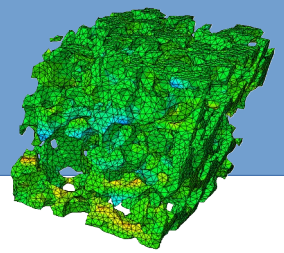

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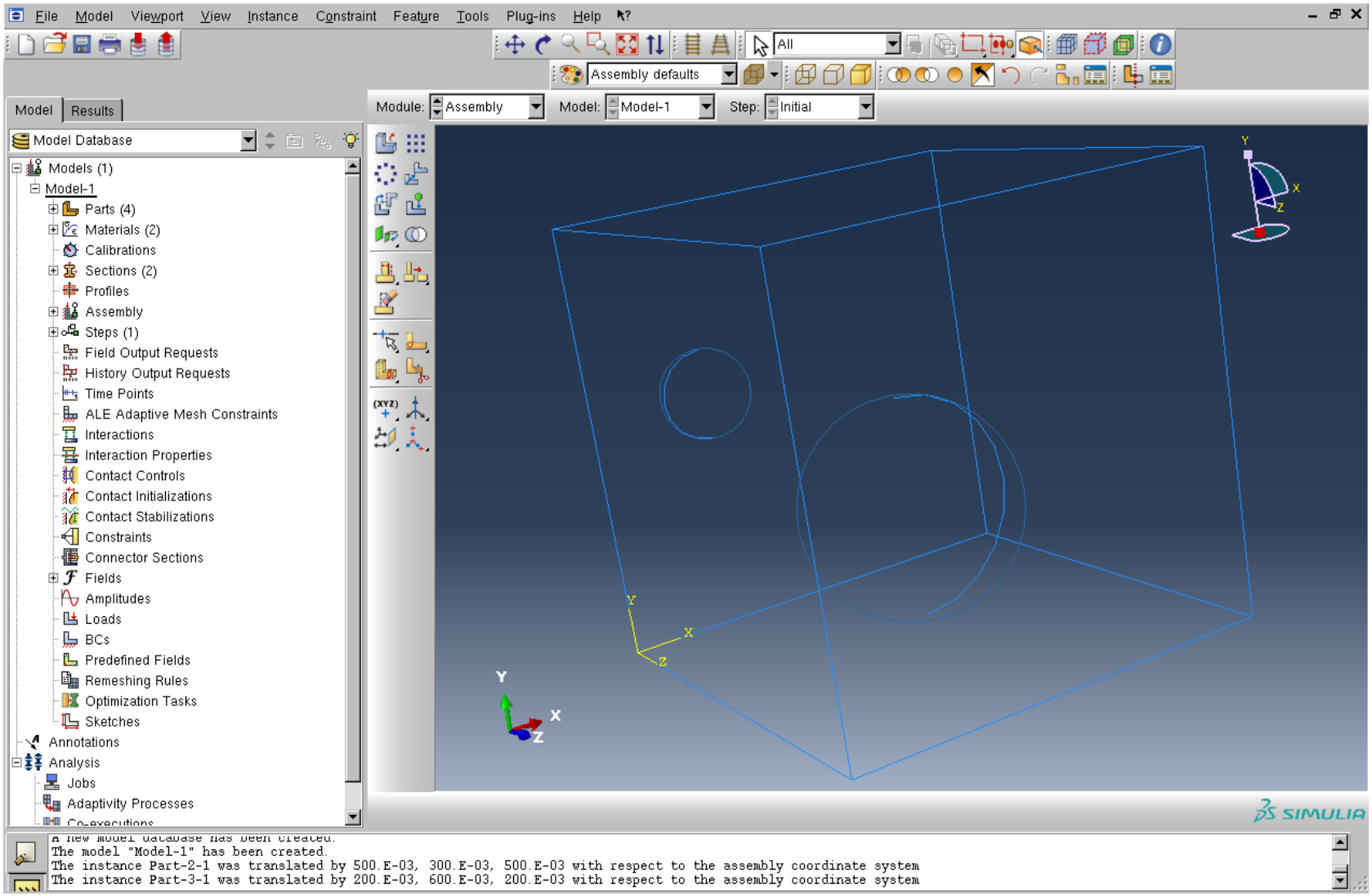
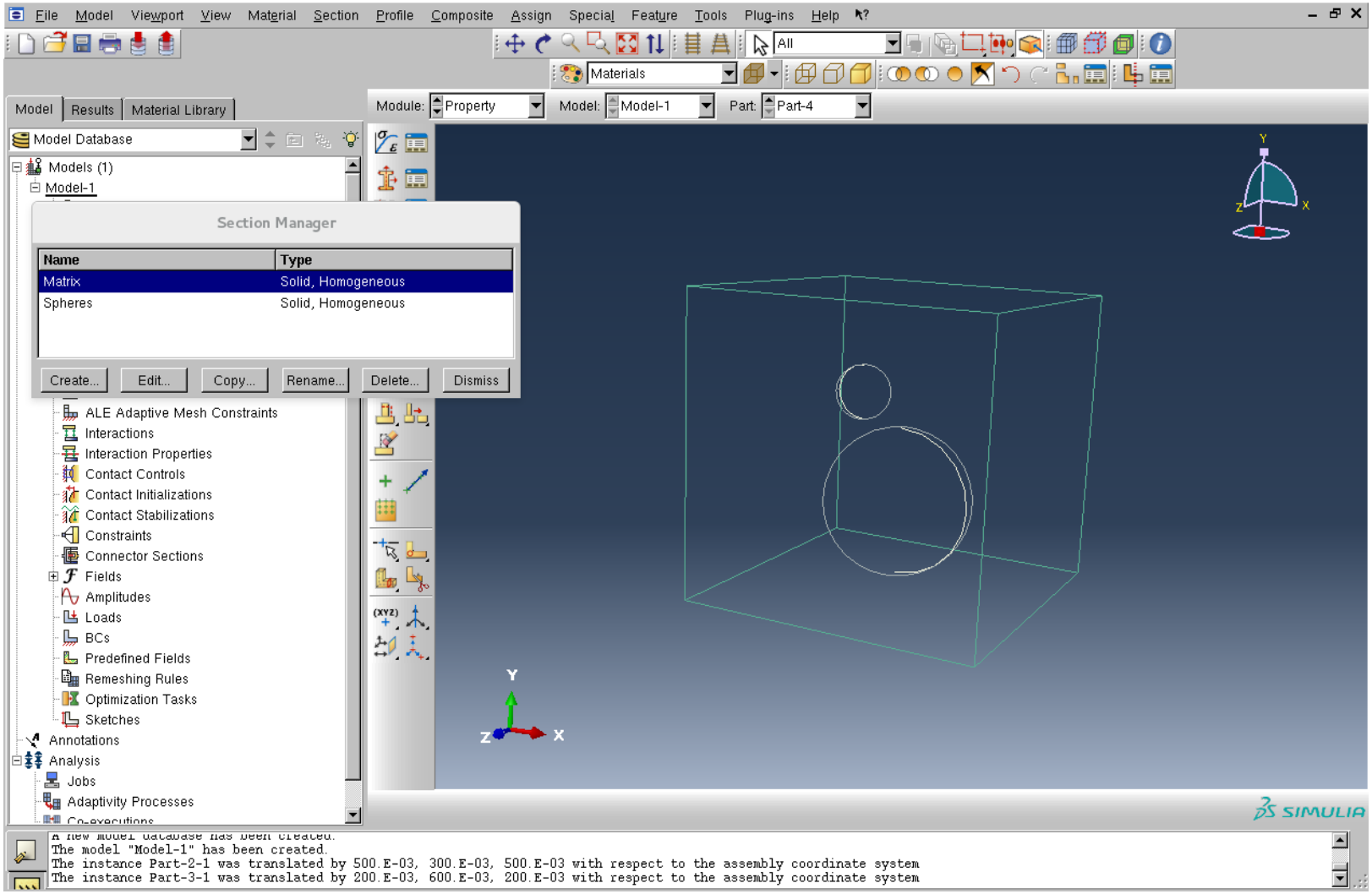
1st example: rigid spherical inclusions in an elastic media

