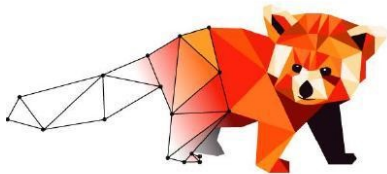


# 3D Remeshing using MMG & Zoltan

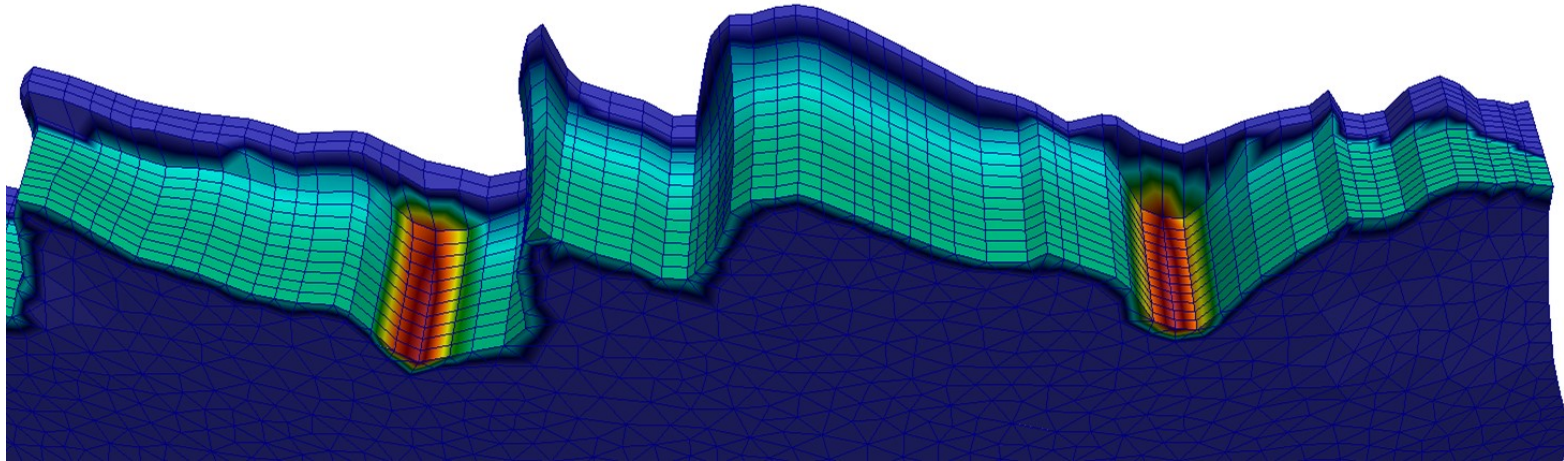
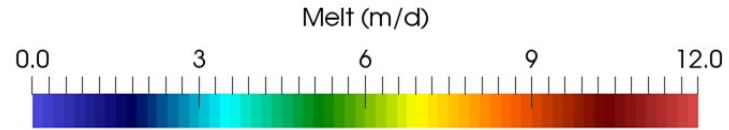
Joe Todd



Upgrade  
your meshes

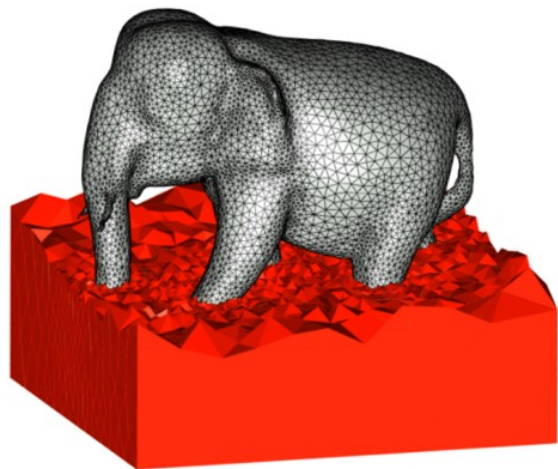
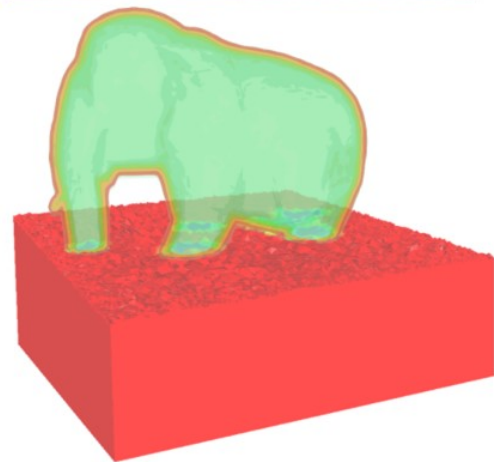
# Motivation

