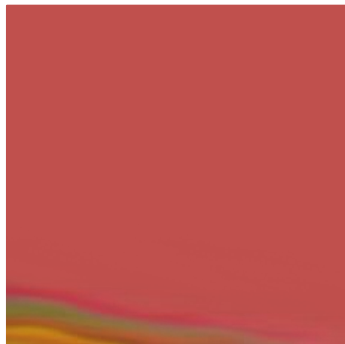
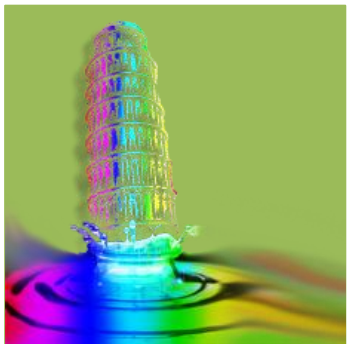
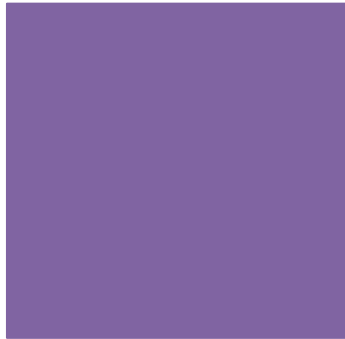
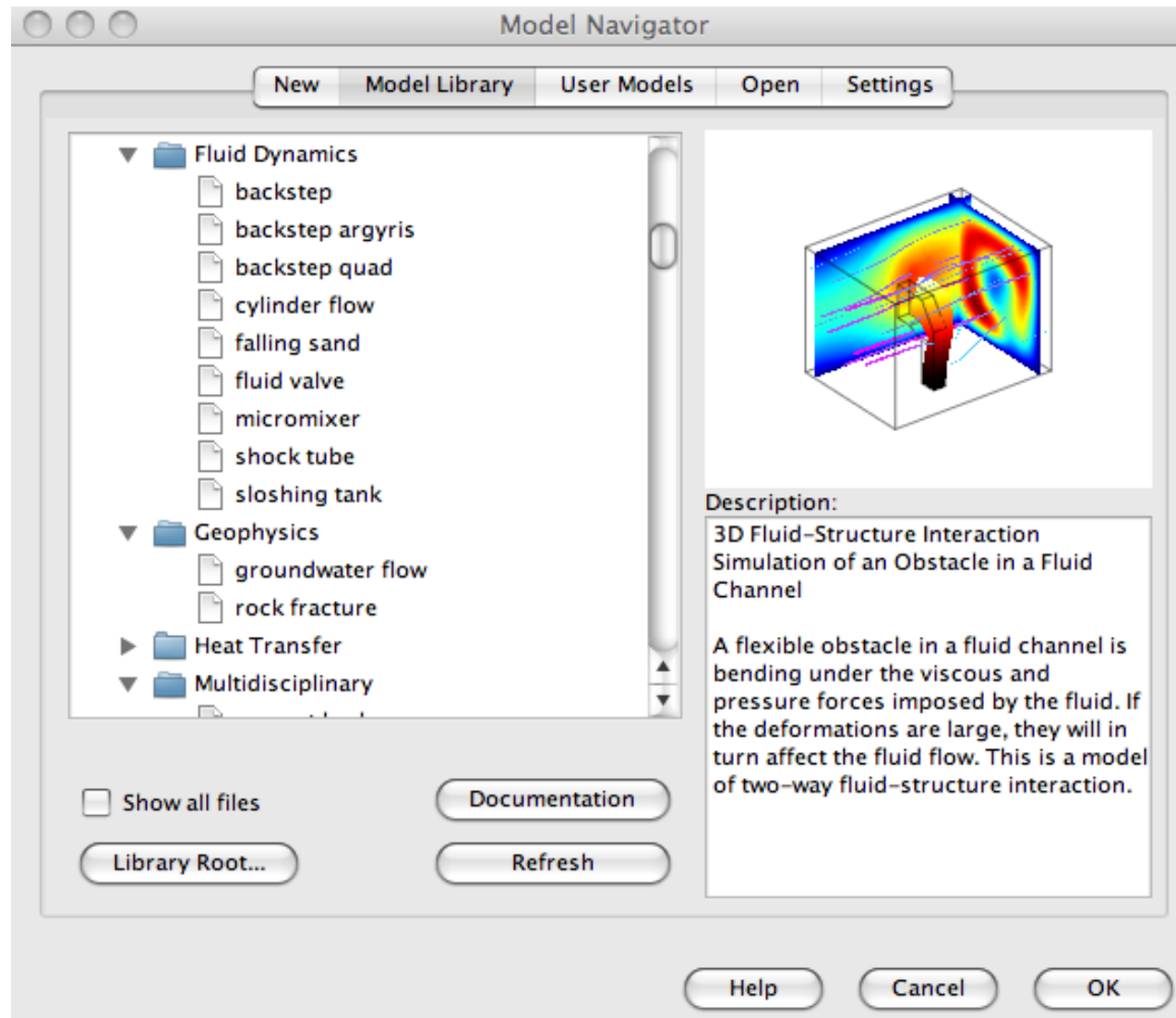