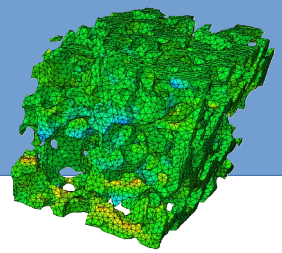
step 1 : part creation (in this case merging two sphere and a cube)



1st example: rigid spherical inclusions in an elastic media

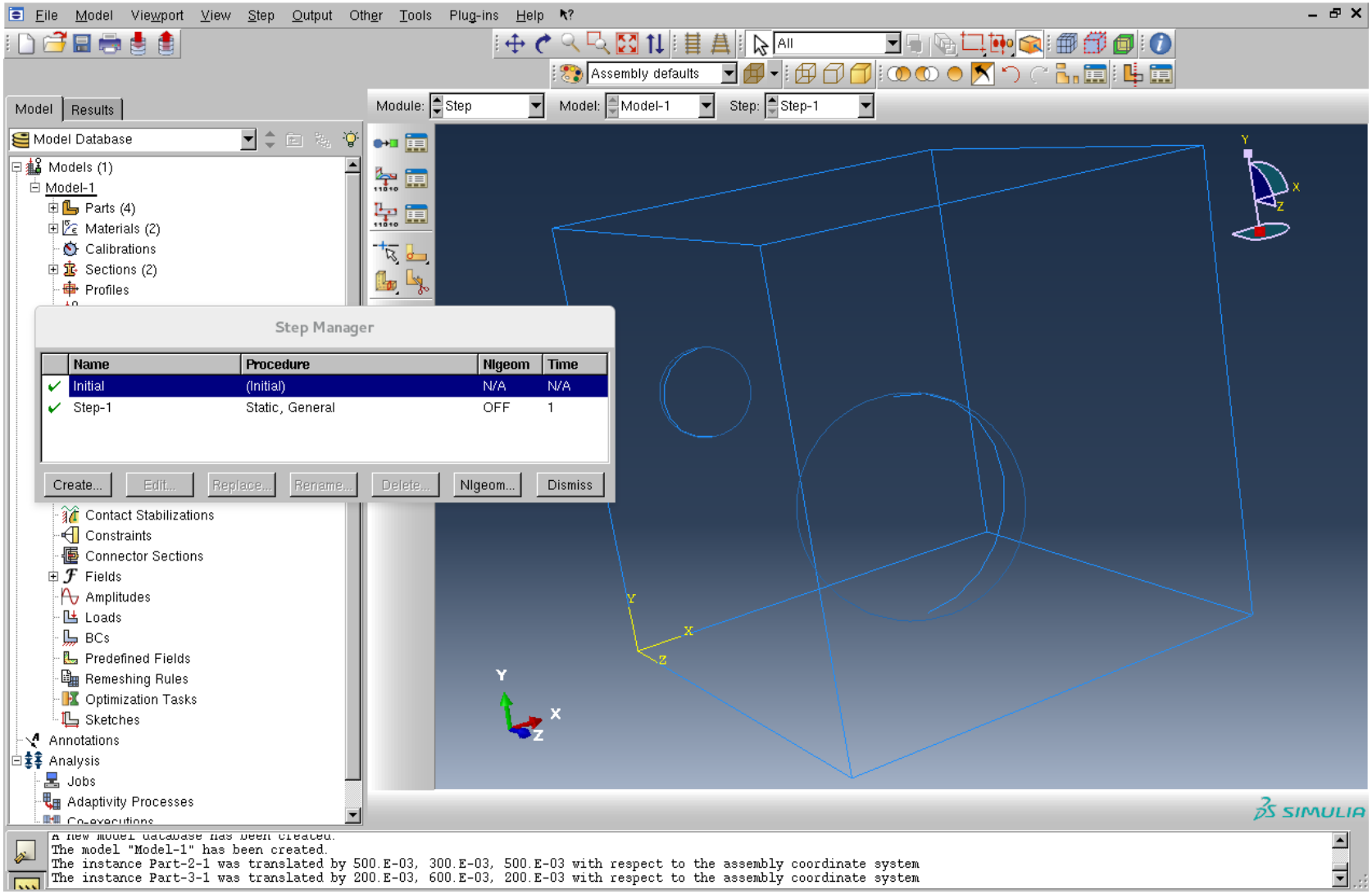
step 2 : properties assignment, in this case two elastic and isotropic behavior but homtools is not limited to a particular behavior





