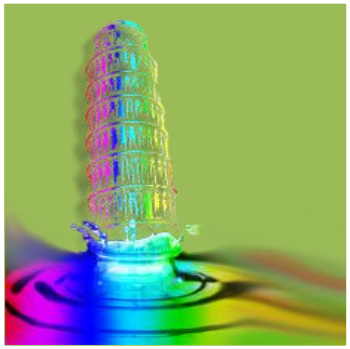
CENTRO E. PIAGGIO
Bioengineering and Robotics Research Center



Comsol Multiphysics

Analisi termica

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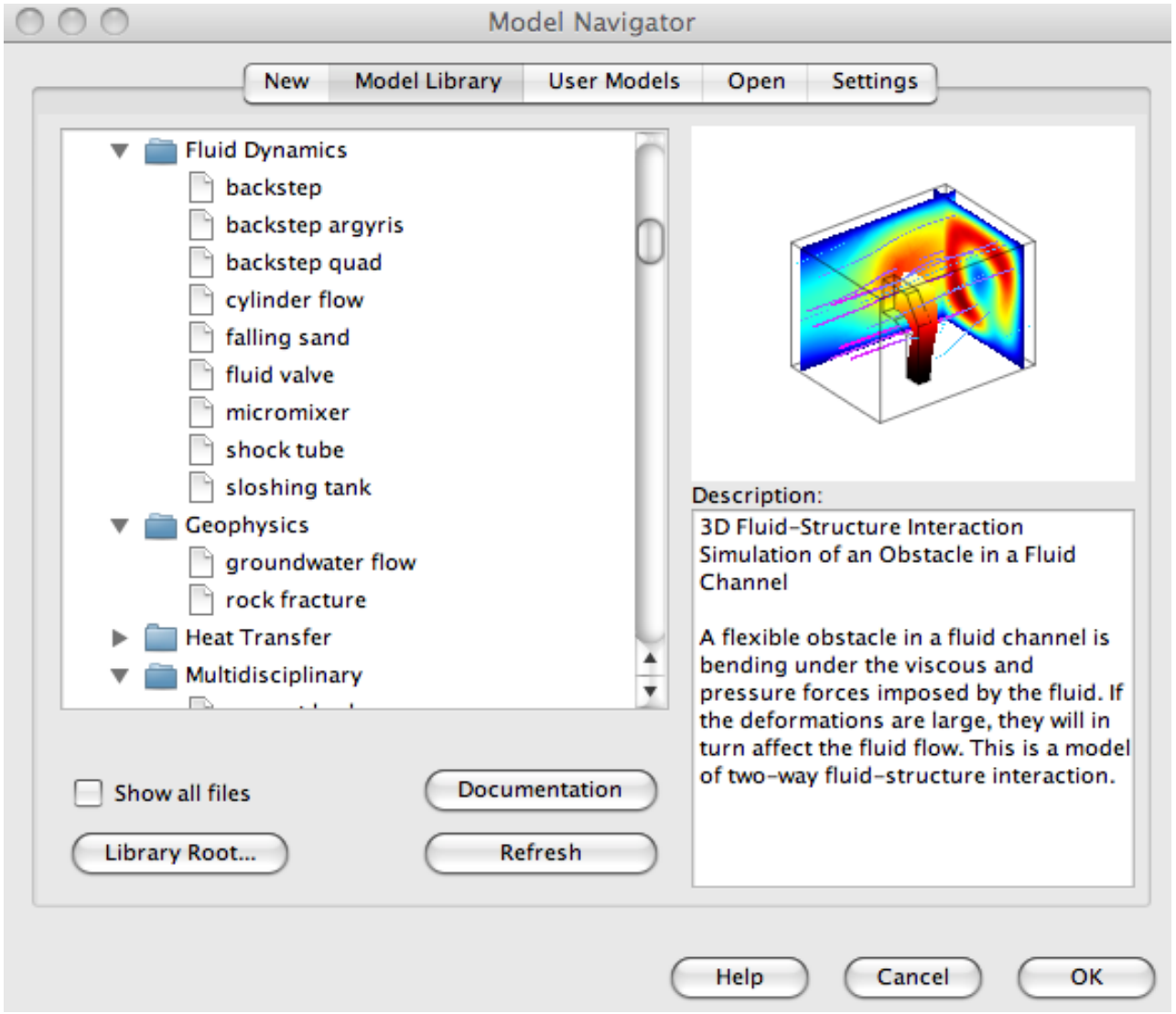
