Stabilization time in Infiltration Test

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Introduction: The flow of water inside the massive soil is known by percolation. For modeling, the percolation of water into soil is considered valid Darcy's law when the flow is laminar. In this manner, the key property is the coefficient of hydraulic conductivity. This coefficient is a function of soil texture and structure and shows great variability. Its determination can be made through laboratory and field testing. Among the field tests highlights the infiltration test called Slug Test. This test consists in a well in the ground where a certain amount of water, or an object of known volume, is added or removed quickly. Then, the change in the hydraulic conditions are monitored over the time, observing the conditions of recovery of the initial static level.
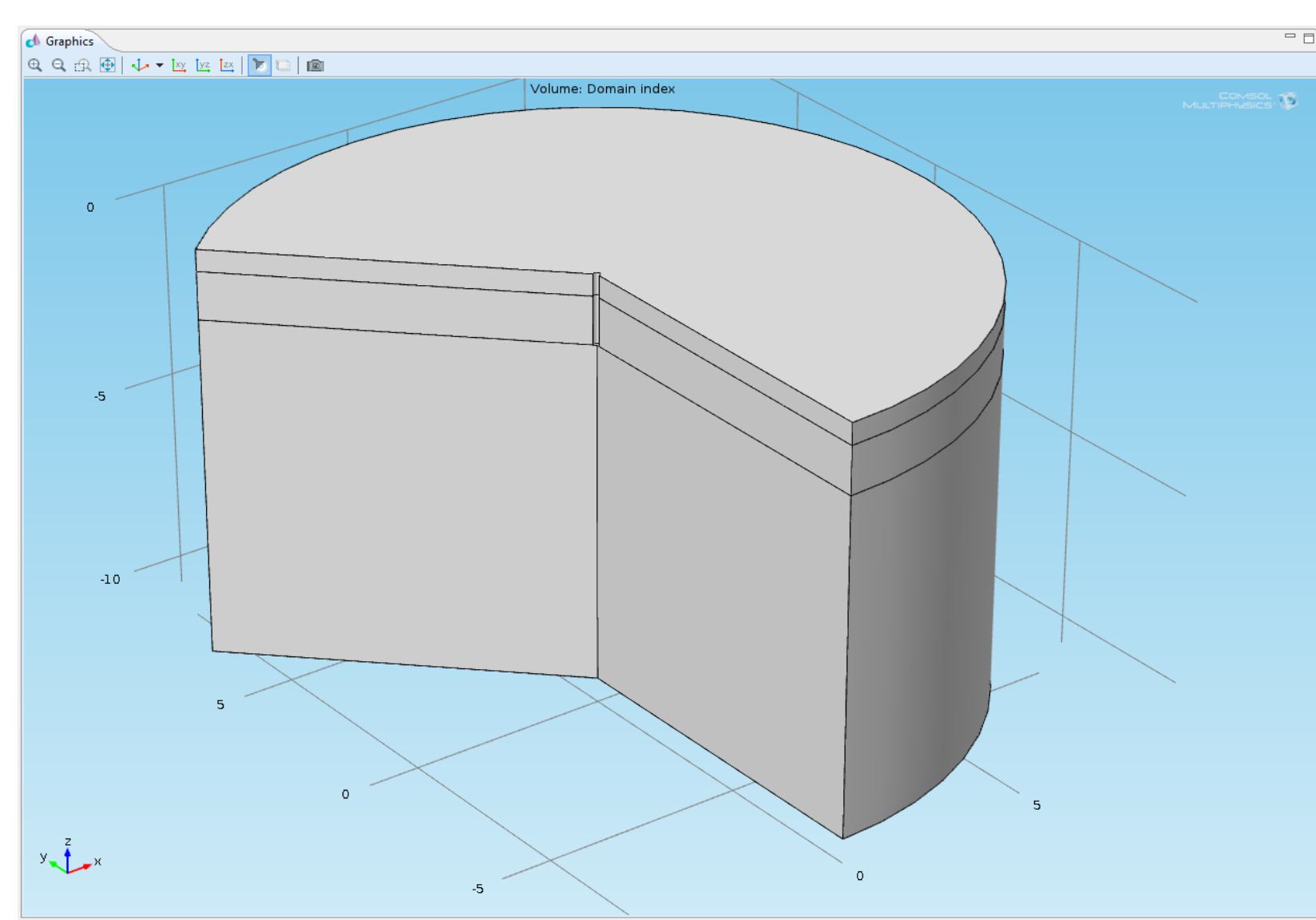