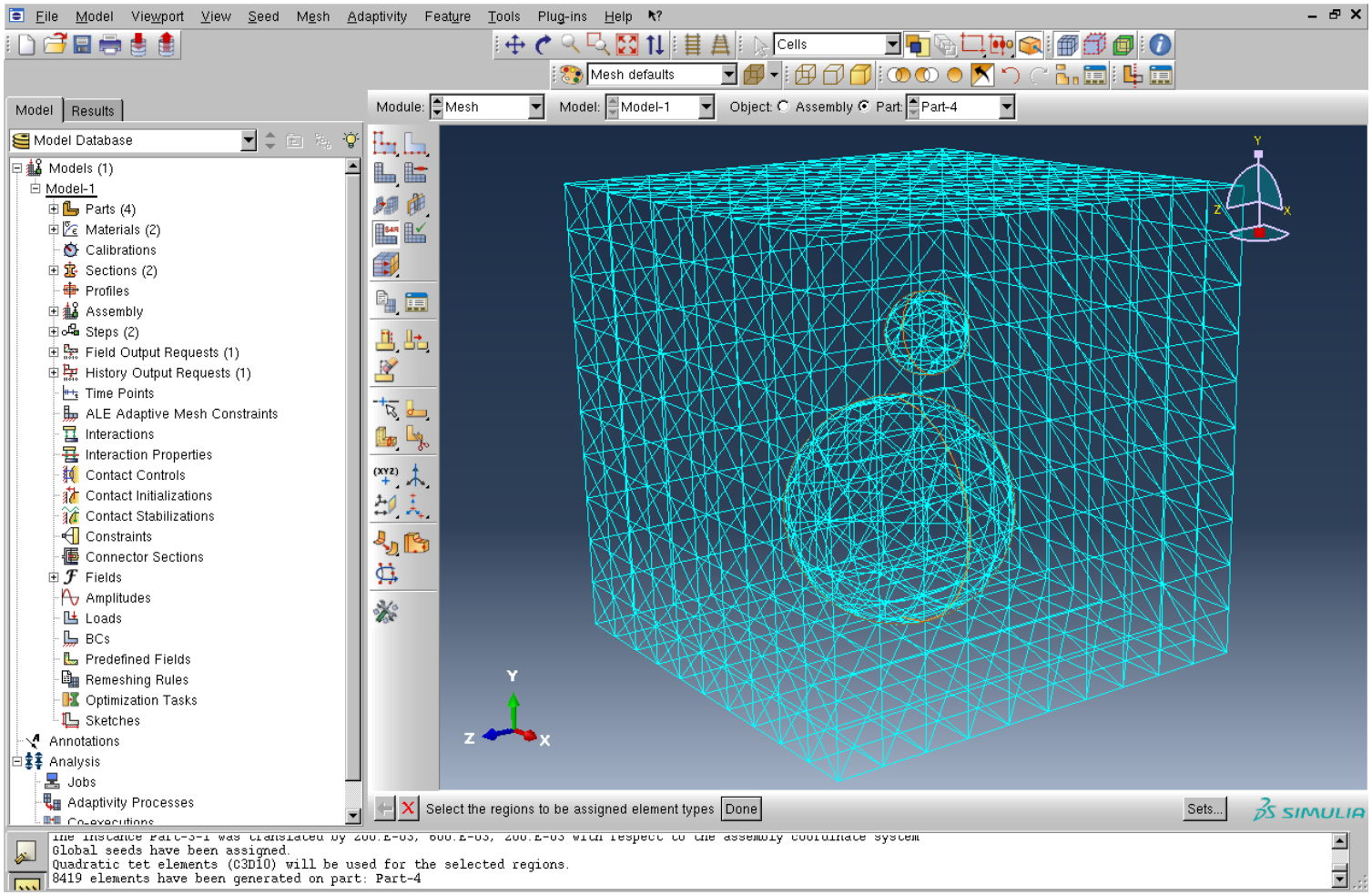
1st example: rigid spherical inclusions in an elastic media

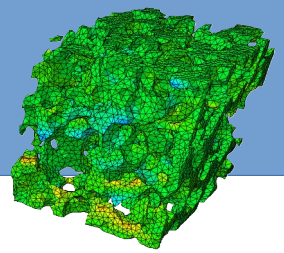
step 3 : step definition, in this linear (small strain) but homtools can be used with nlgeom option



1st example: rigid spherical inclusions in an elastic media

step 4 : mesh definition,Homtools required a mesh to generate linear equations on the boundary. For each meshing modification the equations needs to be re-generated by homtools (old equations needs to be previously deleted)