Comsol Multiphysics

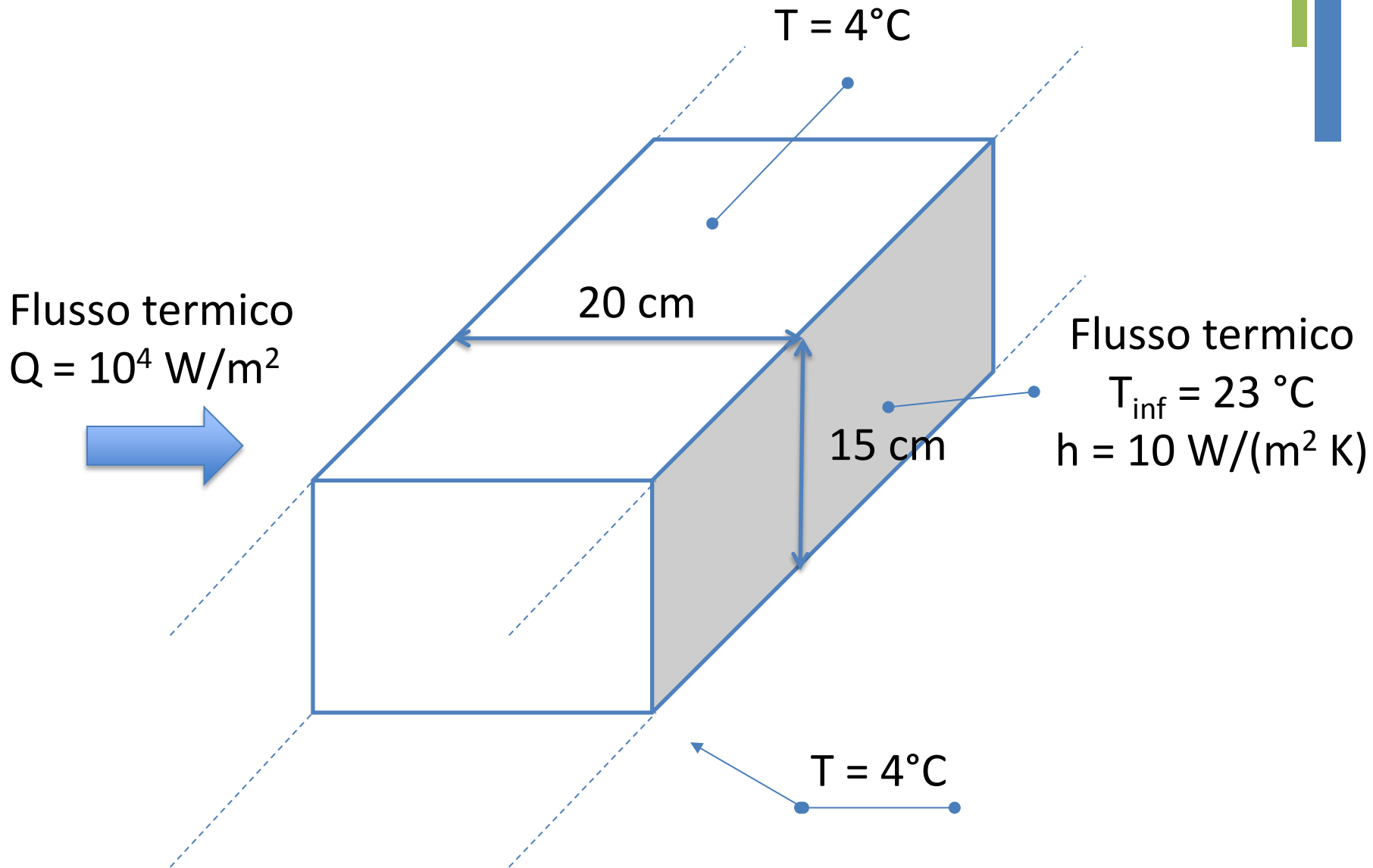
Analisi termica



