M3D-C1 ZOOM Meeting

09/27/2021

Announcements

CS Issues

1. Questions for LBL group
2. NERSC Time
3. Changes to github master since last meeting
4. Regression tests
5. Update to adapt_by_field -- Morteza

Physics Studies

1. Adding edge viscosity stabilizes inoslip_pol=2
2. New code version becomes unstable on some problems
3. DIII Pellet Injection without RE goes unstable – Chen Zhao
4. Status of new RE paper –Chen Zhao
5. Test of ikapparfunc=1 ..Hank Strauss

Note: meeting minutes posted on m3dc1.pppl.gov

In attendance

Steve Jardin
Cesar Clauser
Jin Chen
Andreas Kleiner
Nate Ferraro
Chen Zhao
Brendan Lyons
Chang Liu
Mark Shephard
Seegyoung Seol
Usman Riaz
Morteza SIboni

Announcements

- People's experience with NX-centos7
  - Display variable set on stellar?
- NERSC ERCAP requests due Oct 4
- /p/tsc upgraded during Sept. maintenance period .. **done**
  - 20 times faster and greatly expanded size
- John Mandrekas requested a 90 min presentation from all SciDACs
- Asia-Pacific Conference on Plasma Physics this week
  - Chang Liu: Kinetic-MHD simulation of nonlinear interaction between Alfven & EP
- APS Nov 8-12
  - Meeting will be IN PERSON with virtual option. Will DOE allow travel?
- EPS 6/27 – 7/1 2022 in Maastricht, Netherlands
  - Nominate invited speakers by 29 October 2021

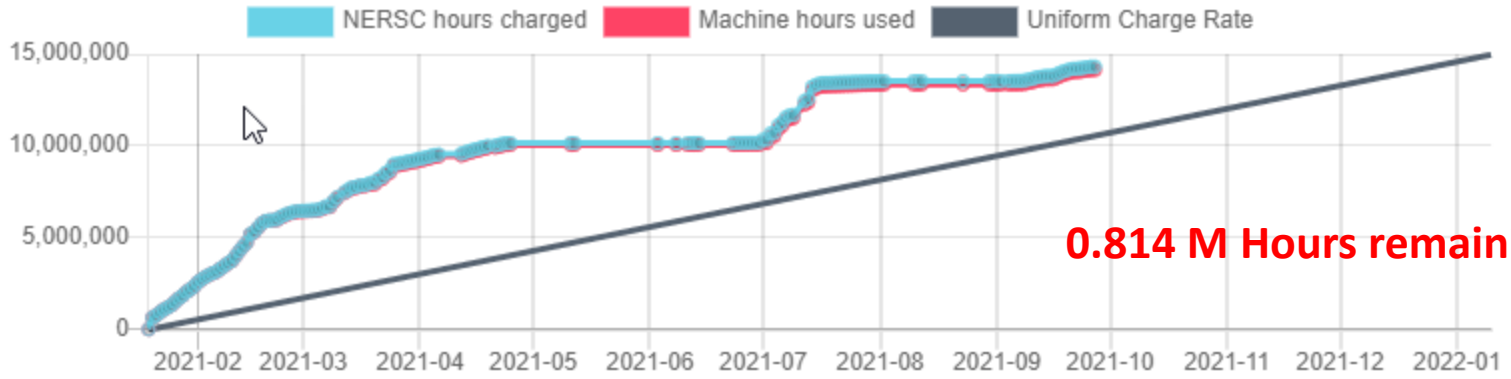
Questions for LBL group

To make our monthly meeting with the LBL group more productive, they suggested that we send them a list of questions ahead of time

Any suggestions?