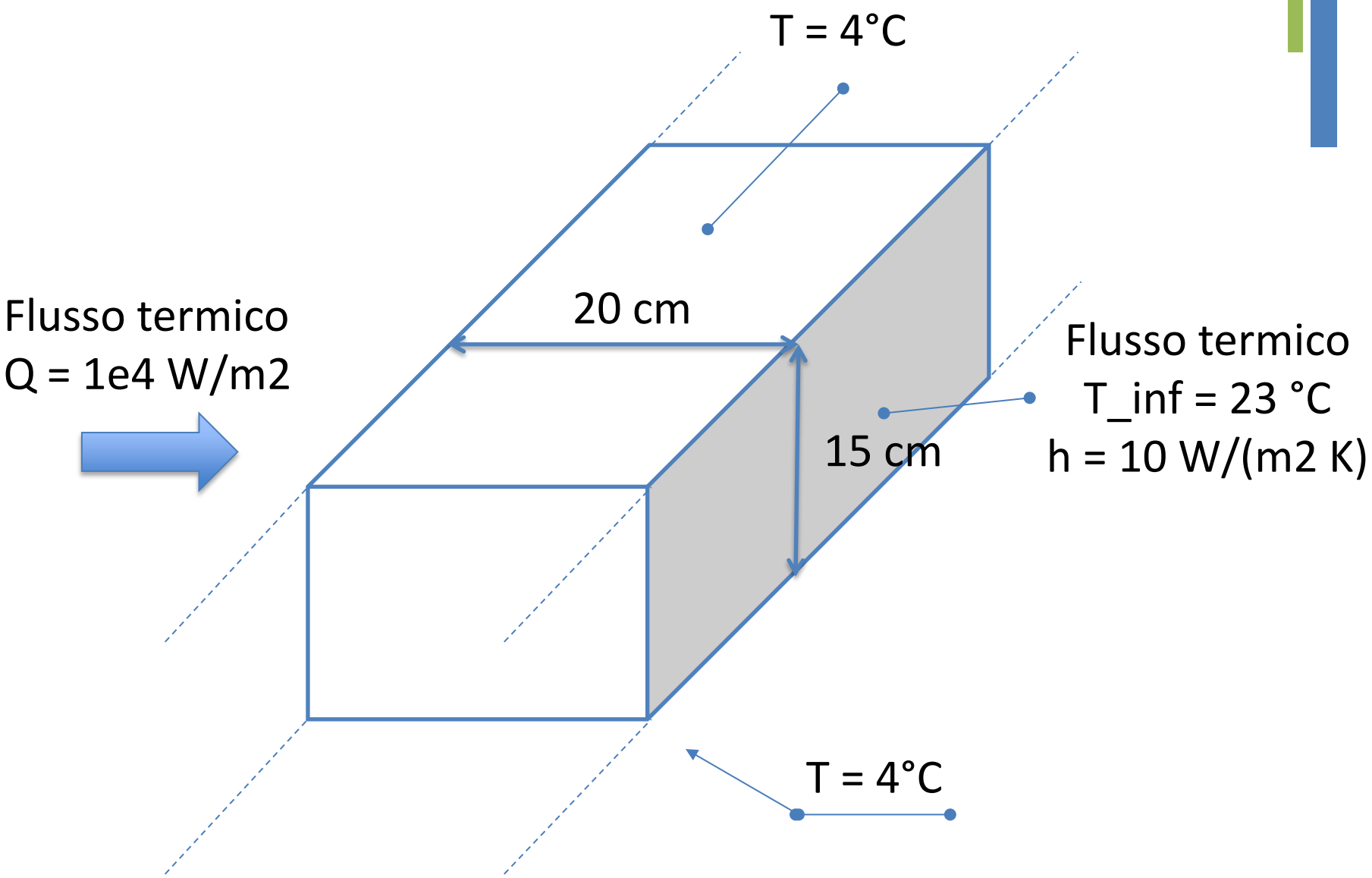
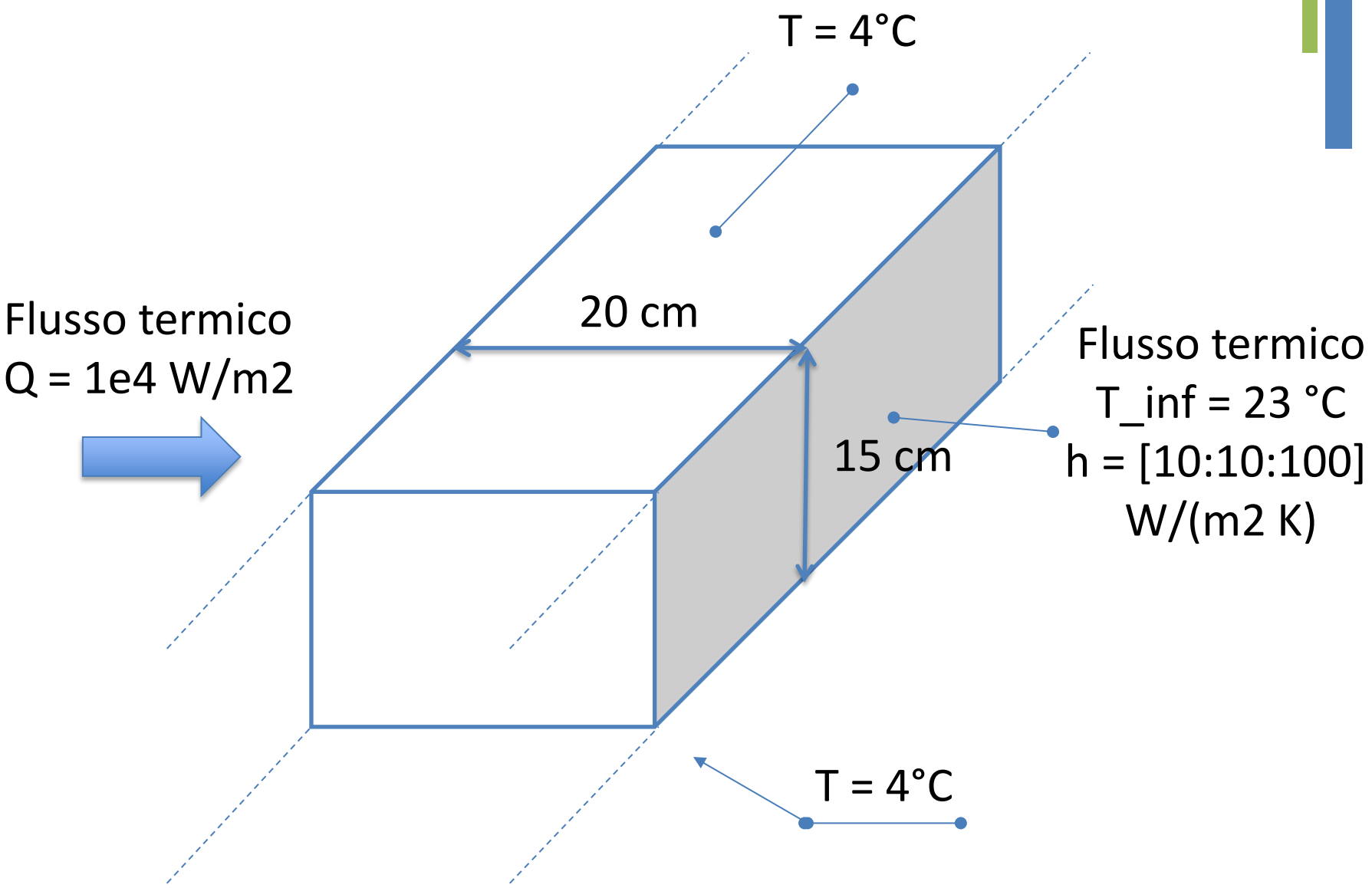
Comsol Multiphysics