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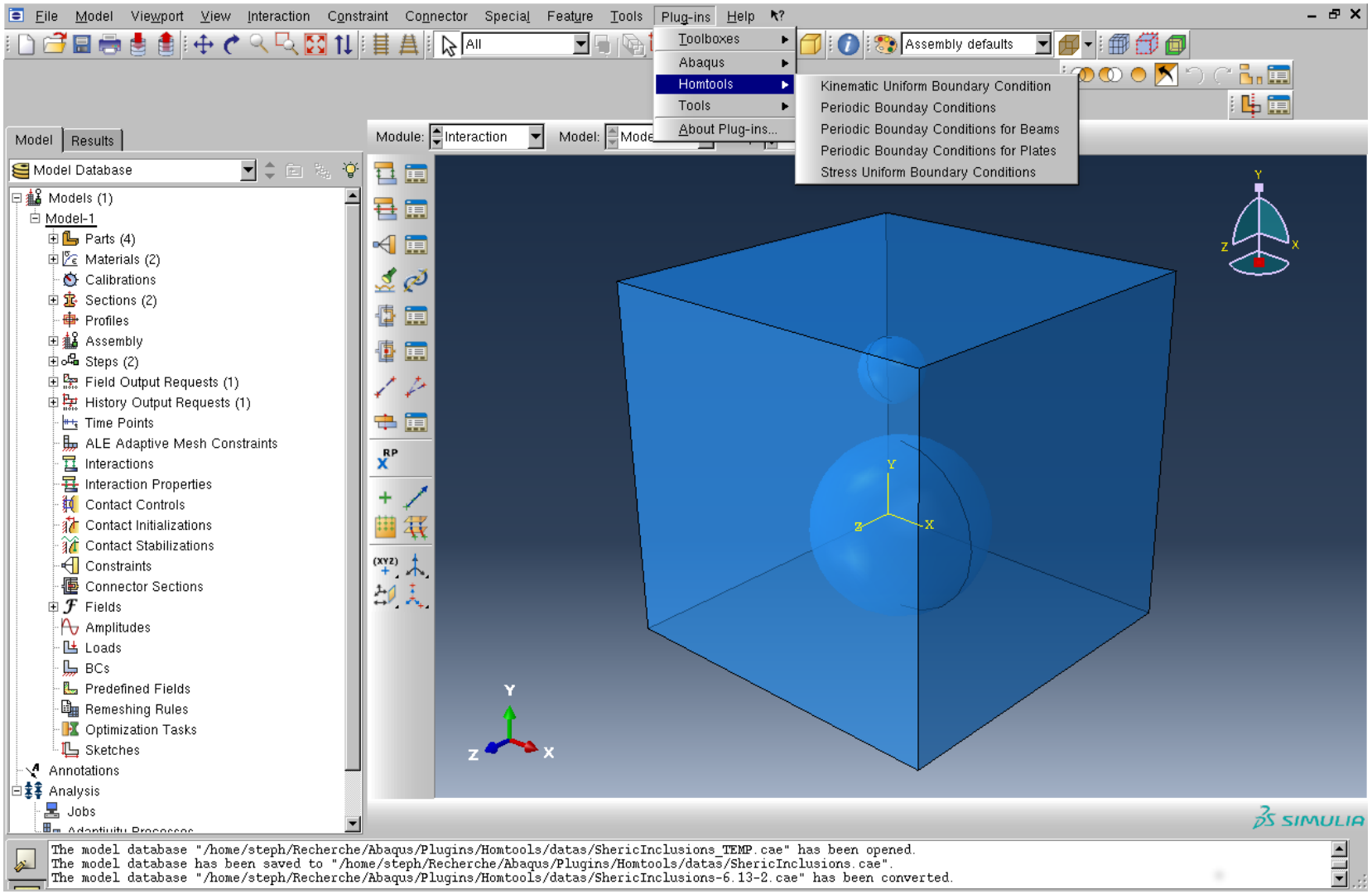
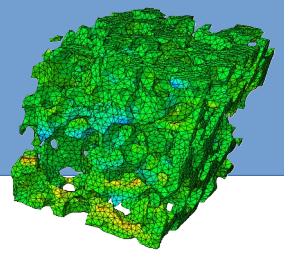
1st example: rigid spherical inclusions in an elastic media

step 5 : Homtools is avaible from the plug-ins menu in the interaction module.





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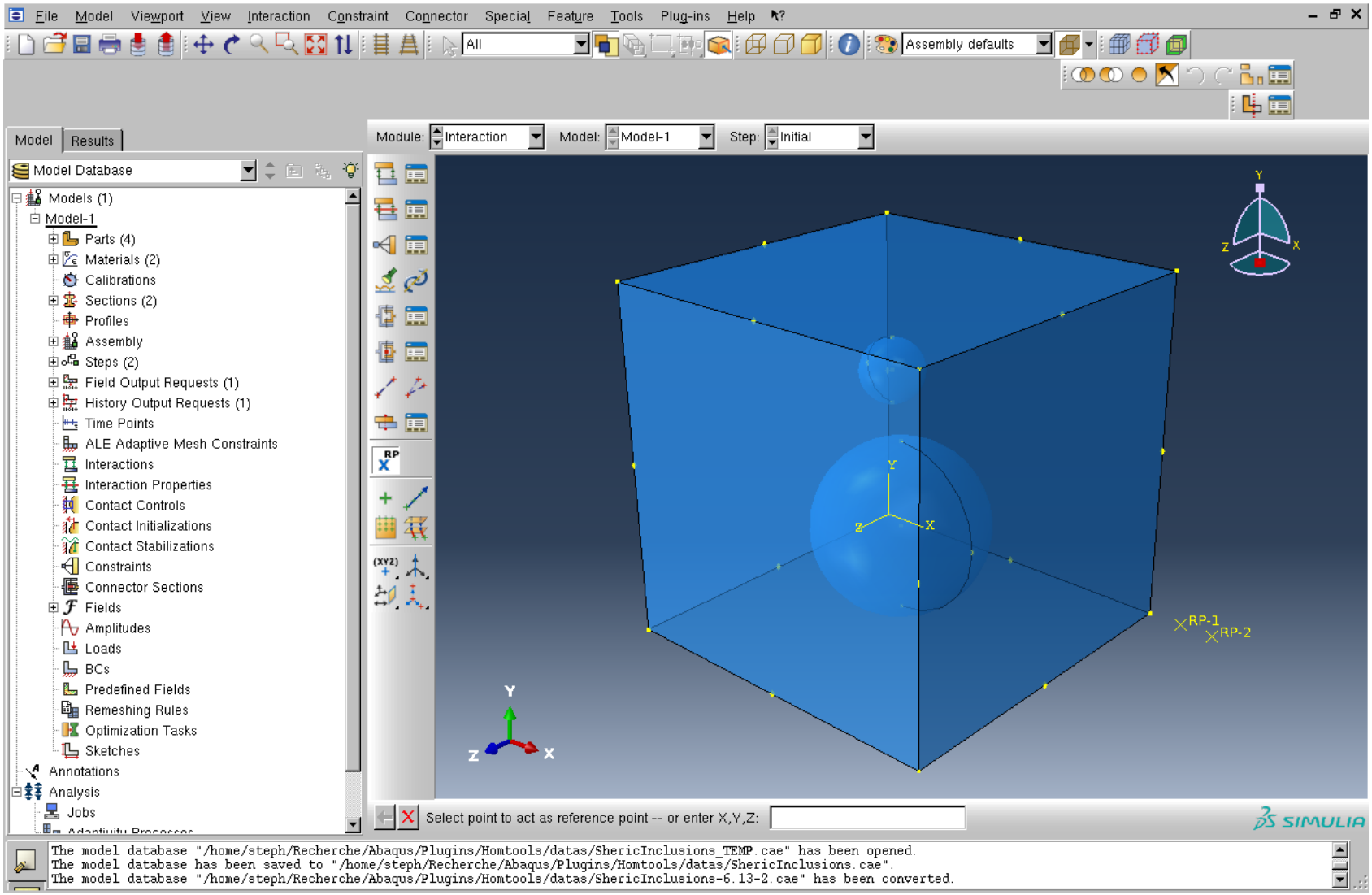
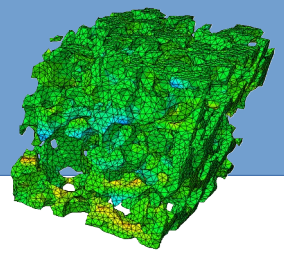
1st example: rigid spherical inclusions in an elastic media