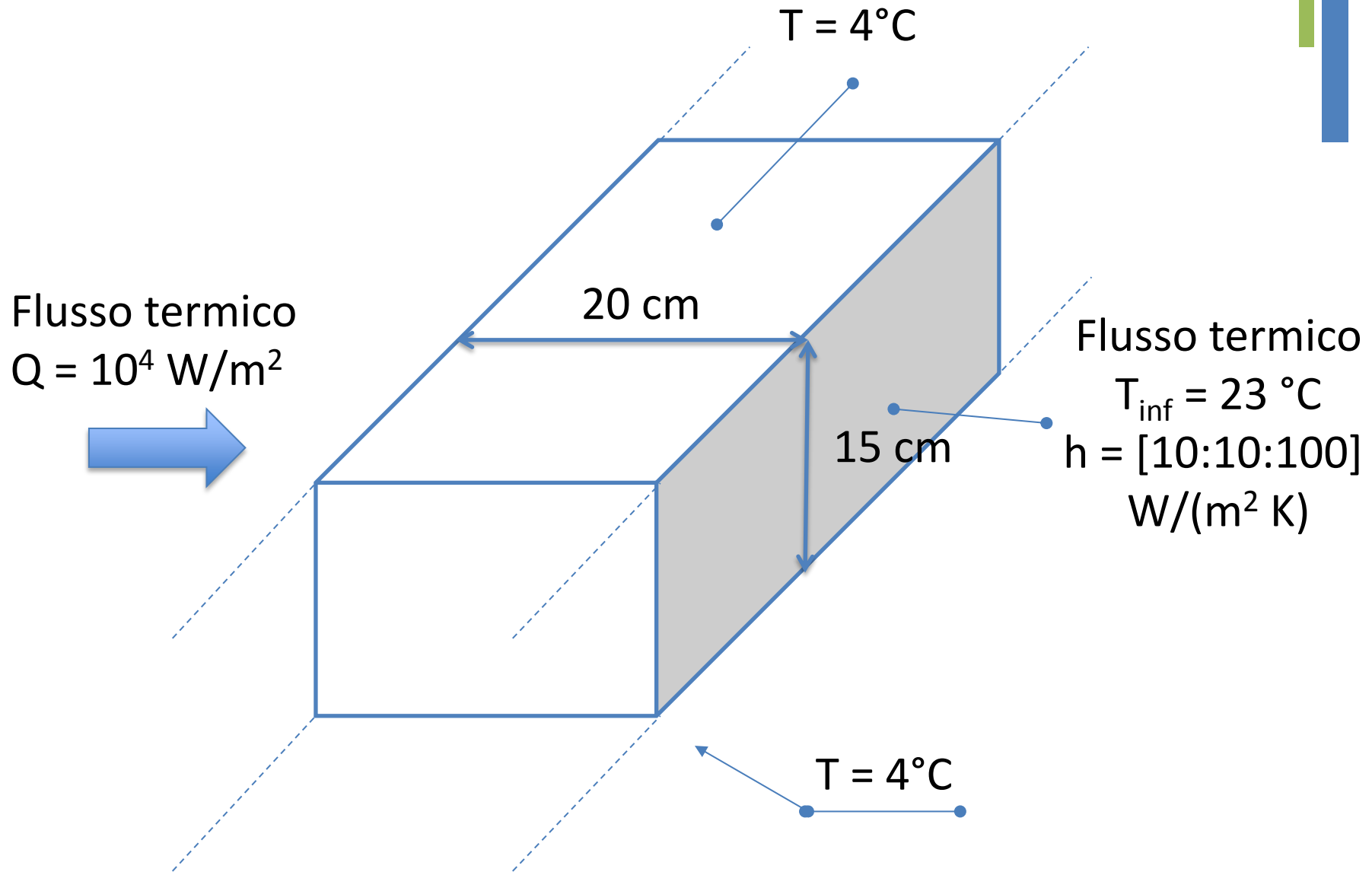
+ Comsol Multiphysics



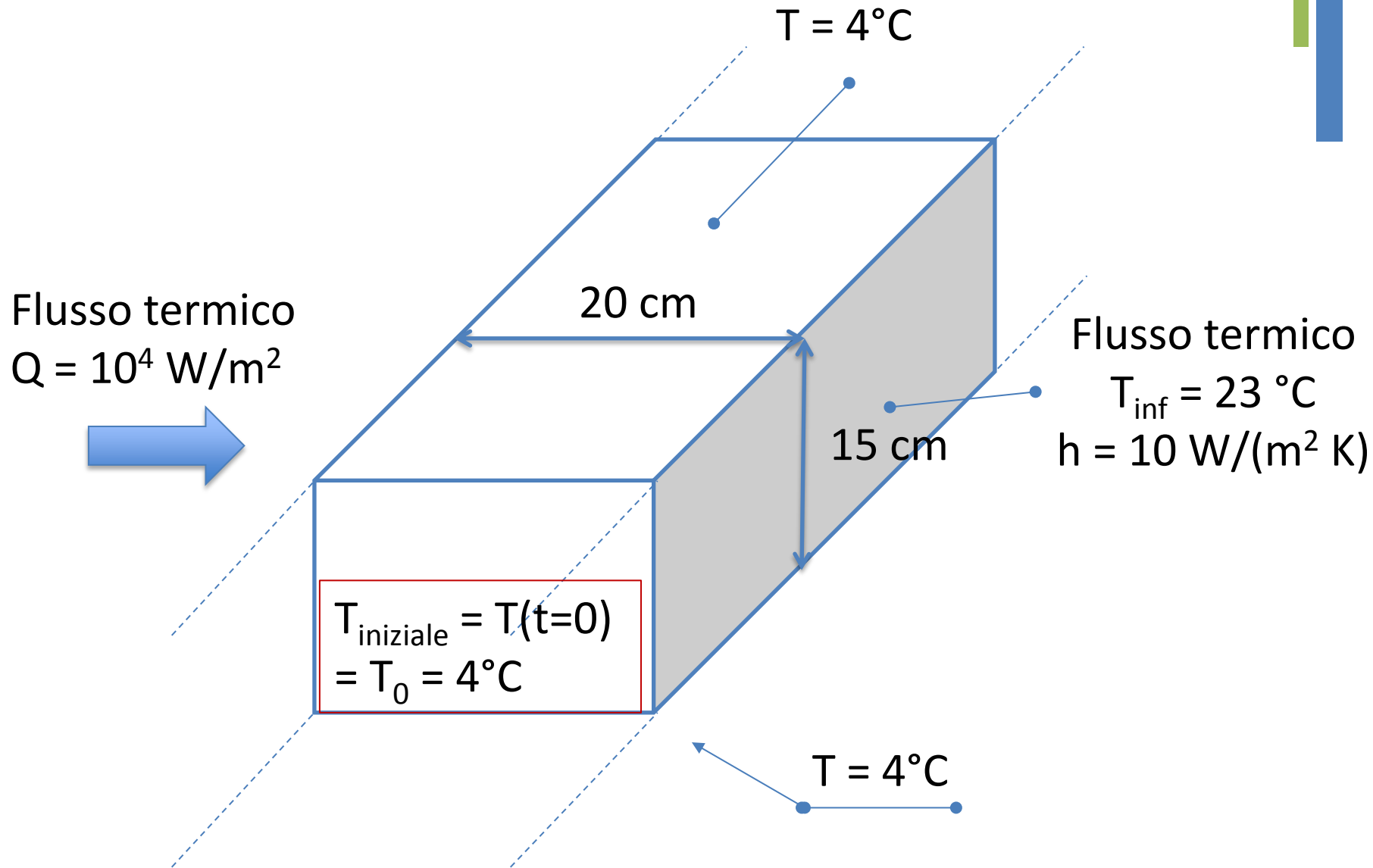
+ Esercizio