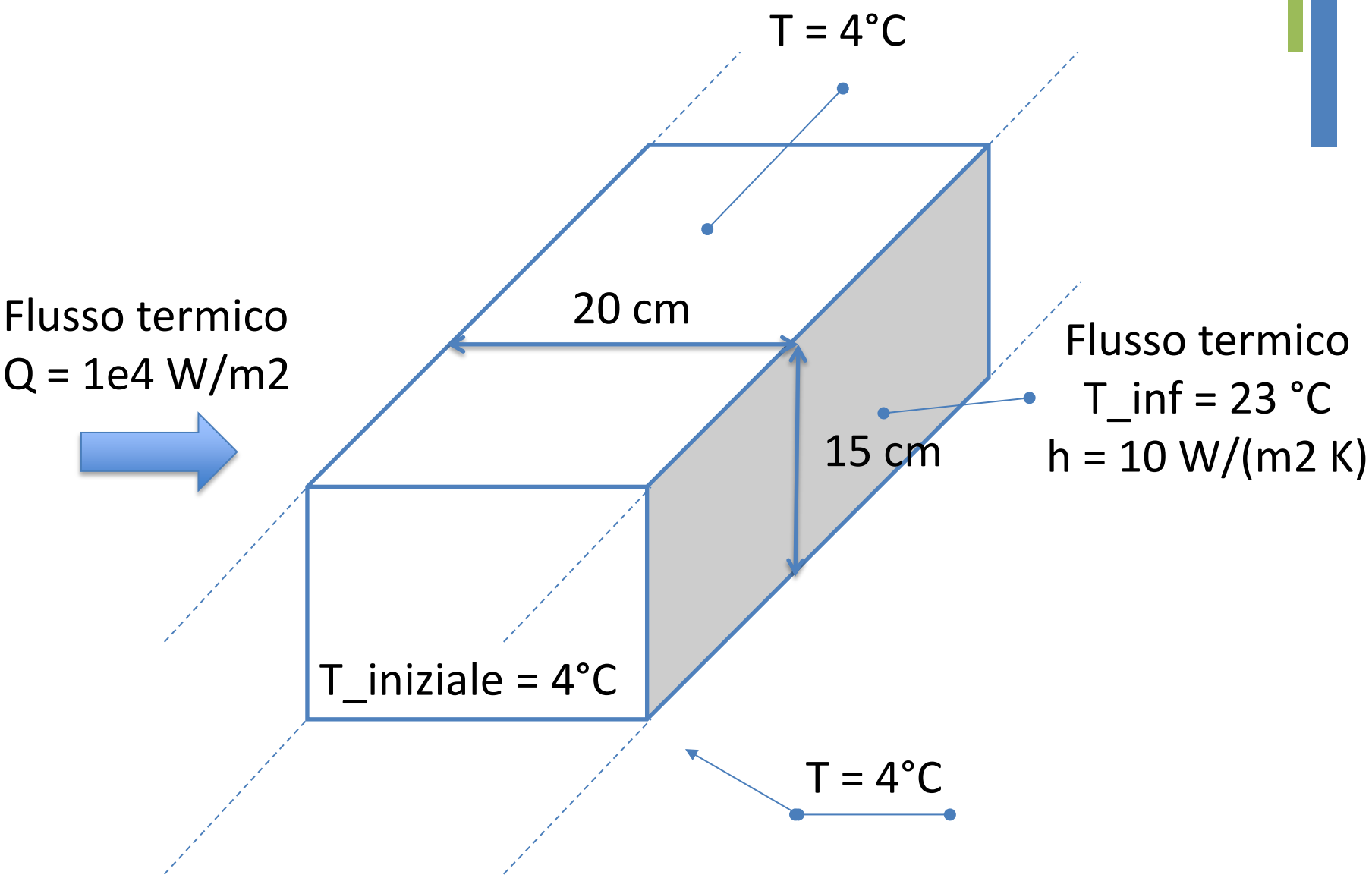
Esercizio


T = 4°C
Flusso termico
Q = 1e4 W/m2
20 cm
15 cm
Flusso termico
T_inf = 23 °C
h = 10 W/(m2 K)
T = 4°C