step 5 : Reference points creations for macro stress or strain (two ref points are needed in the case of small strain)





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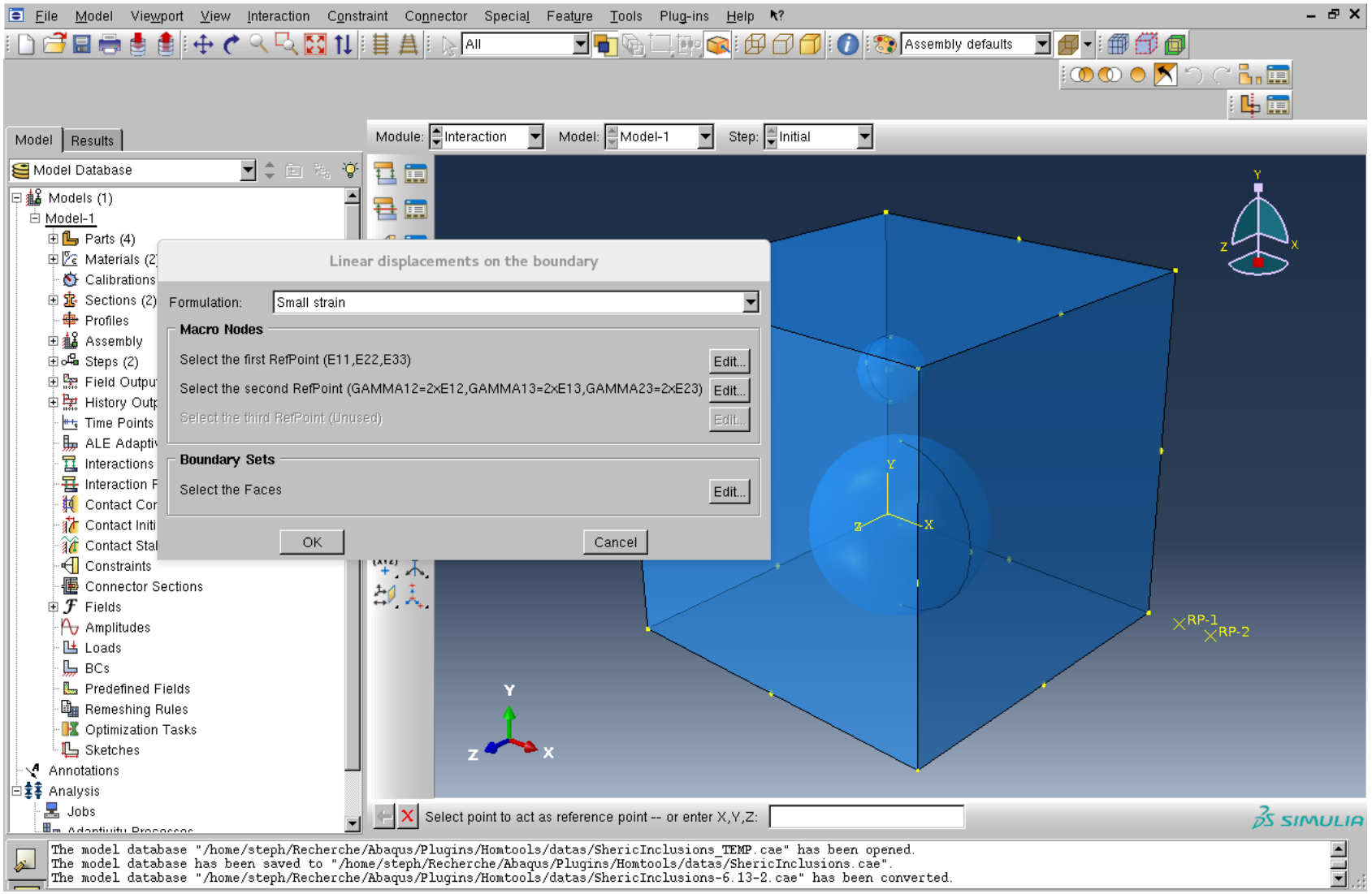
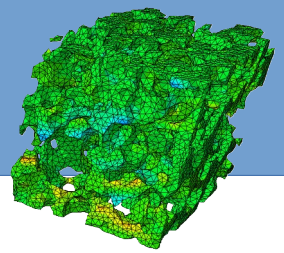
1st example: rigid spherical inclusions in an elastic media