NERSC Time

mp288



0.814 M Hours remaining!

- mp288 received 10M Hrs for CY 2021, + 5M Hrs additional
- Pearlmutter time will not be charged for this FY
- We are NESAP Tier 2. Machine not yet ready. Phase-I w GPUs
- FY2022 ERCAP now open, due 10/4/12 (Lyons: include DE-SC0020299 for analysis of JET/KSTAR mitigation experiments)
- Should I ask for more time this year? (Ends mid January)

Changes to github master since 09/19/21-(1 of 2)

Nate Ferraro:

9/20/21: added “kappar” to field_data.pro
added stellarator regression test (LHD_full)
added mesh for LHD_full regression test
added pppl centos7 batchscript for LHD_full test
Rebaselined RMP nonlin regtest to account for new terms in stellarator version
Increased time limit for LHD full regtest on pppl centos7
added check for m3dc1_3d_st in regtest/run
updated devel-knl module to include netcdf (for stellarator version)
added cori and cori_knl batchscripts for LHD_full regression test
updated stellar.mk to use intel-mpi
updated stellar regtest batch script to use split_smb directly
updated make file so that “make all” builds all versions, “make clean” deletes all
“OPT=1; OPT=1 COM=1; OPT=1 3D=1 MAX_PTS=60;
OPT=1 3D=1 MAX_PTS=60 ST=1; a2cc; and bin
removed stellar-intelmpi (since stellar.mk now uses intel-mpi)
fields from stellarator version are now plotted in real coordinates by
default use /logical to plot in logical coordinates.
added requirement for m3dc1_3d_st in regtest/README

Changes to github master since 09/19/21-(2 of 2)

J. Chen:

9/20/21: minor changes in regtest/KPRAD_2D/base/batchjob.stellar-intelmpi-sg
update stellar-intelmpi.mk

Seegyoung Seol:

9/20/21: added mesh count stmt after adaptation

Chang Liu

9/20/21: add files for traverse compiling and regtest

Morteza Siboni

9/21/21: Updates adapt_by_field to allow possibility of turning coarsening off

Yao Zhou

9/23/21: changed stellarator regtest to an NCSX case

Local Systems

- PPPL centos7(09/26/21)
  - Compilation error in read_vmec.f90 use netcdf
- PPPL greene (09/26/21)
  - Compilation error in read_vmec.f90 use netcdf
- STELLAR (09/26/21)
  - 6 regression tests **PASSED** on stellar
  - ADAPT **failed**
- TRAVERSE(09/26/21)
  - Compilation error in read_vmec.f90 netcdf.mod
  - KPRAD_restart **PASSED**
  - adapt **failed**
  - KPRAD_2D, pellet, RMP,RMP_nonlin timed out

Other Systems

- Cori-KNL (9/26/2021)
  - 6 regression tests **PASSED** on KNL
  - ADAPT **failed**
- Cori-Haswell (9/26/2021)
  - 6 regression tests **PASSED** on cori
  - ADAPT **failed** in same way as on knl
- MARCONI
  - All regression tests PASSED on MARCONI (J. Chen, 9/04/20)