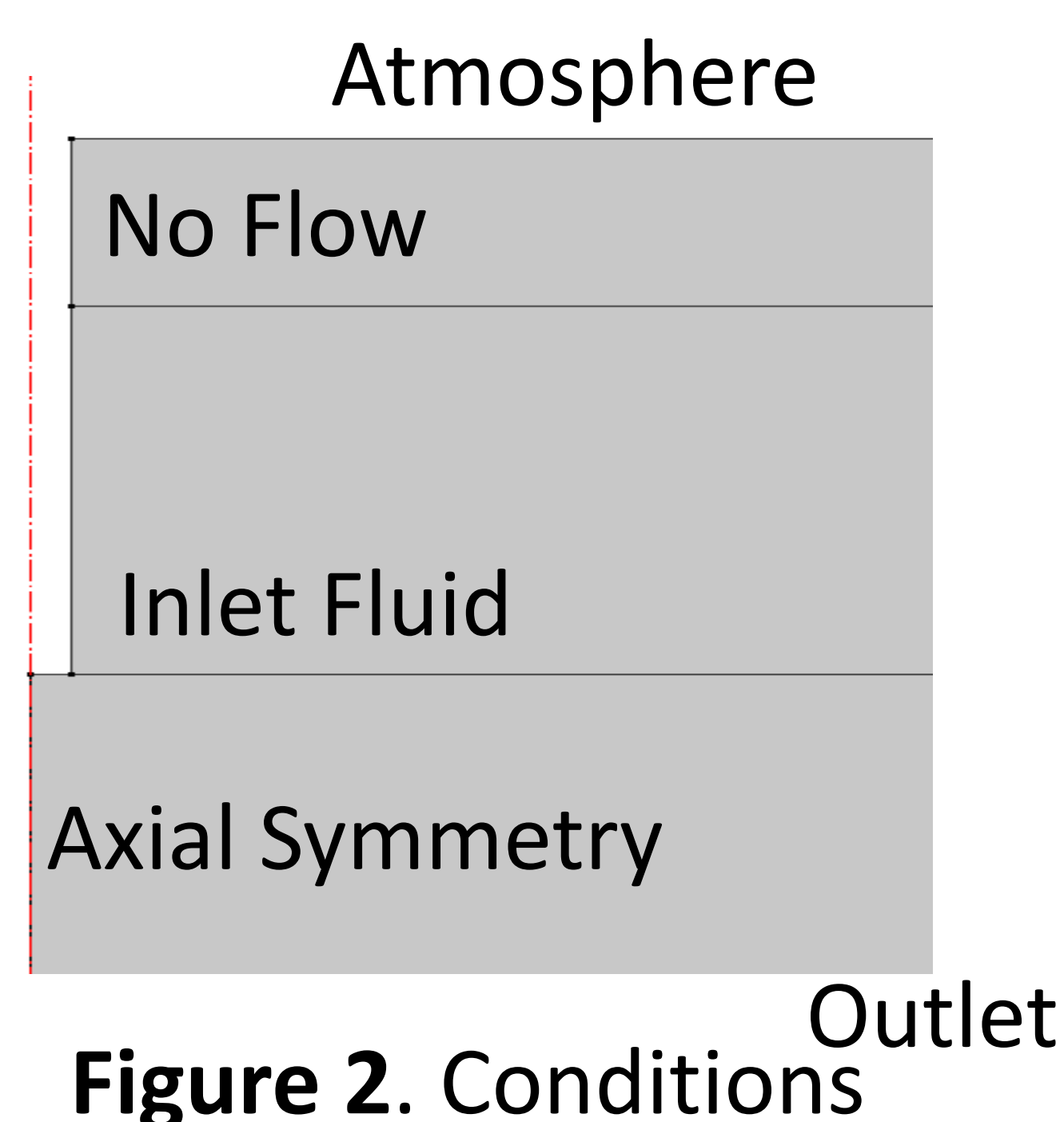**Figure 1**. Geometry   **Figure 2**. Conditions

Computational Methods: Thus, this work aims to calibrate a numerical model, using COMSOL Multiphysics® software, applying the model for fluid flow (water) in porous media governed by Darcy's law to evaluate the stabilization time flow in infiltration Slug Tests, allowing a better understanding of water flow in a soil and providing the basis for studies of infiltration in devices such as filters.