Esercizio – analisi parametrica

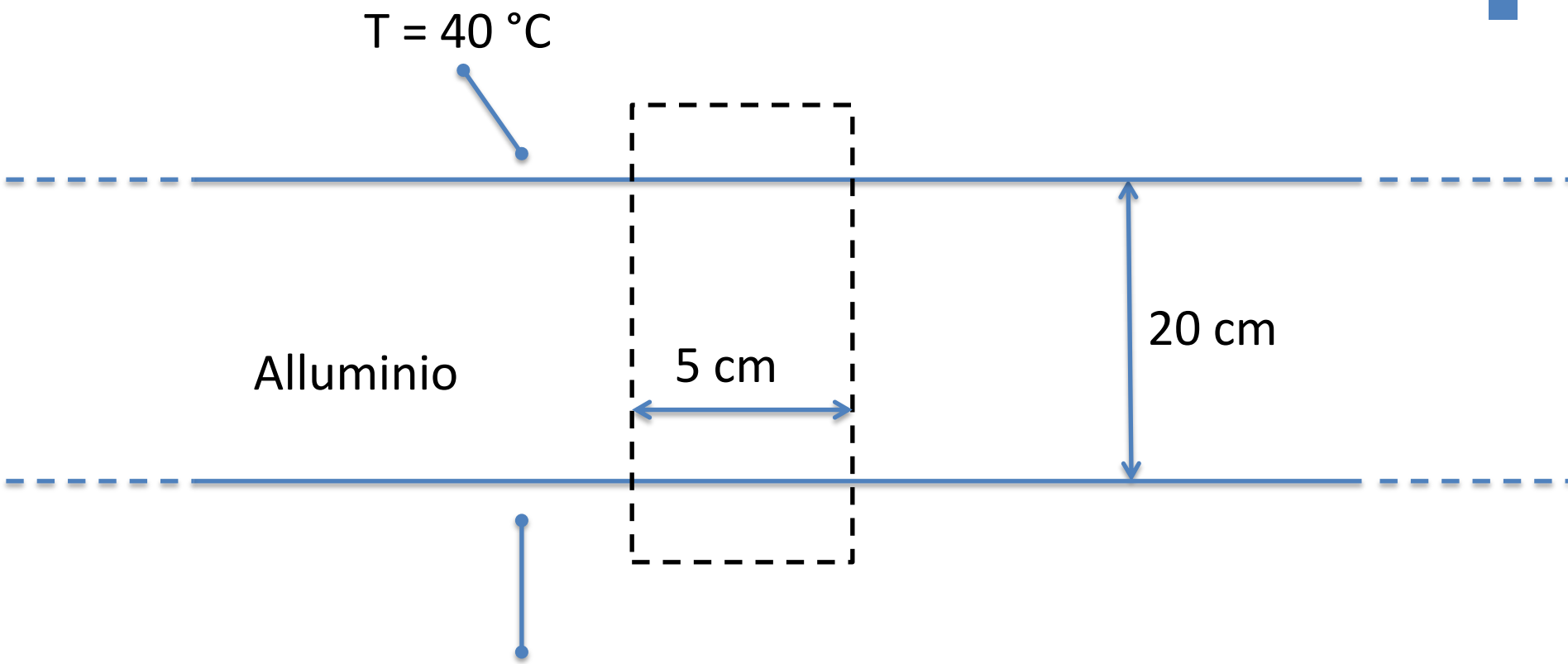


Esercizio –tempo variante