- **ADAPT fails in same way on all machines**

New adapt option

Author: Morteza H. Siboni <hakimm2@rpi.edu>
Date: Tue Sep 21 16:16:15 2021 -0400

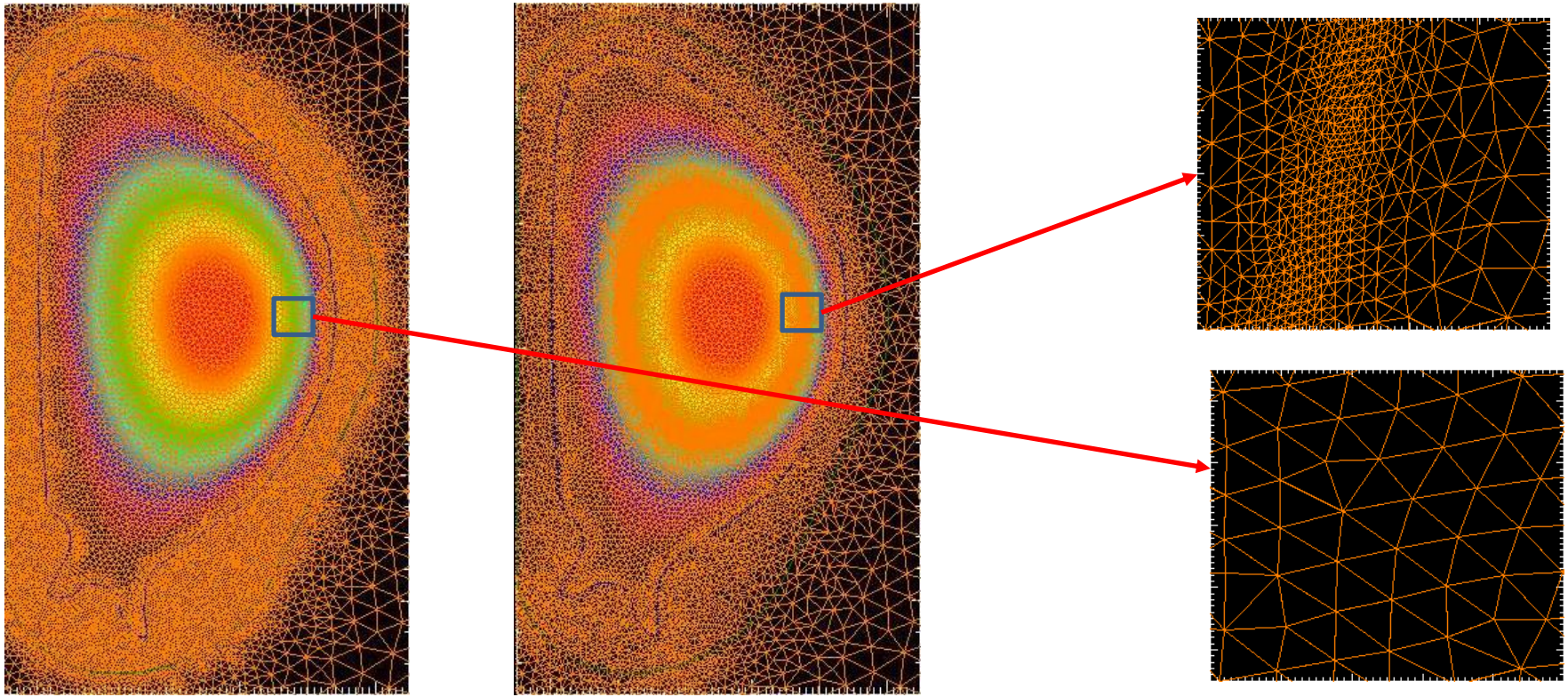
Updates the new logic for adapt_by_field

The 14th parameter in sizefieldParam (if exists) should be either 0 or 1 and with this change the following behaviours can be expected

(1) if there are 13 parameters things will work as before
(2) if there are 14 parameters the last parameter should be either 0 or 1 (any other value will cause an error).
  (2a) value of 1 will leave coarsening "on"
  (2b) value of 0 will turn coarsening "off"
(3) if there are more than 14 or less than 13 parameters in "sizefieldParam" this will cause an error.

