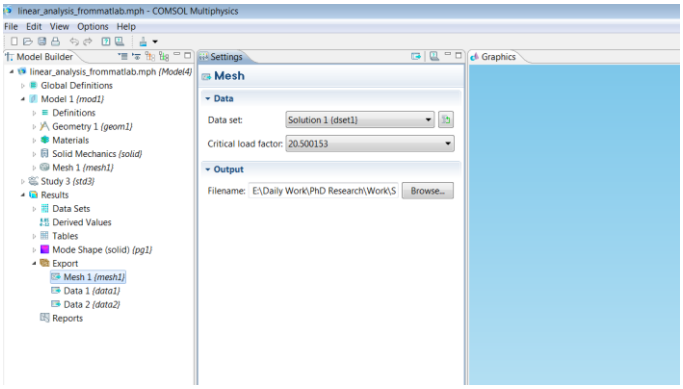
Generating MATLAB seed models from COMSOL models

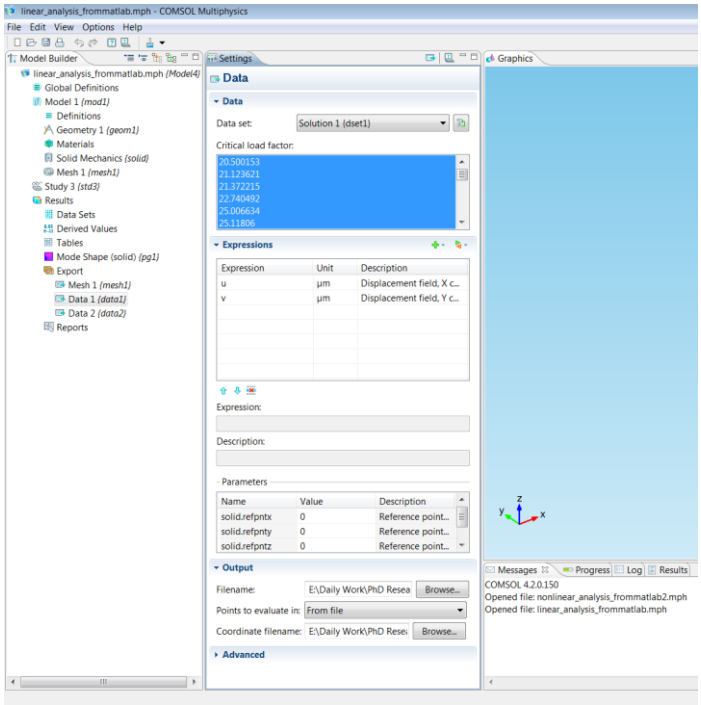
The .m MATLAB seed models included in this software are specific to the 2D and 3D bilayer wrinkling problem. To solve for other buckling bifurcation problems, one must provide new seed models. The steps outlined here describe the process of generating the .m MATLAB seed models from the corresponding COMSOL models. This conversion process is required only in the beginning to generate the new seed model. Once the new seed model is available, the codes provided here may be used to perform unattended parametric analysis by replacing the preexisting seed model with the new seed model.

The steps for generating the .m MATLAB seed models are:

1. Set-up the linear buckling analysis study in COMSOL desktop environment.
   1.1. Set-up to export (undeformed) mesh from the COMSOL file



   1.2. Set-up to export the displacements at mesh point coordinates



   1.3. Note: displacements at top layer mid-plane coordinates are exported via MATLAB codes

2. Import (undeformed) mesh from linear buckling analysis and set-up the non-linear buckling study in the COMSOL desktop environment using this mesh:
   2.1. Modify linear buckling model to generate the nonlinear model in COMSOL or generate a new COMSOL model from scratch
   2.2. Re-define the boundary conditions and domains after importing the mesh.

3. Export the non-linear study as a .m MATLAB file
   3.1. Name the file: **nonlinear_analysis_seed.m**

4. Modify the non-linear analysis .m file:
   4.1. Change name of function to:
   nonlinear_analysis_seed(modifiedMesh)
   4.2. Change model tag to 'Model NL':
   model = ModelUtil.create('Model NL');
   4.3. Add this line to show progress bar:
   After line: model = ModelUtil.create('Model NL');
   <code>
   ModelUtil.showProgress(true);
   </code>
   4.4. Change name of mesh file
   <code>
   model.mesh('mesh1').feature('imp1').set('filename',modifiedMesh);
   </code>
   4.5. Enable/disable solving the model in MATLAB via commenting "**model.sol('sol1').runAll;**"

5. Set-up the main MATLAB file to run all analyses:
   5.1. Change the file names to appropriate values. Note: all files will be created anew. Consistency of file names across steps is taken care of within the codes.
   5.2. Set-up the appropriate weighting values for the initial imperfection calculation

Troubleshooting

1. There may be extraneous codes in the exported model '.m' scripts. Comment out these lines and run the file again to troubleshoot.

2. If unrealistic new (modified) mesh is observed, check that proper units of the plate/film thickness are selected in the MATLAB codes and that the units are consistent with the geometry units.

3. Set-up the appropriate solvers in the COMSOL model before converting to .m file format. Otherwise, the default solvers (MUMPS) are used.

4. Check that domain names are correctly identified during post processing within the MATLAB codes.

5. Check that the variable/parameter names across MATLAB and COMSOL are consistent.

6. If Java exceptions are observed during parametric analysis, verify that the model tags of the linear model and nonlinear model are different from each other (Step# 4.2).