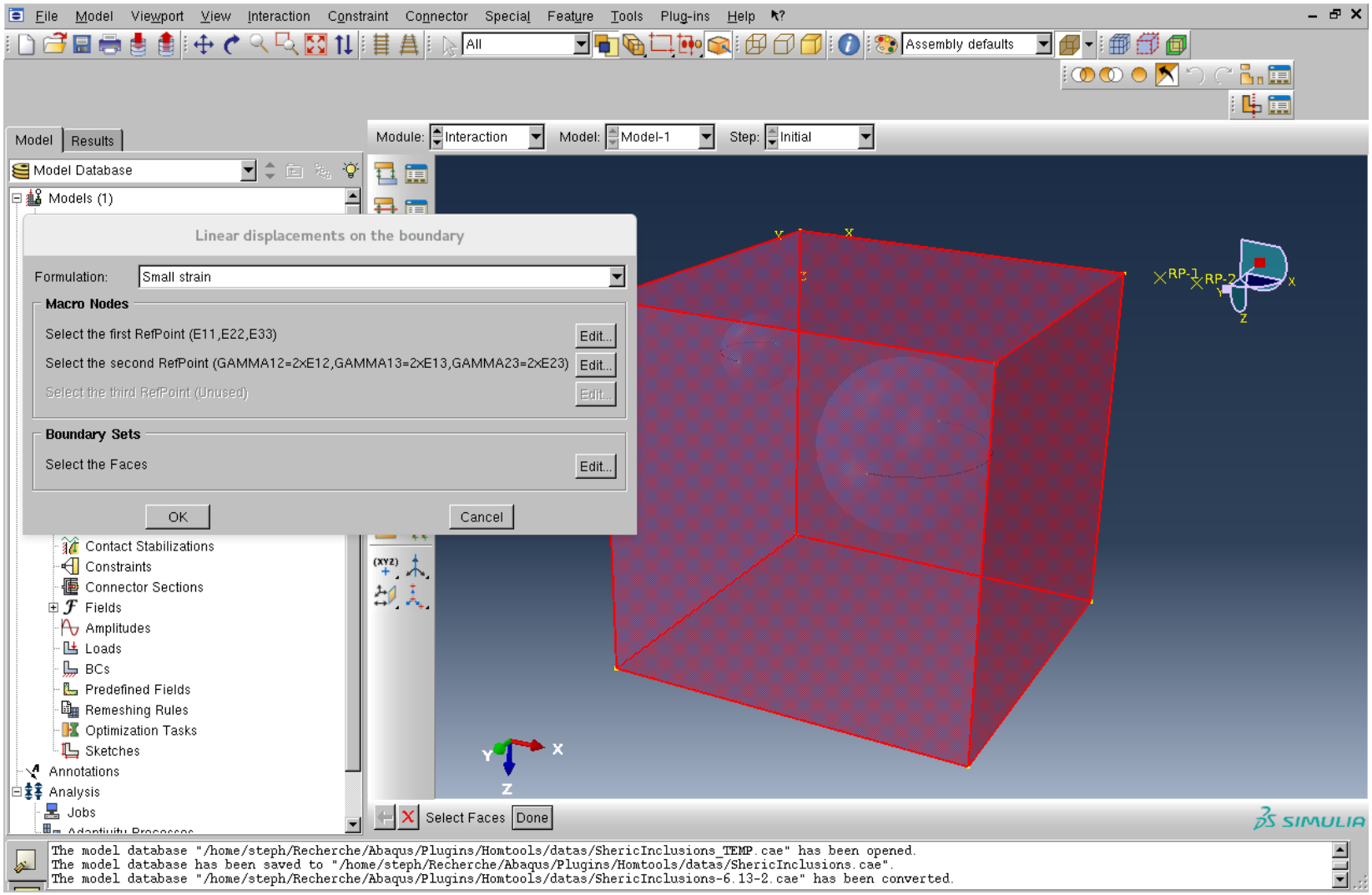
step 5 : Choice of a homogeneisation method : in this case Kinematic Uniform Boundary Conditions (KUBC)