$$\frac{\partial}{\partial t}(\rho \epsilon_p) + \nabla.(\rho u) = Q_m$$

$$u = -\frac{K}{\mu}(\nabla \rho + \rho g \nabla D)$$

Results: The study shows that only at distances smaller than 1 meter from the center of the hole occur a significant change in pressure. Stabilizing the hydraulic pressure at 30000s.
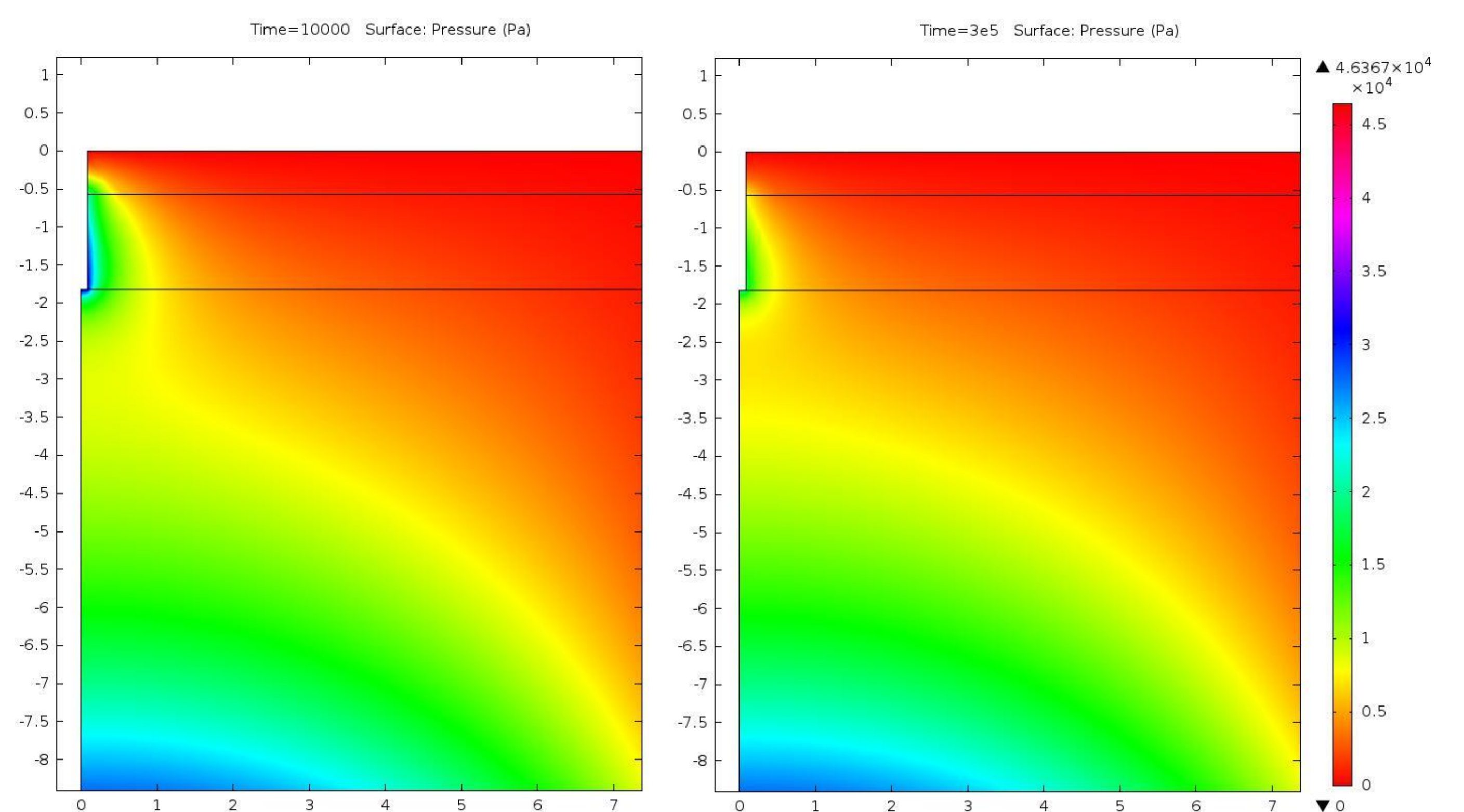