1. 2. 2. .01 .4 .01 .4 .1 .1 .01 .02 .05 .5 0

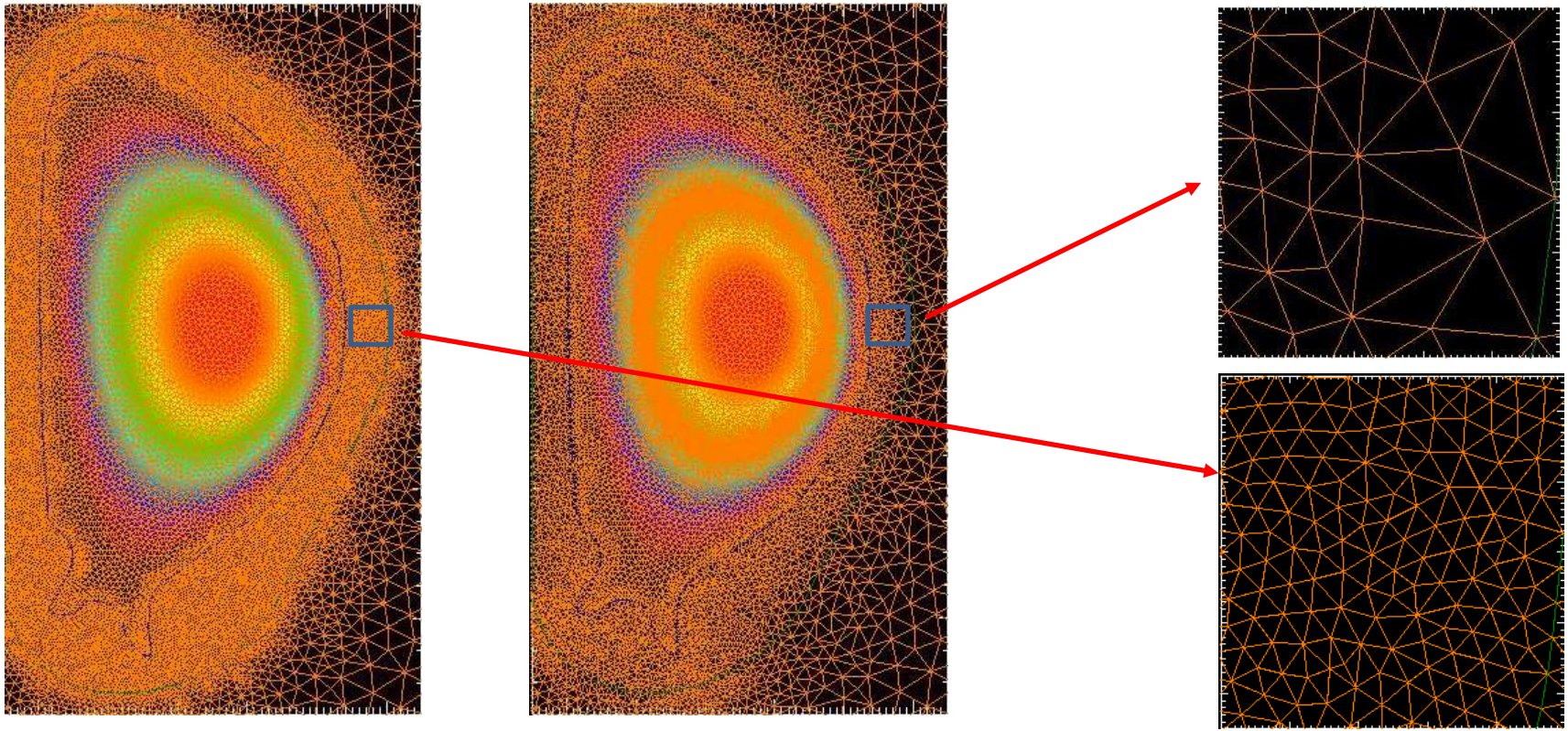
Testing on ITER equilibrium -- 1



/p/tsc/m3dnl/ITER/NewMesh/Eq2 and …/Adapted

Refines plasma region ok

