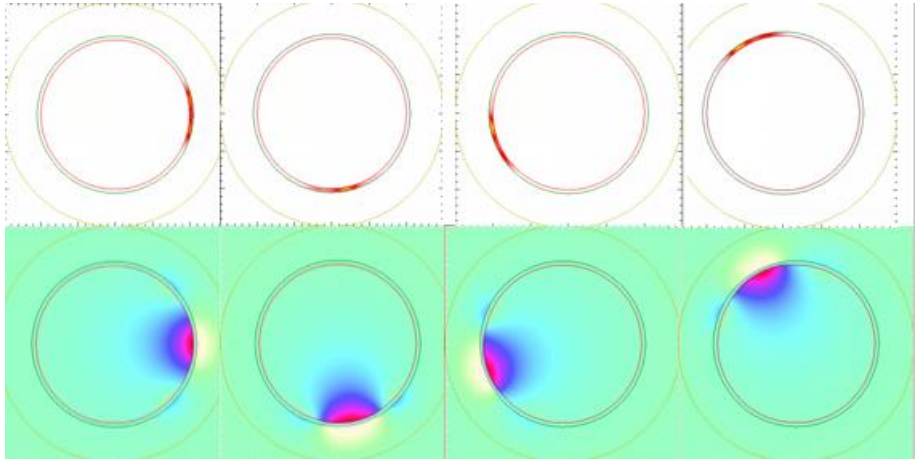
Chen Zhao 7/28/23

I changed the init_common.f90 adding a parameter rjra multiple the nre_79 when irunaway == 1 and its default value is 0.

Helical Current Paths in Conductor

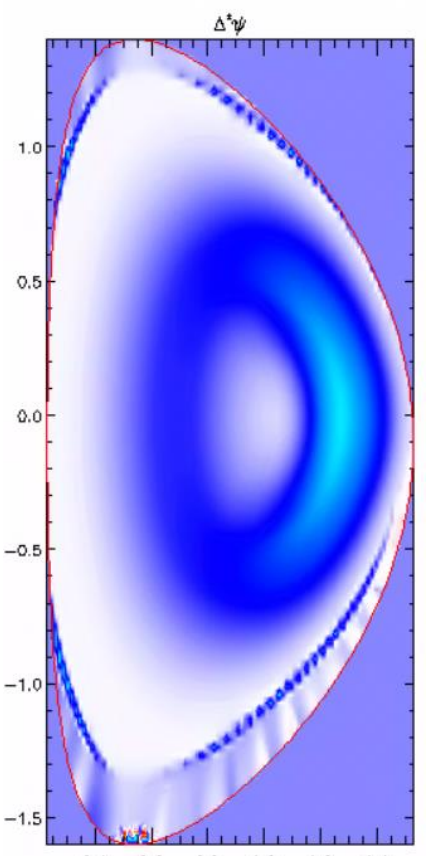


Helical coil results are very different for jadv=0 or 1



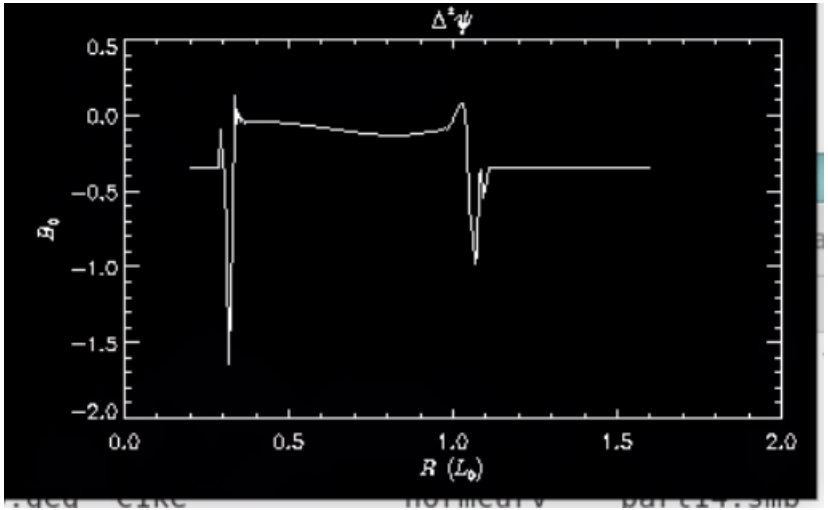
Top: Toroidal current and Bottom: Toroidal Field at for calculation with jadv=0 (helical)

Attempt to read a geqdsk from TRANSP



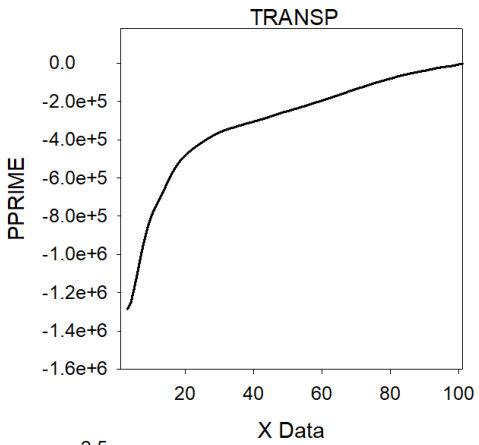
- Discontinuity at PV boundary and GS solution doesn't converge

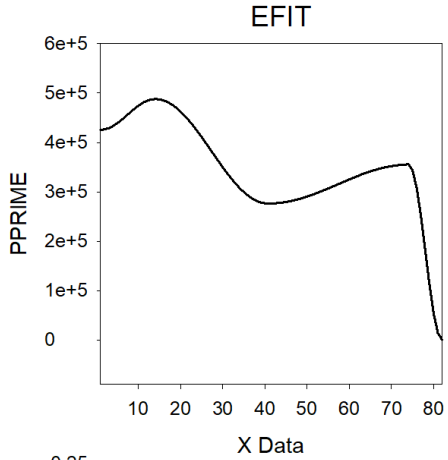
cutz = 1

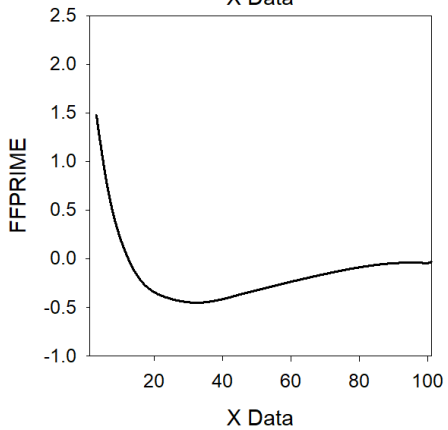


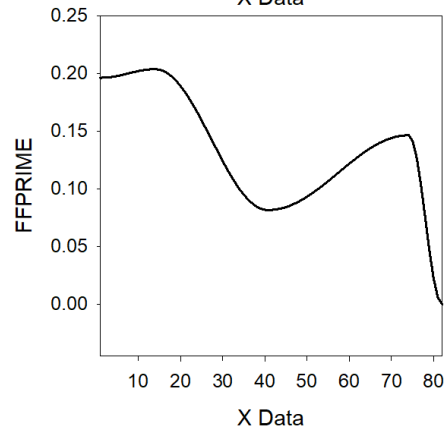
/p/tsc/m3dnl/NSTX/Matthew/Run05

P-prime has different sign in TRANSP geqdsk









"current" is positive in both files

That’s All I have

Anything Else ?