Figure 3. Pressure in 10000s and Pressure in 30000s

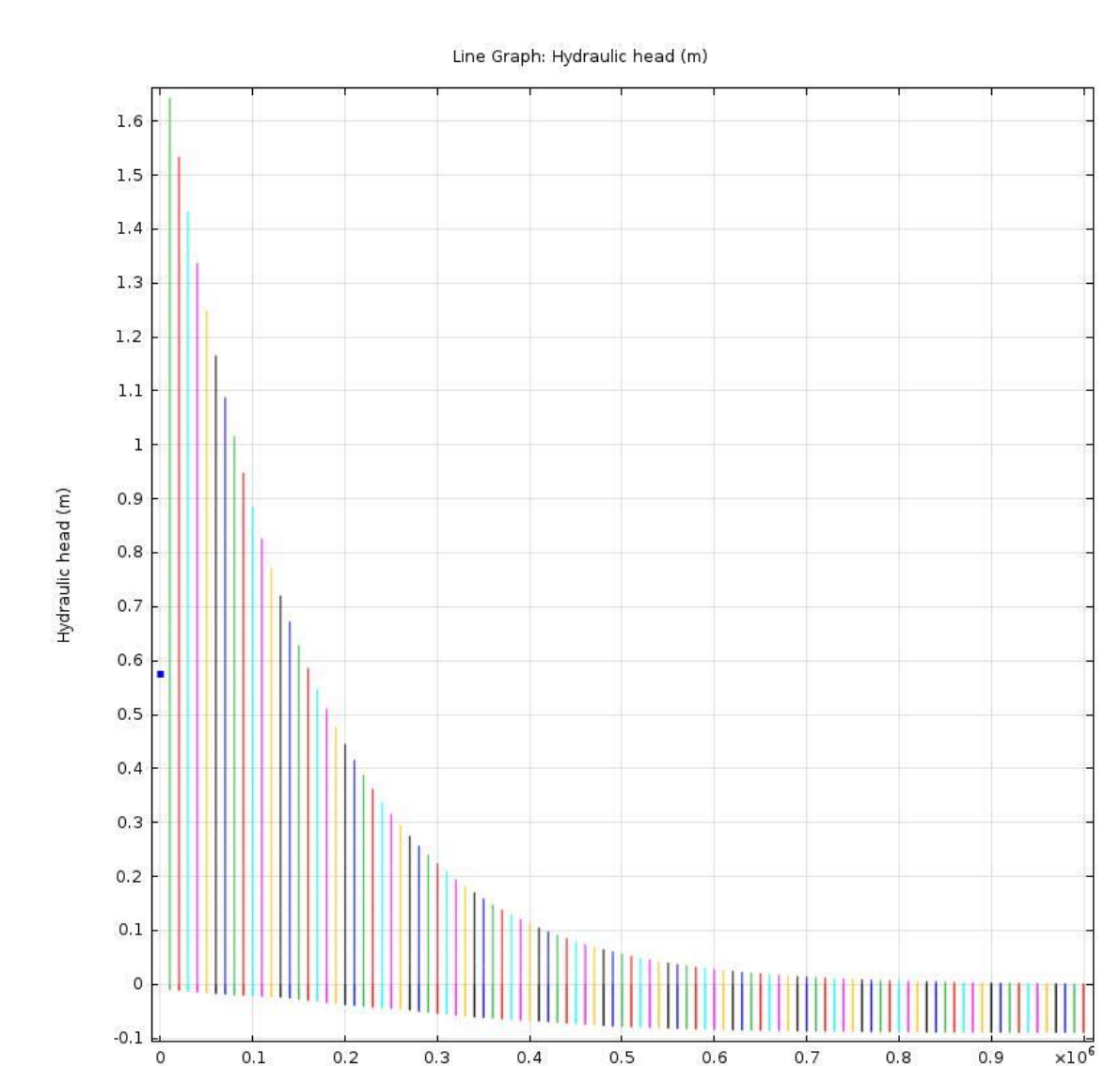| Parameters		
Name	Expression	Value
K	10^(-5) [cm/s]	1.0000E-7 m/s
rc	8.89[cm]	0.088900 m
R	8.89 [cm]	0.088900 m
Re	R*100	8.8900 m
PF	3.50 [m]	3.5000 m
NA	57 [cm]	0.57000 m
Le	125 [cm]	1.2500 m
Lw	PF-NA	2.9300 m
H0	176 [cm]	1.7600 m
A	pi*R^2+(R-rc)^...	1.6615 m²

Table 1. Parameters

Figure 4. Hydraulic Head (m) x Time (s)

Conclusions: The settling time depends on the initial load and soil conditions, in which the decay of homogeneous soil hydraulic load is given by exponential decay, which can take a few days to stabilize

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