M3D-C1 ZOOM Meeting 4/20/2020

Agenda

- 1. Announcements
- 2. CS Issues
 - 1. Code optimization: Yang, Jin, Seegyoung
 - 2. Adaptation status
 - 3. Regression tests demo Brendan Lyons
 - 4. NERSC Time
- 3. Physics Studies
 - 1. 3D VDE Benchmark Results
 - 2. 3D ITER VDE Force calculation status
 - 3. Fluid runaway electrons with sources Chen Zhao
 - 4. Runaway-Electron, Energetic-Ion synergy—Chan Liu
 - 5. Other

Announcements

- IAEA Technical Meeting on Plasma Disruptions and Their Mitigation
 - 20-23 July 2020 at ITER Headquarters (as of now)
 - Abstracts due by 27 April via IAEA-INDICO
 - Forms A & B submitted to <u>Shahida.Afzal@science.doe.gov</u> by May 4
 - SJ: Invited talk on electromagnetic load modeling in existing devices and in ITER (with input from others)
- Center for Tokamak Transient Simulations (CTTS) talk series to begin soon
 - Format? One talk per week? Wed@4:00 PM ET?
 - Now requesting speakers
 - Chang Liu Energetic Particles in M3D-C1K
- APS Invited Talk nominations due this Wed. (at PPPL)
 - May 6 at APS-DPP
 - Anyone interested in being nominated? (one request so far)

CS Issues-1

- Yang Liu installing autotuning on CORI-KNL
 - Needs to build with openmpi+gnu compiler
 - Code not working correctly
 - Status of complex version on haswell (works for mumps)
 - Superlu team should check
- VTUNE on Eddy?
 - Jin to look at
- Option to reuse LU decomposition for velocity, field, and pressure matrices (5,6,17)?
 - Jin is working on solve2 to recover preconditioner reuse capability
 - Jin to look at SCOREC coding (Seegyoung says fortran side)
 - Chang reports having nskip > 1 speeds up code

CS Issues-2

Mesh Adaptation status

- You can increase the number of planes at restart time
 - just increase "nplanes" in C1input (and adjust the number of processes and the bjacobi options accordingly).
 - This needs to be added to the documentation (Seegyoung?)
- Mark Shephard:
 - Currently we can adapt a 2D mesh using local mesh modification
 - Define a new 2D size field
 - Traverse the mesh looking at each element
 - Locally modify each element (split, collapse, etc) so it is consistent with the size field
 - Locally update the field values on just that portion of the mesh that has been modified (toroidal wedges going around in the toroidal direction
 - This needs to be implemented in 3D version
- Conference call to discuss this scheduled for Tuesday at 1:00 PM ET
 - Mark, Seegyoung, Brendan, Nate, me
 - Anyone else interested?

CS Issues-3

Regression Tests

- Brendan to give example
- Add to documentation

NERSC



M3163



Need to use less mp288. m3163 approaching linear usage rate Add to batch file: #SBATCH –account=3163

(clauser, kleiner, lyons, strauss)

Status of new 3D M3D-C1 benchmark with JOREK and NIMROD

M3D-C1 toroidal current density

t= 0	t= 8.95 ms	t = 9.84 ms	t = 10.13 ms
Zmag=-0.015	Zmag=-0.280	Zmag=-0.655	Zmag=-0.88
Initial equilibrium	Start of 3D	03/30/20	04/06/20







M3D-C1

NIMROD

JOREK



Forces on Vessel



- Found error in M3D-C1 wall force diagnostic for n=1, x,y (Jardin, Clauser, Ferraro all agree)
- Now rerunning segments to get new result. One point obtained (about 60% greater than NIMROD)
- This will also affect Cesar's ITER runs

3D ITER VDE – coupling to CARIDDI



Time (ms)

Fluid Runaway Electrons with Source



Chen Zhao

Fluid Runaway electrons with source term



dnredt, t = 3ms



But the e_par out put from runaway.f90 is not zero and dnredt is non-zero.

SJ: Make sure you are outputing and plotting what you think you are

Chen Zhao

Possible idea for Runaway Electrons

• Chang Liu to present

That's All I have

Anything Else ?

Linear stability of low-shear equilibrium in toroidal geometry with flow (important for new ST model)



- Nicolas Lanchon has reproduced the M=0 results (no rotation)
- Noted that adding rotation can slightly affect the q-profile
- Some analytic papers exist for flat and sheared rotation.

Bug Report: JA-2 Test Problem, cylinder, numvar=1, tearing mode