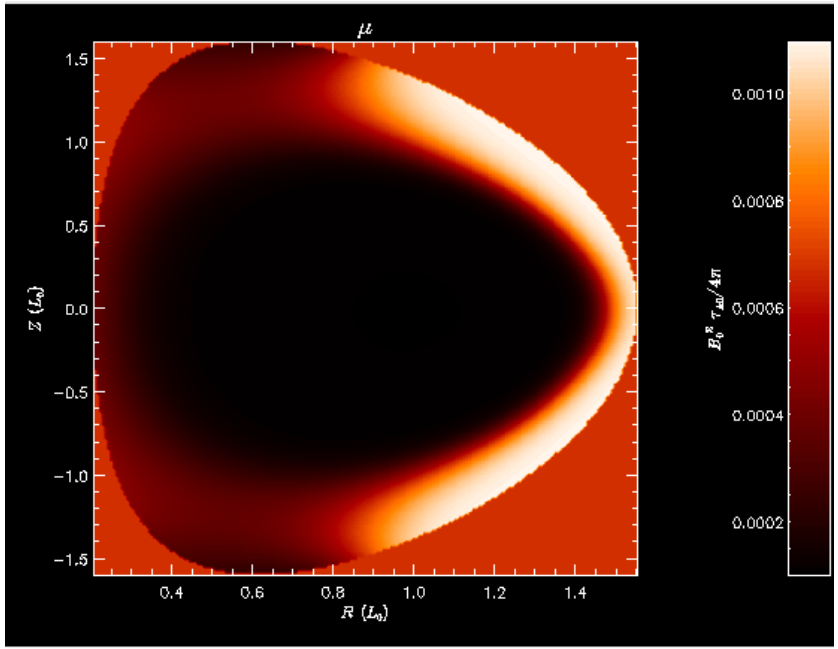
Testing on ITER equilibrium -- 2

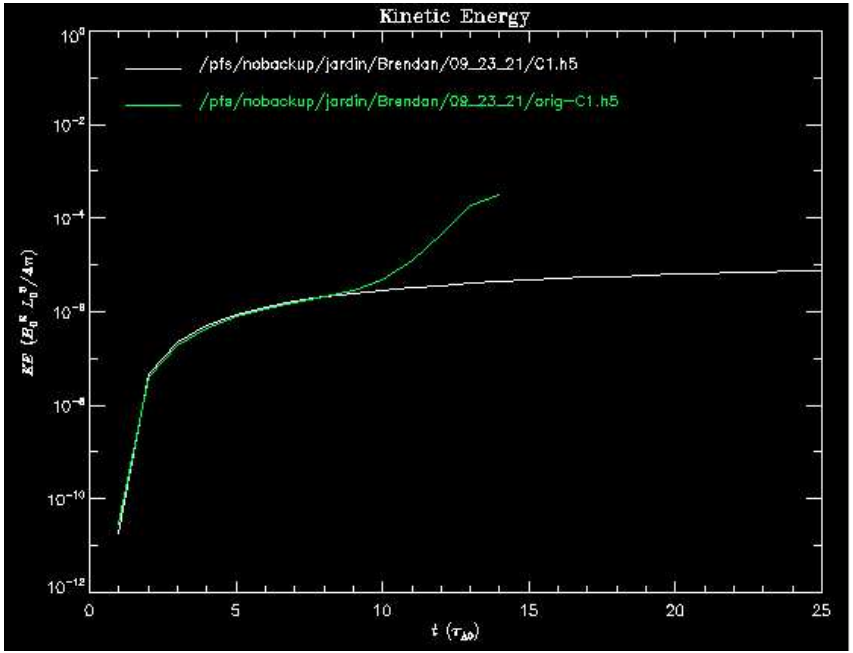


/p/tsc/m3dnl/ITER/NewMesh/Eq2 and …/Adapted

But it also coarsened wall!