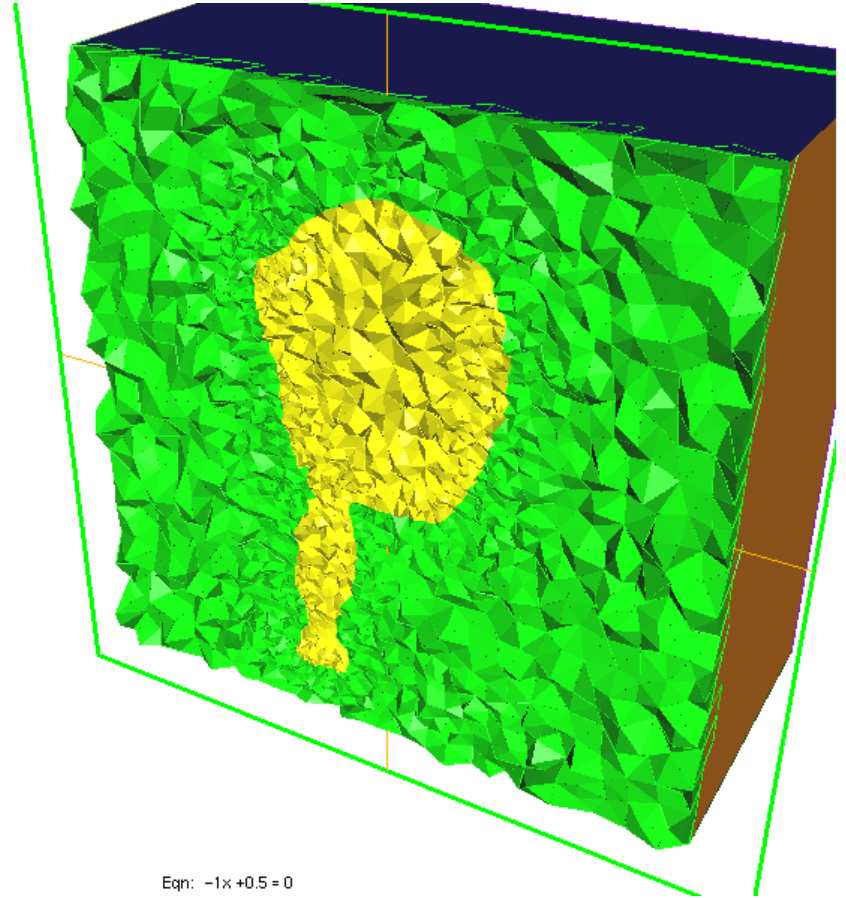
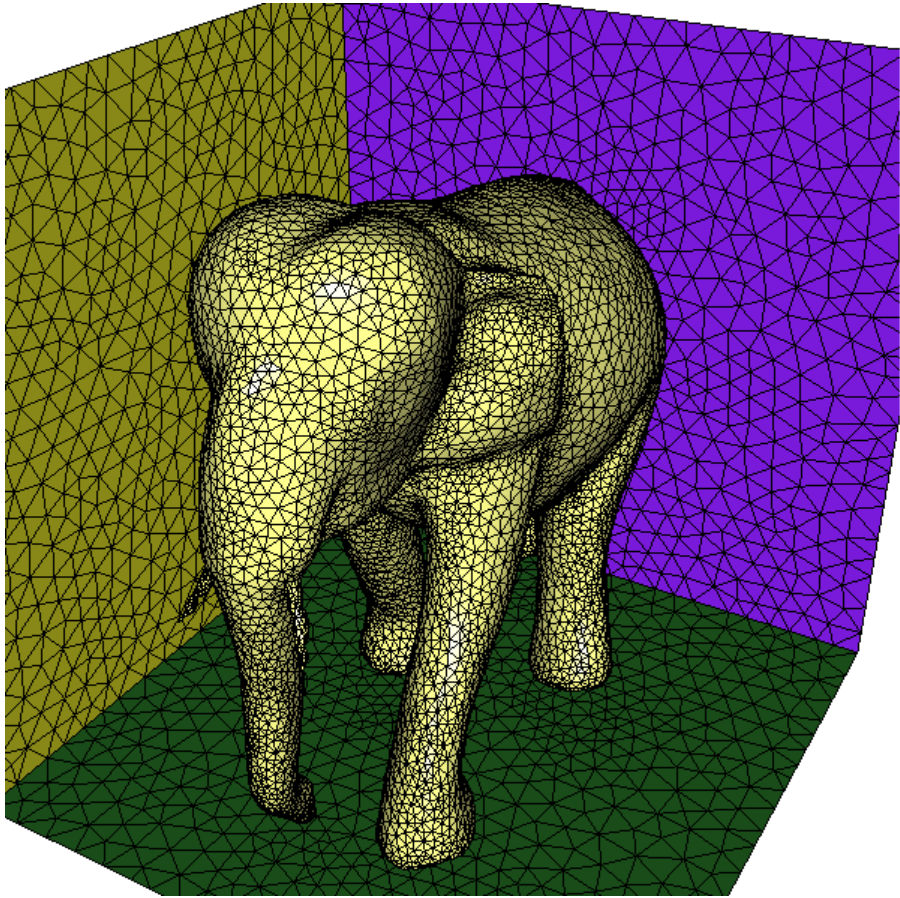
- Elmer/Ice 3D (Calving3D) depends on vertically extruded meshes
- This can be severely limiting...
- ... particularly when BCs are non-vertical
- But without vertical extrusion, (re)meshing is more complex.