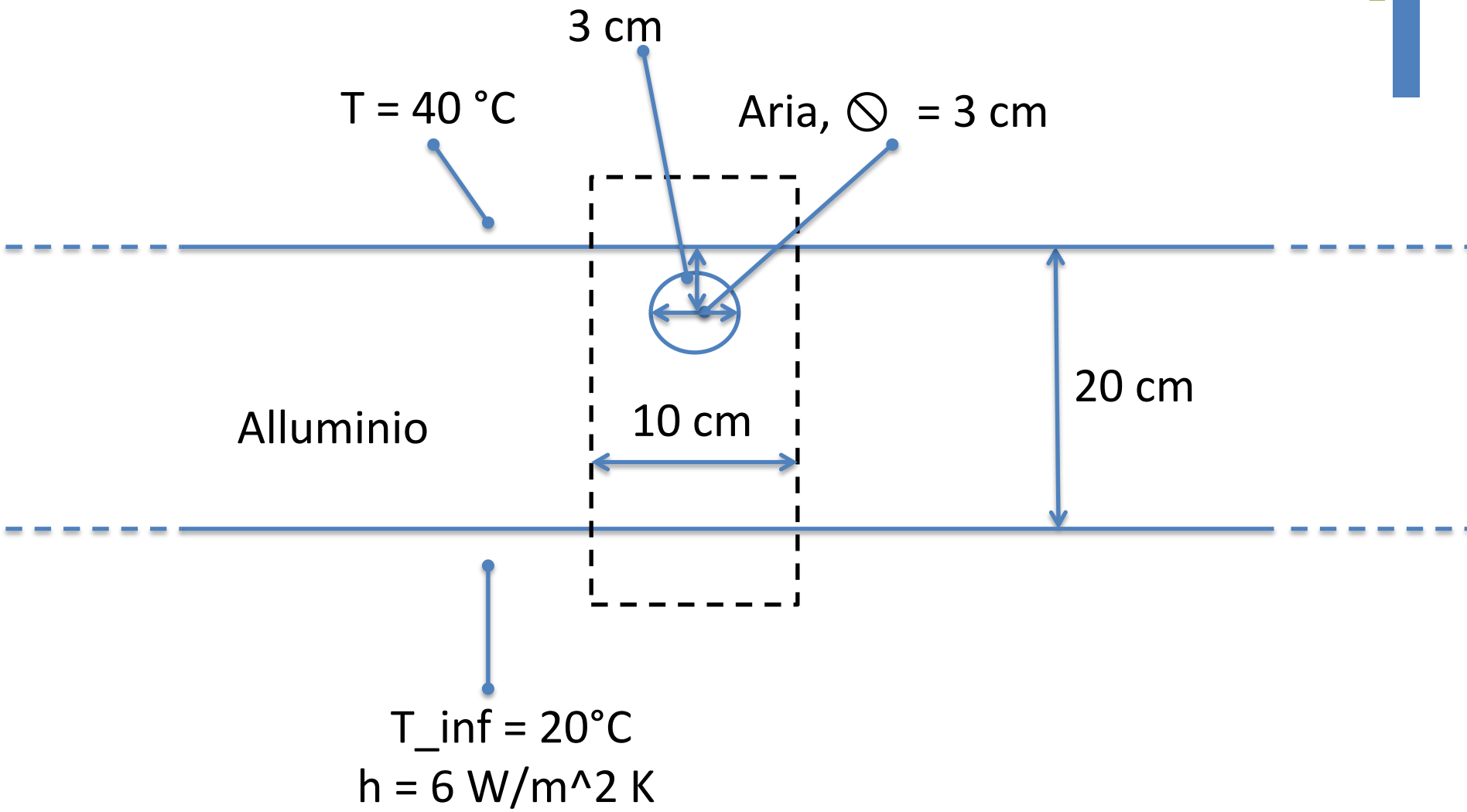
Come cambia il profilo di temperatura nel tempo?