Adding edge viscosity stabilizes inoslip_pol = 2



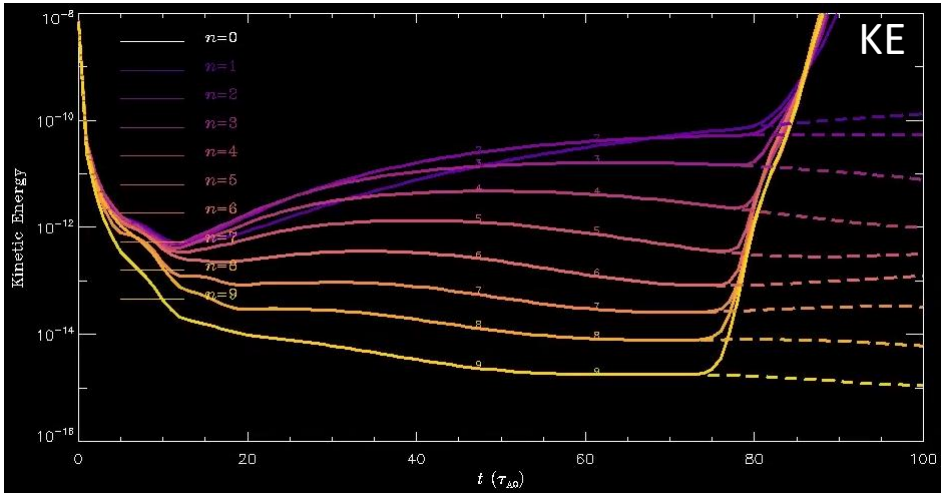


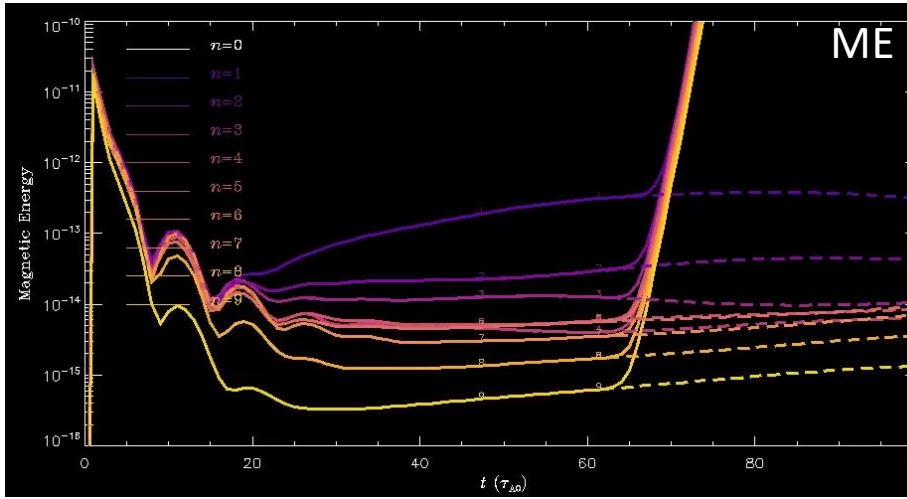
/pfs/nobackup/jardin/Brendan/09_23_21

ivisfunc=1
amuoff = .1

amudelt = .2
amu_edge = 1.e-3

New Code version becomes unstable on some problems



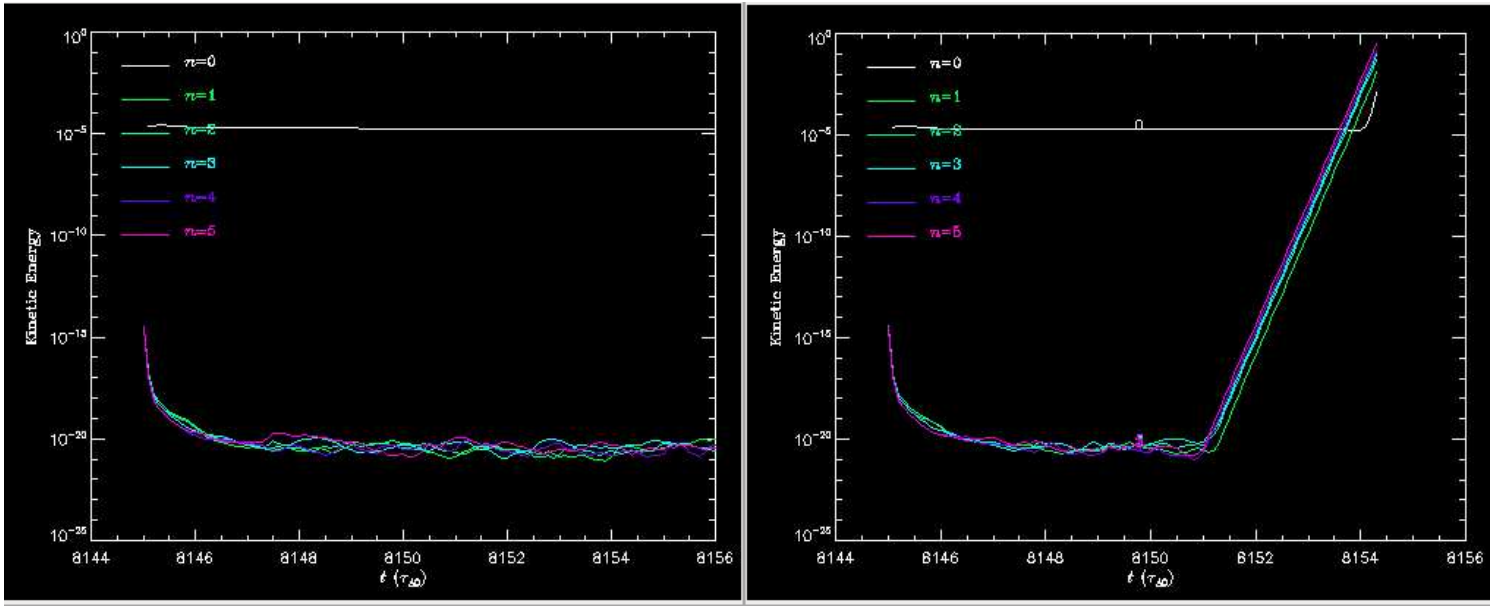


Solid: /home/sjardin/data/Ideal/3D-2F6 Present git master version

Dashed: /home/sjardin/data/Ideal/3D-2F6b Sept 16 code version

Also fails at NERSC

Another unstable case