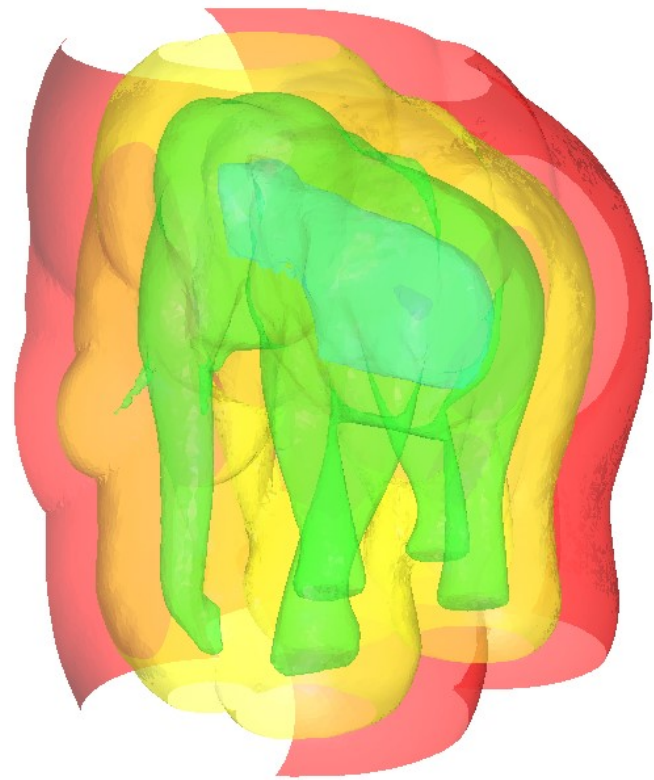
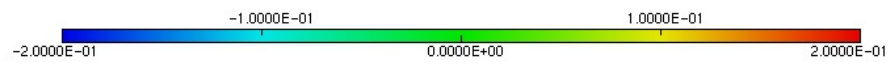
# Capabilities of MMG3D

- Anisotropic adaptation - *grounding line, adaptive remeshing. (Elmer/Ice depends on anisotropic meshing!)*
- 'Implicit surface' meshing - *calving events*
- Lagrangian deformation - *MeshUpdate++*
- Elephant generation