+ Esercizio – analisi parametrica

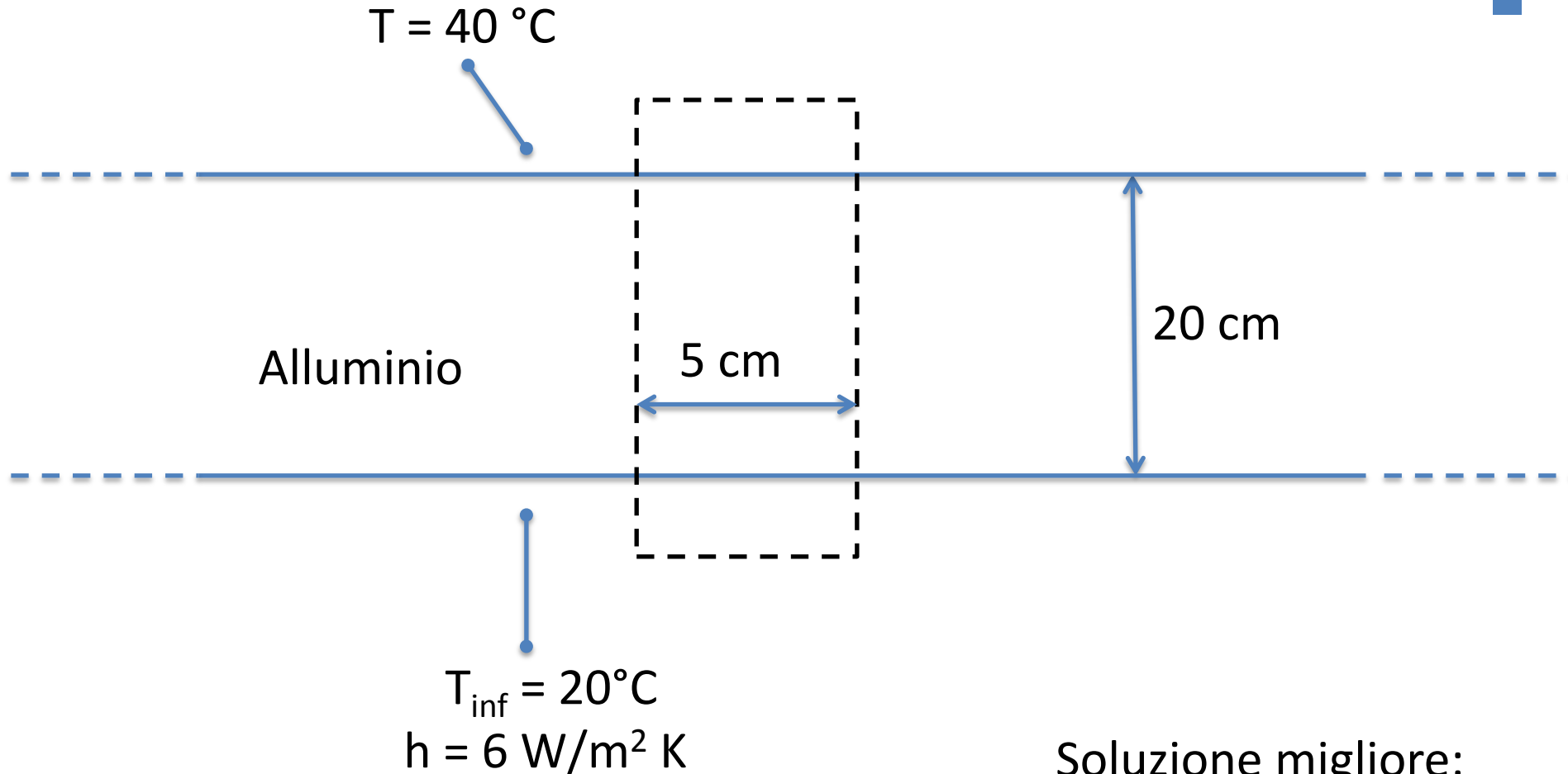


+ Esercizio – tempo variante