/home/sjardin/data/ITER/Run05NM-redo-2-3D good (Sept 16 version)
/home/sjardin/data/ITER/Run05NM-redo-2-3DF fails current version

Debugging status

1. Tried swapping out ludef_t.f90 … did not help

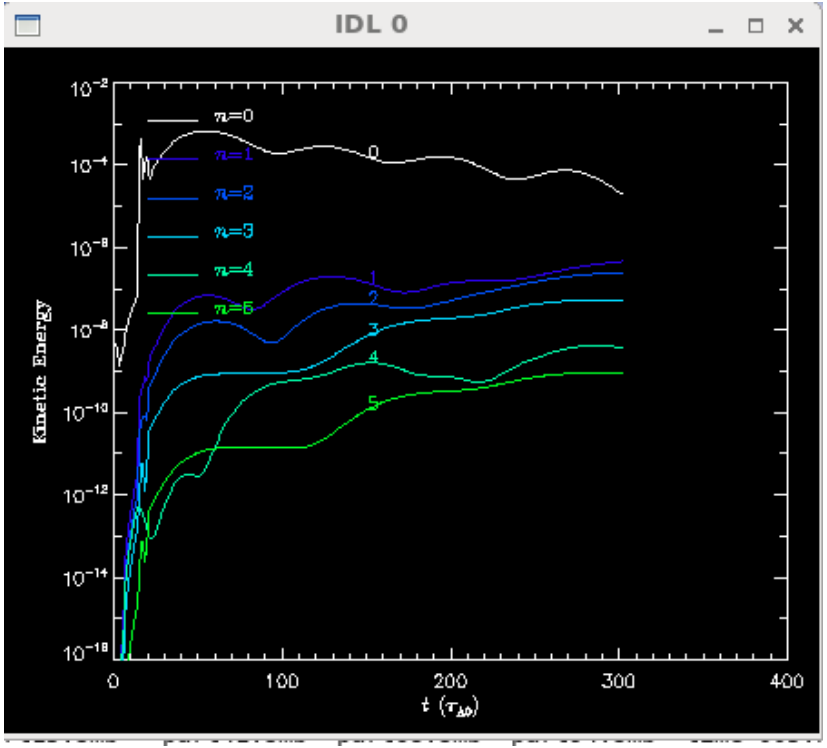
2. Next routines to swap out: (changed after 9/16…in time loop)

basic_mesh.f90
biharmonic.f90
boundary.f90
element.f90
m3dc1_nint.f90
metricterms_new.f90
model.f90
newpar.f90
petsc_vector.f90
scorec_mesh.f90
scorec_vector.f90
spline.f90
transport.f90