Eqn:  $-1x + 0.5 = 0$

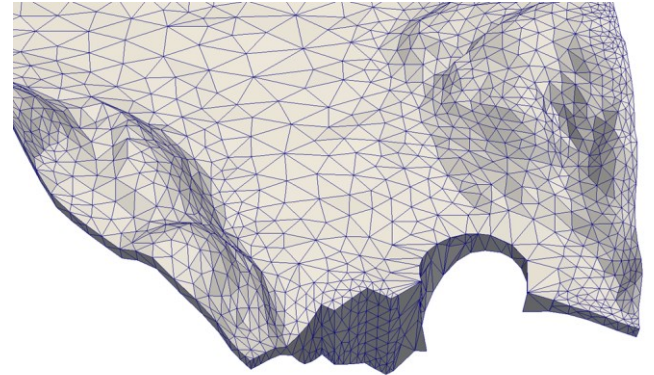
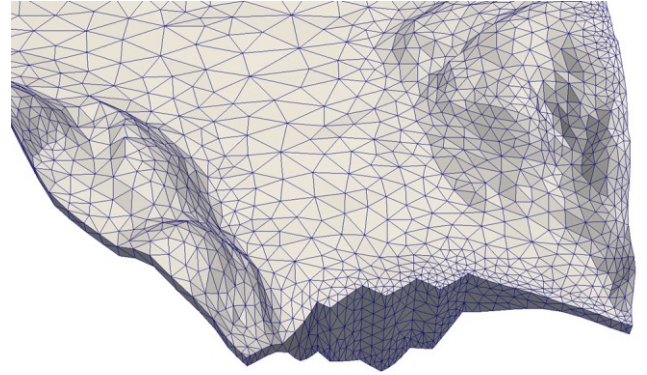




# Implementing Calving using MMG3D

Designed to be a drop-in replacement for the CalvingRemesh subroutine (CalvingRemesh.F90)

1. Define a level-set surface (a 3D zero contour) for the calving event
2. Pass the mesh, some parameters & the level set to MMG3D
3. MMG3D cuts out the calving event and refines the mesh near the new surface
4. Repartition the mesh (Zoltan), interpolate field variables & continue.



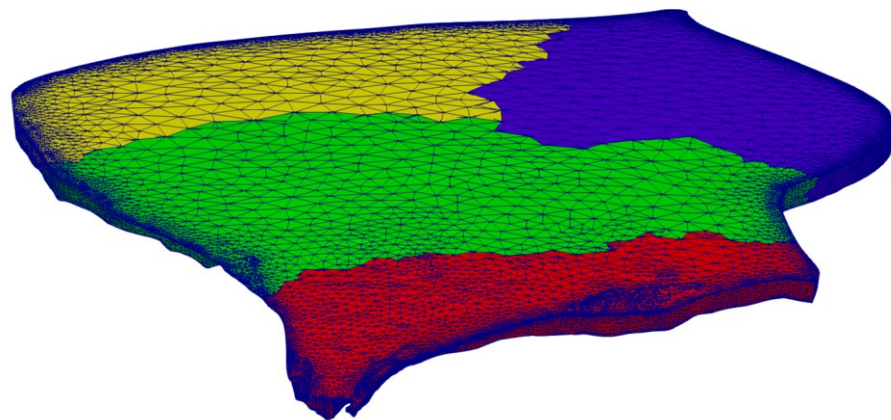
# Zoltan - boring but important

Mesh adaptation -> loss of load balance

Zoltan: parallel repartitioning - parallel partitioning improvement in parallel...

Due to a bug in OpenMPI 2.0, you might get weird errors. Options:

- Use libzoltan from Trilinos
- Don't use OpenMPI
- Get in touch with Joe for Zoltan patch
- Elmer distributes patched Zoltan?
- Trilinos distributed package – for unknown reason – doesn't include F90 modules



# Final Remarks

- Out-the-box, *nothing* is currently properly implemented, but much of the important code is written
- Joe will work on this in 2019, but for now, do it yourself
- MMG can do much more than just calving! (see Fabien's work, for example)