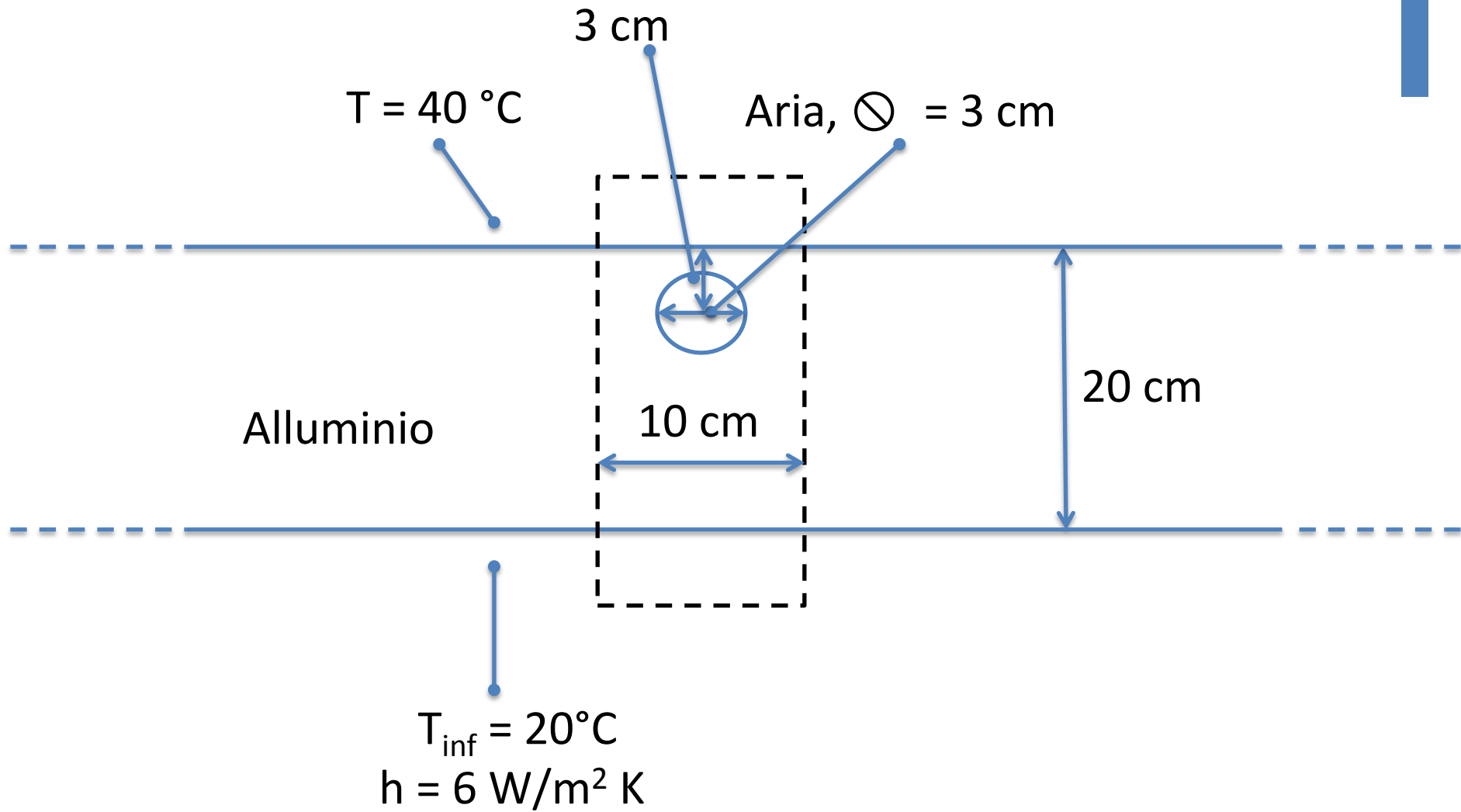
Come cambia il profilo di temperatura nel tempo?