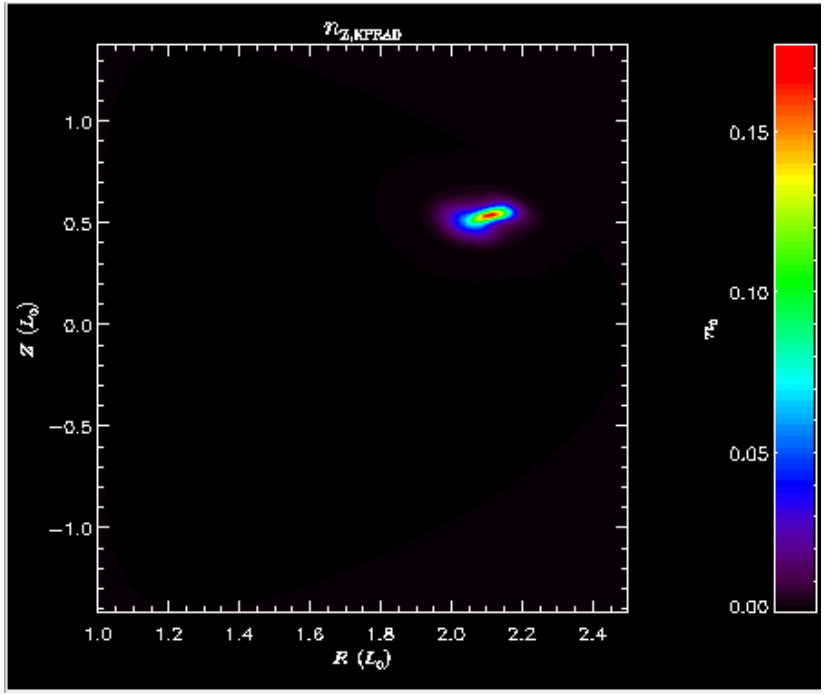
3. Now running test with all these swapped out on …../3D-2Fc

DIII-D Pellet injection case goes unstable (without RE)

plot_hmn



plot_field, 'kprad_totden'



Could the impurity density be going negative?

See /scratch/gpfs/cz12/kprad2_test

Chen Zhao

Chen Zhao paper in preparation

Simulation of the runaway electron plateau formation during current quench

C. Zhao[1], C. Liu[1], S. C. Jardin[1], N. M. Ferraro[1], B. C. Lyons[2], V. Bandaru[3], M. Hoelzl[3]

[1] Princeton Plasma Physics Laboratory, Princeton, NJ, United States of America
[2] General Atomics, San Diego, CA, United States of AmericaGeneral Atomics, San Diego, CA, United States of America
[3] Max Planck Institute for Plasma Physics, Boltzmannstaße, Garching, Germany

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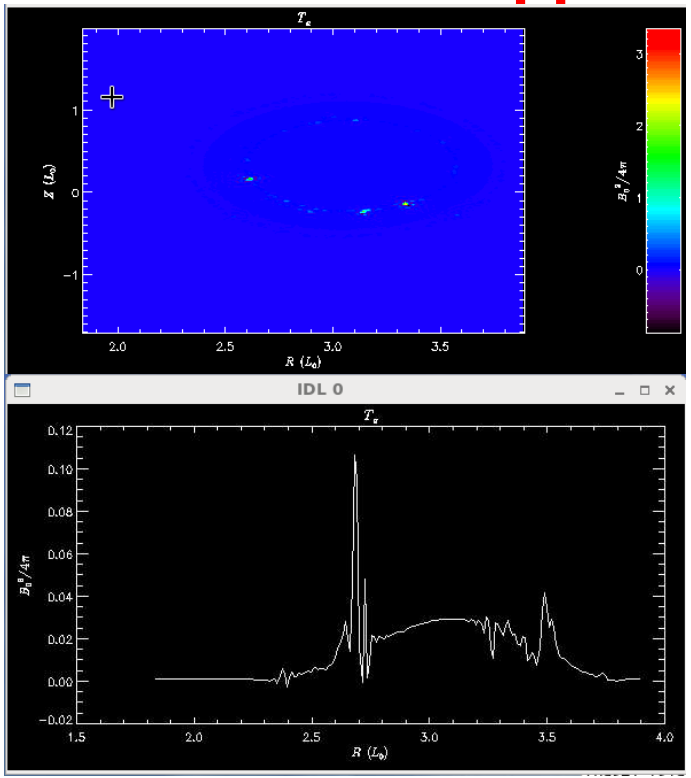
- Now only contains formulation and 2 test problems (1 cylindrical and 1 with JOREK)
- No section on experimental comparisons or on sawtooth
- Need some discussion on validity of Dreicer model (from Chang)
- Add section on comparison with characteristics model of advancing runaways?

Strauss test of ikapparfunc=1



Initial temperature profiles is unphysically jagged, goes negative

/scratch/gpfs/hs9956/JETm3dc1_0.12h9_r5

That’s All I have

Anything Else ?