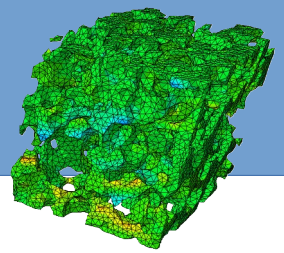




1st example: rigid spherical inclusions in an elastic media

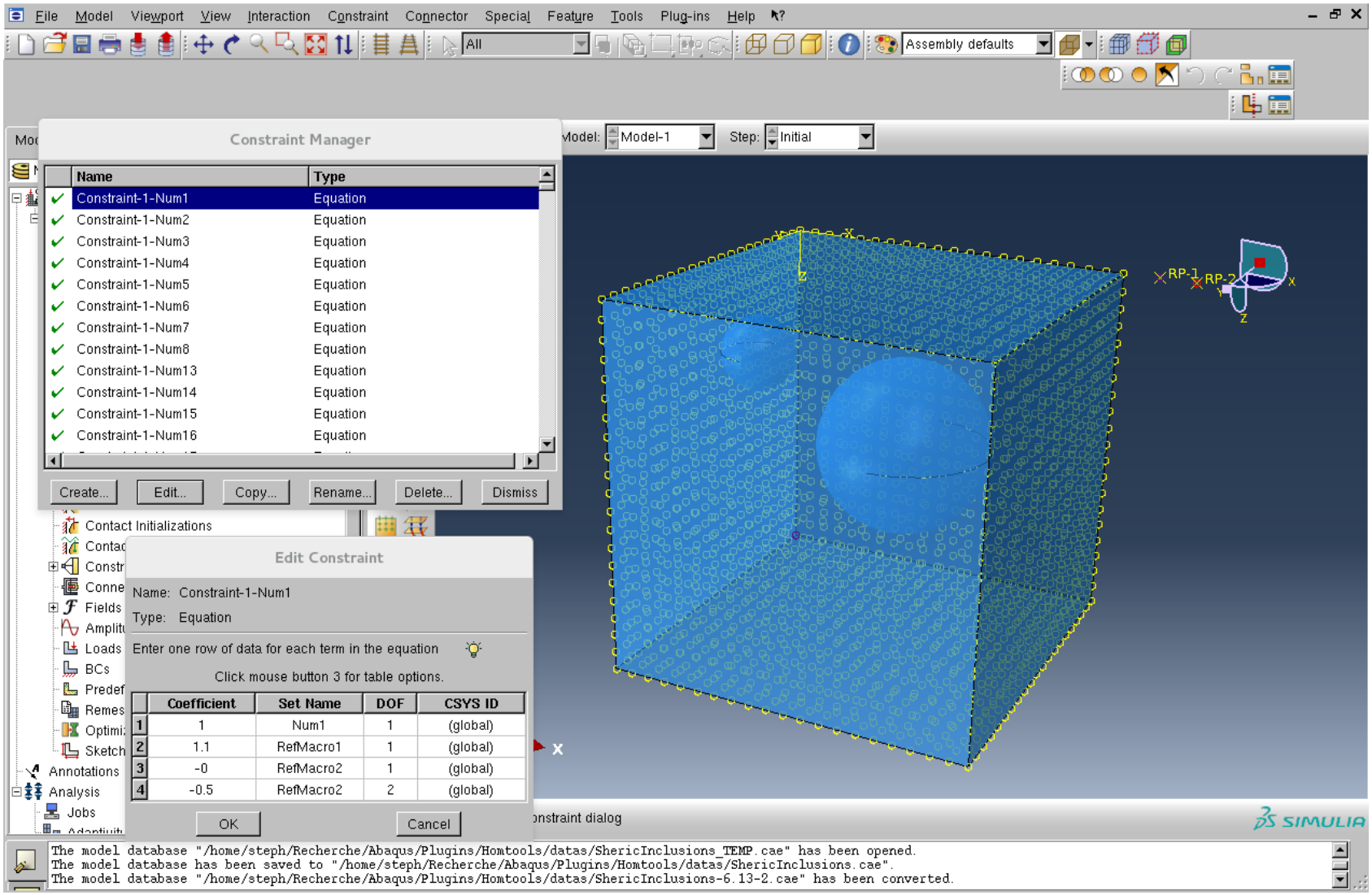
step 5 : The two ref points are selected and 6 faces of the cube define the boundary sets

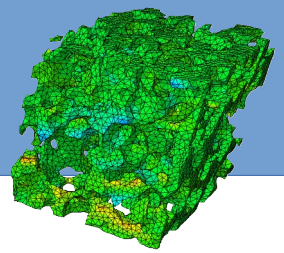




1st example: rigid spherical inclusions in an elastic media

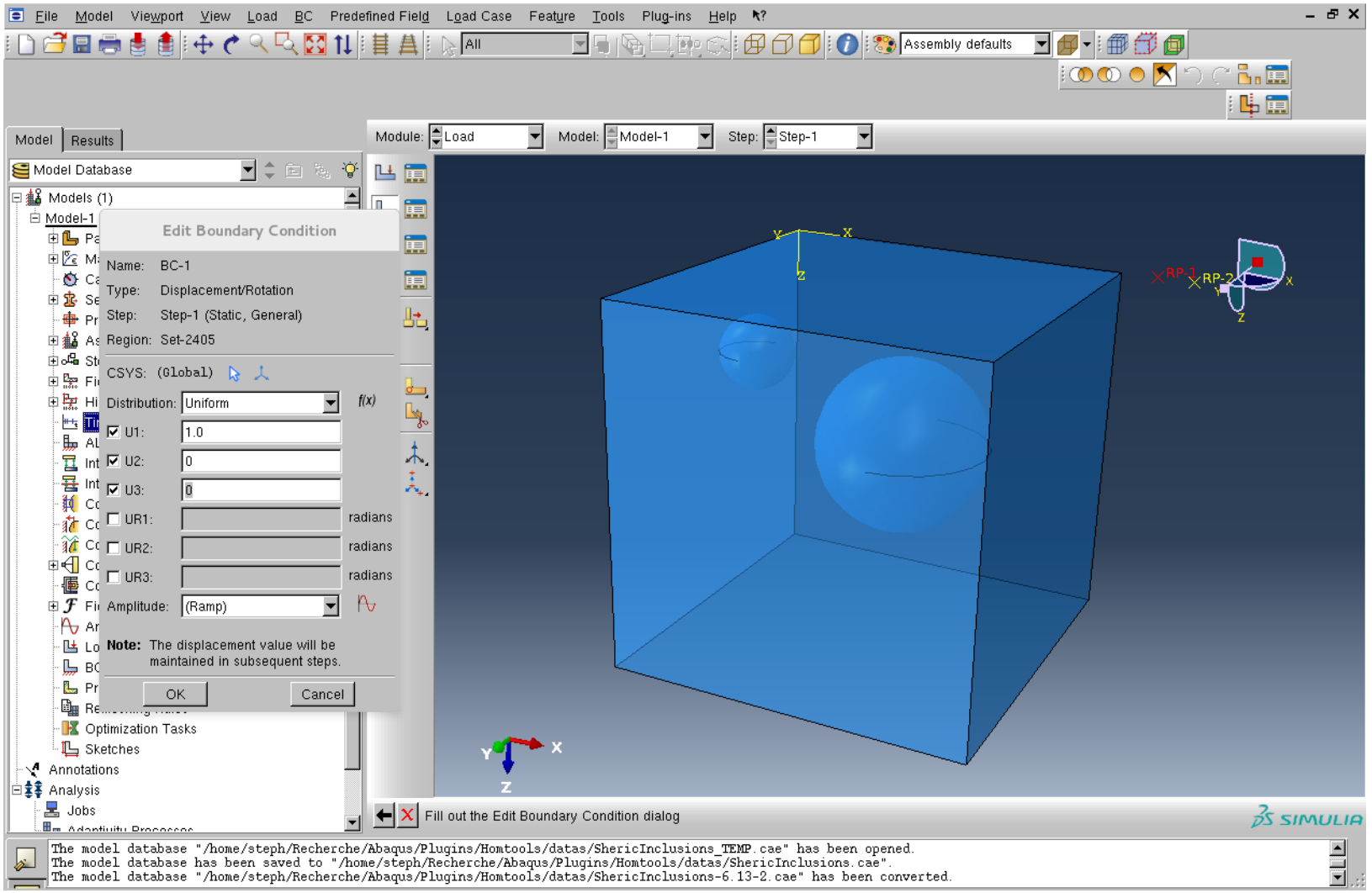
step 5 : Homtools generates the constraint equations (linear relations between ref nodes and boundary nodes) on the boundary sets