Esercizio



Soluzione migliore:
modello monodimesionale

Esercizio

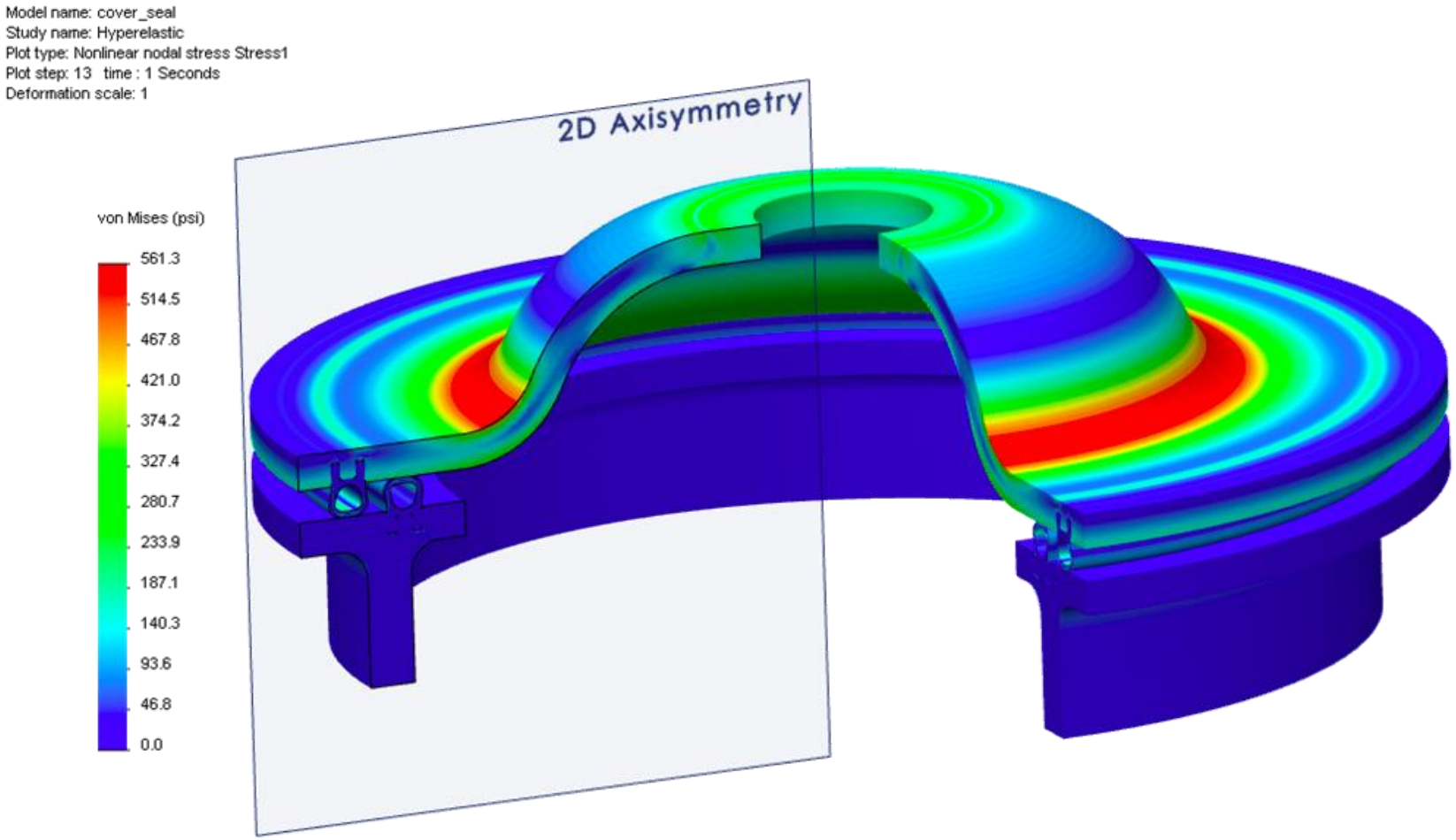


Simmetrie

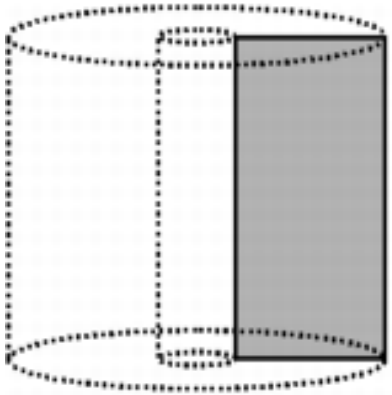
- Simmetria rispetto ad un piano
  - Geometria simmetrica
  - Condizioni (al contorno ed iniziali) simmetriche

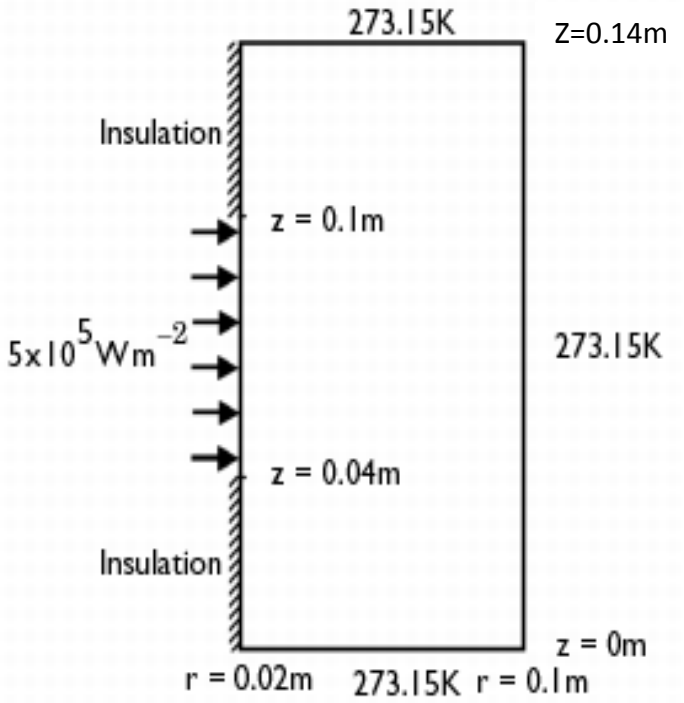
- Assialsimmetria
  - Geometria assialsimmetrica
  - Condizioni (al contorno ed iniziali) assialsimmetriche