+ Esercizio



Soluzione migliore:
modello monodimensionale

+ Esercizio



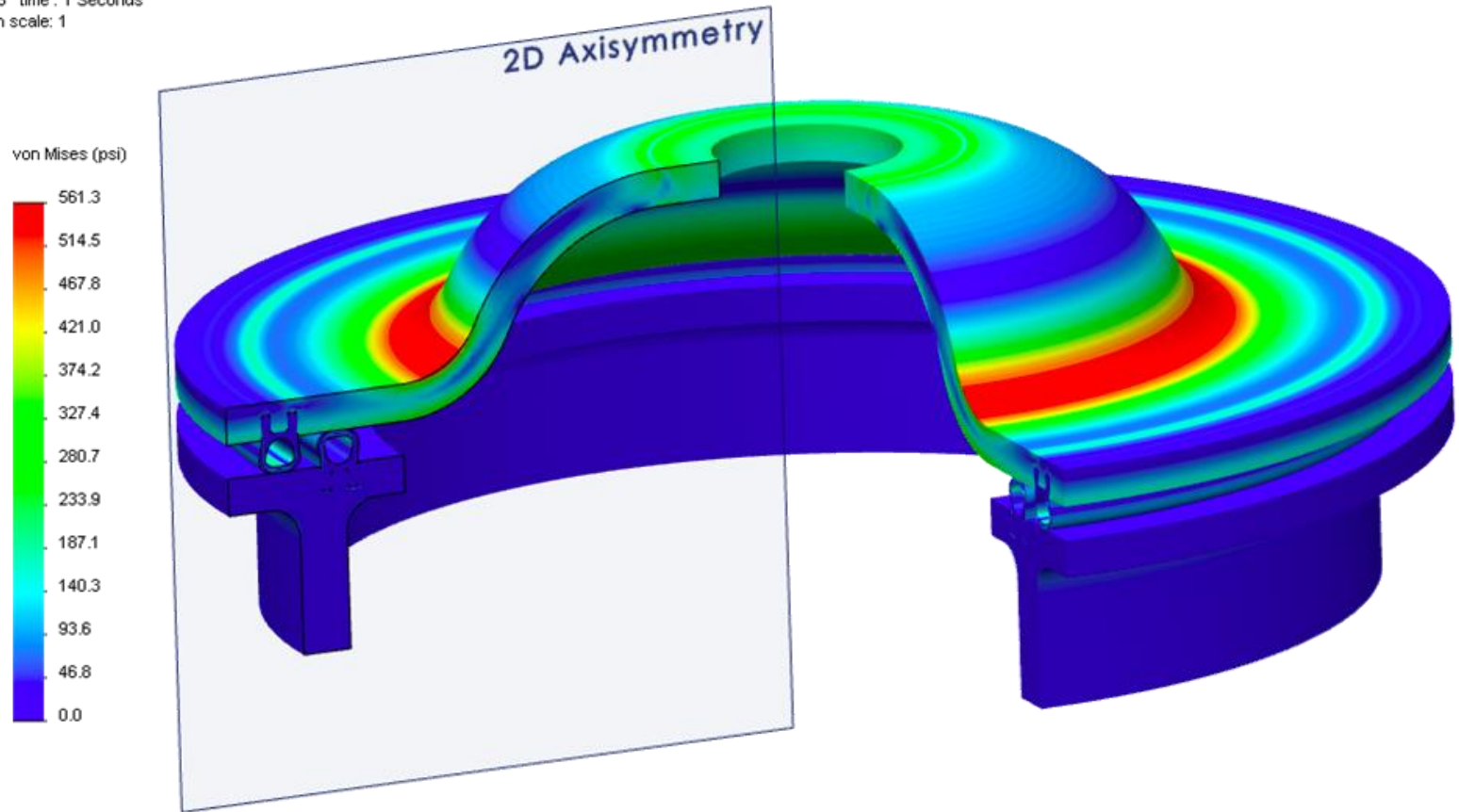
+ Simmetrie

- Simmetria rispetto ad un piano
 - Geometria simmetrica
 - Condizioni (al contorno ed iniziali) simmetriche
- Assialsimmetria
 - Geometria assialsimmetrica
 - Condizioni (al contorno ed iniziali) assialsimmetriche