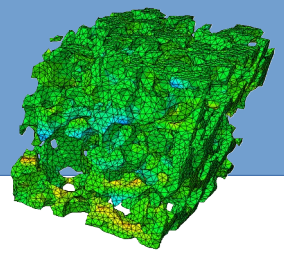




1st example: rigid spherical inclusions in an elastic media

step 6 : Macro strains (resp. stresses) are defined from displacement boundary conditions (resp. cload condition) specified at the ref nodes. In this case (3D small strains) at ref node 1 we have E11,E22,E33 and 2E12,2E13,2E23 at ref node 2.





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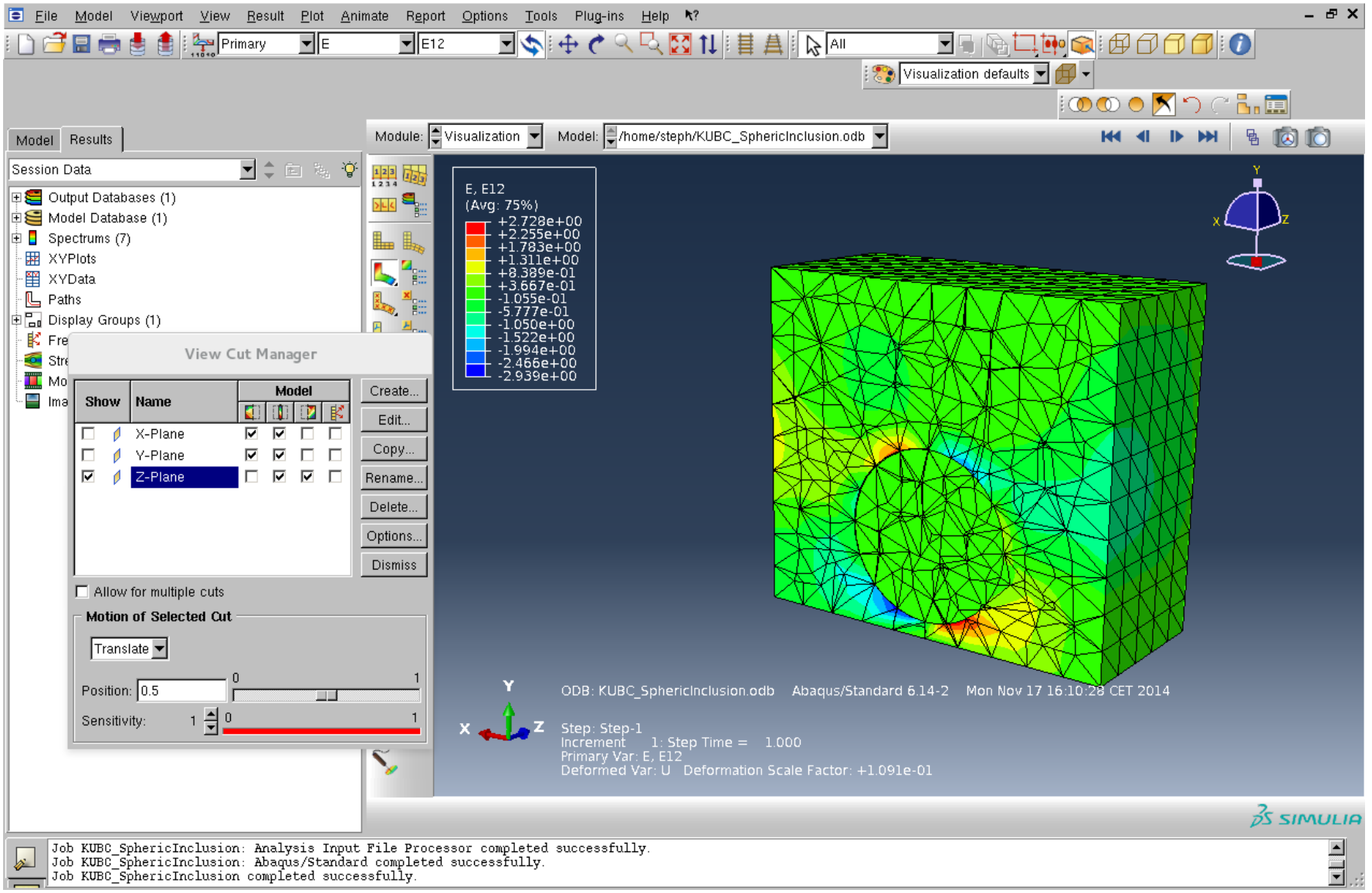
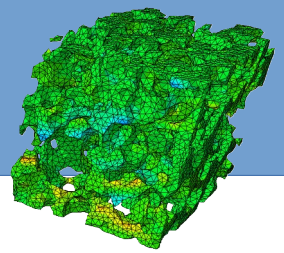
1st example: rigid spherical inclusions in an elastic media

step 7 : Job submission and local results, nothing special compare standard results





1st example: rigid spherical inclusions in an elastic media

step 7 : Macro stress/strain relationship is easily obtained by creating xydata from odbfield at reference points. Macro strain correspond to variable U, macro stress correspond to variable RF at ref nodes.