Assialsimmetria



Esercizio
Assialsimmetria Conduzione





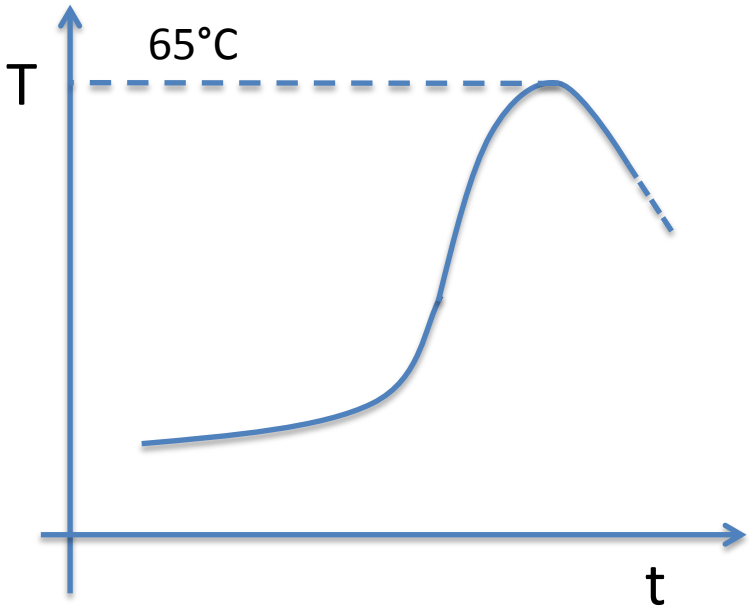
Da 2D axi a 3D postprocessing

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:

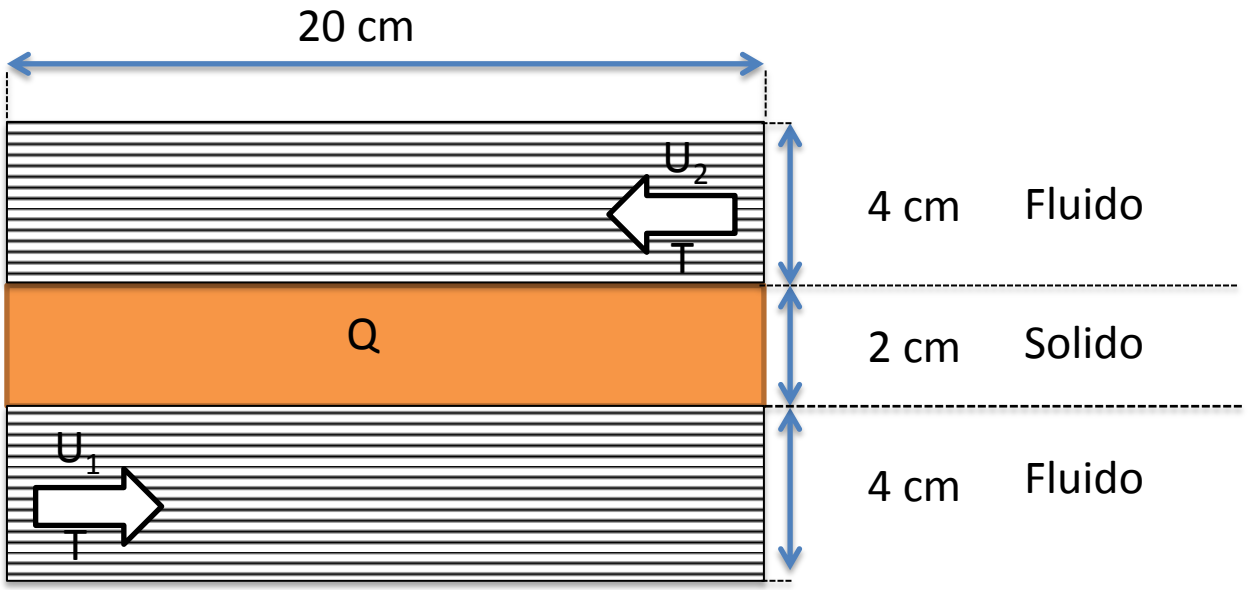
1. From the Draw menu, choose Revolve.
2. In the Revolve dialog box, leave the default settings and click OK. This creates a cylinder in 3D. Note that the axis of revolution in 3D is the y-axis, which means that the plane that you map the radial coordinate r to is the xz-plane.
3. Click the Geom1 tab at the top of the drawing area to return to the 2D axisymmetric geometr y.
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 x2 + z2 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 = #matricola (W/m^3)
- T = temperatura (in gradi centigradi) pari alle ultime due cifre del numero di matricola
- Fluido = acqua, profilo laminare
- Solido = ghisa
- Analizzare i casi $U_1 \geq U_2$