+ Assialsimmetria

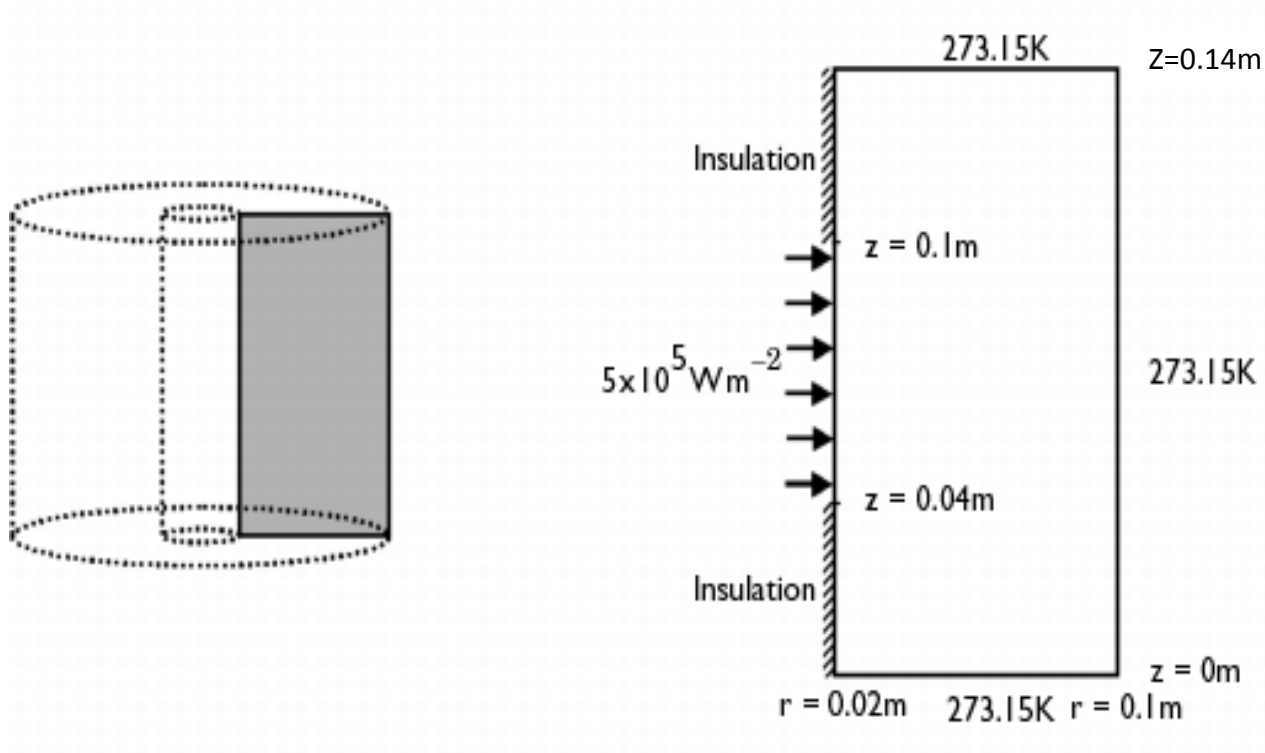
Model name: cover_seal
Study name: Hyperelastic
Plot type: Nonlinear nodal stress Stress1
Plot step: 13 time : 1 Seconds
Deformation scale: 1





Esercizio

Assialsimmetria Conduzione



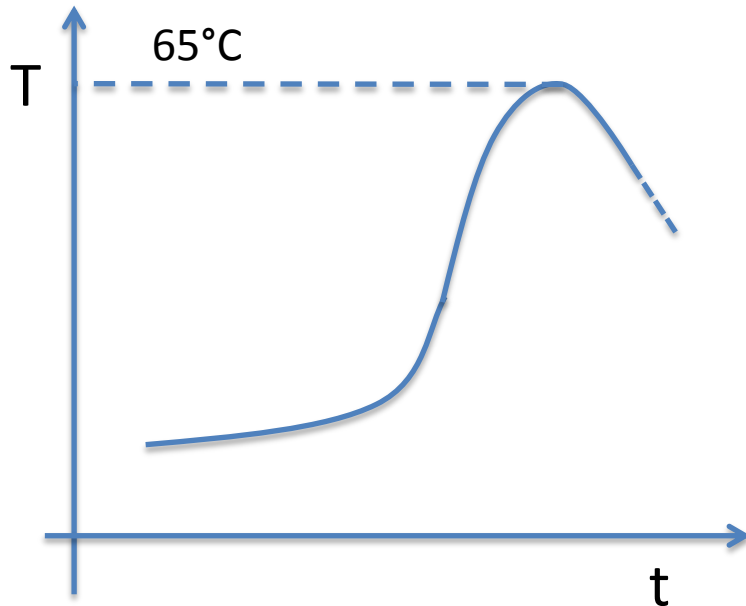
+ Da 2D axi a 3D postprocessing

To postprocess the solution in 3D, first revolve the geometry into a cylinder in a 3D geometry and then map the axisymmetric solution to the cylinder using an extrusion coupling variable:

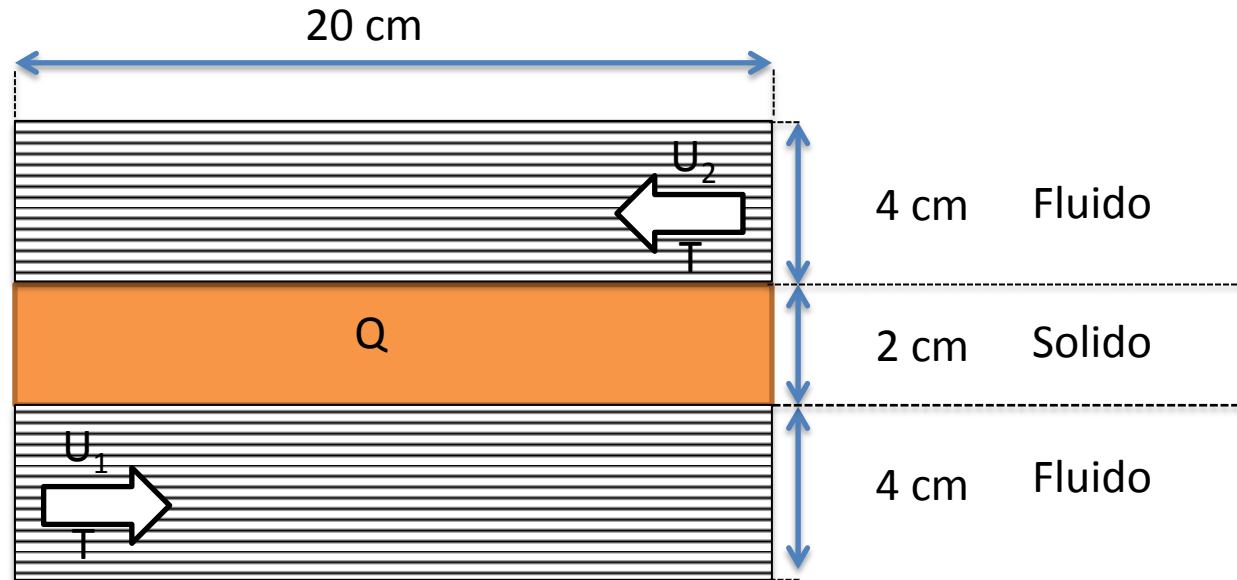
1. From the Draw menu, choose Revolve.
2. In the Revolve dialog box, leave the default settings and click OK. This creates a cylinder in 3D. Note that the axis of revolution in 3D is the y-axis, which means that the plane that you map the radial coordinate r to is the xz -plane.
3. Click the Geom1 tab at the top of the drawing area to return to the 2D axisymmetric geometry.
4. Choose Options>Extrusion Coupling Variables>Subdomain Variables.
5. In the Subdomain Extrusion Variables dialog box, select Subdomain 1 and then type T_{2D} in the first row of the Name column and T is the first row of the Expression column. This creates an extrusion coupling variable T_{2D} that represents the temperature (the variable T).
6. Click the General transformation button. The default source transformation ($x: r$ and $y: z$) is correct.
7. Click the Destination tab.
8. Select Geom2 from the Geometry list, select Subdomain from the Level list, and finally select the 1 check box for Subdomain 1 in the Subdomain selection list. The variable T_{2D} is the only extrusion coupling variable and the software selects it automatically.
9. In the Destination transformation area, type $\sqrt{x^2+z^2}$ in the x edit field, and leave the value y in the y edit field. This transforms r and z in the axisymmetric geometry to $\sqrt{x^2 + z^2}$ and y , respectively, in the 3D geometry.
10. Click OK.
11. From the Solve menu, choose Update Model to map the solution to the 3D geometry.
12. From the Postprocessing menu, choose Plot Parameters.

+ Esercizio

- Raffreddamento del cemento durante la procedura di impianto della protesi d'anca cementata.



+ Esercizio: Convezione e conduzione



- $Q = \# \text{matricola (W/m}^3)$
- $T = \text{temperatura (in gradi centigradi) pari alle ultime due cifre del numero di matricola}$
- Fluido = acqua, profilo laminare
- Solido = ghisa
- Analizzare i casi $U_1 \geq U_2$