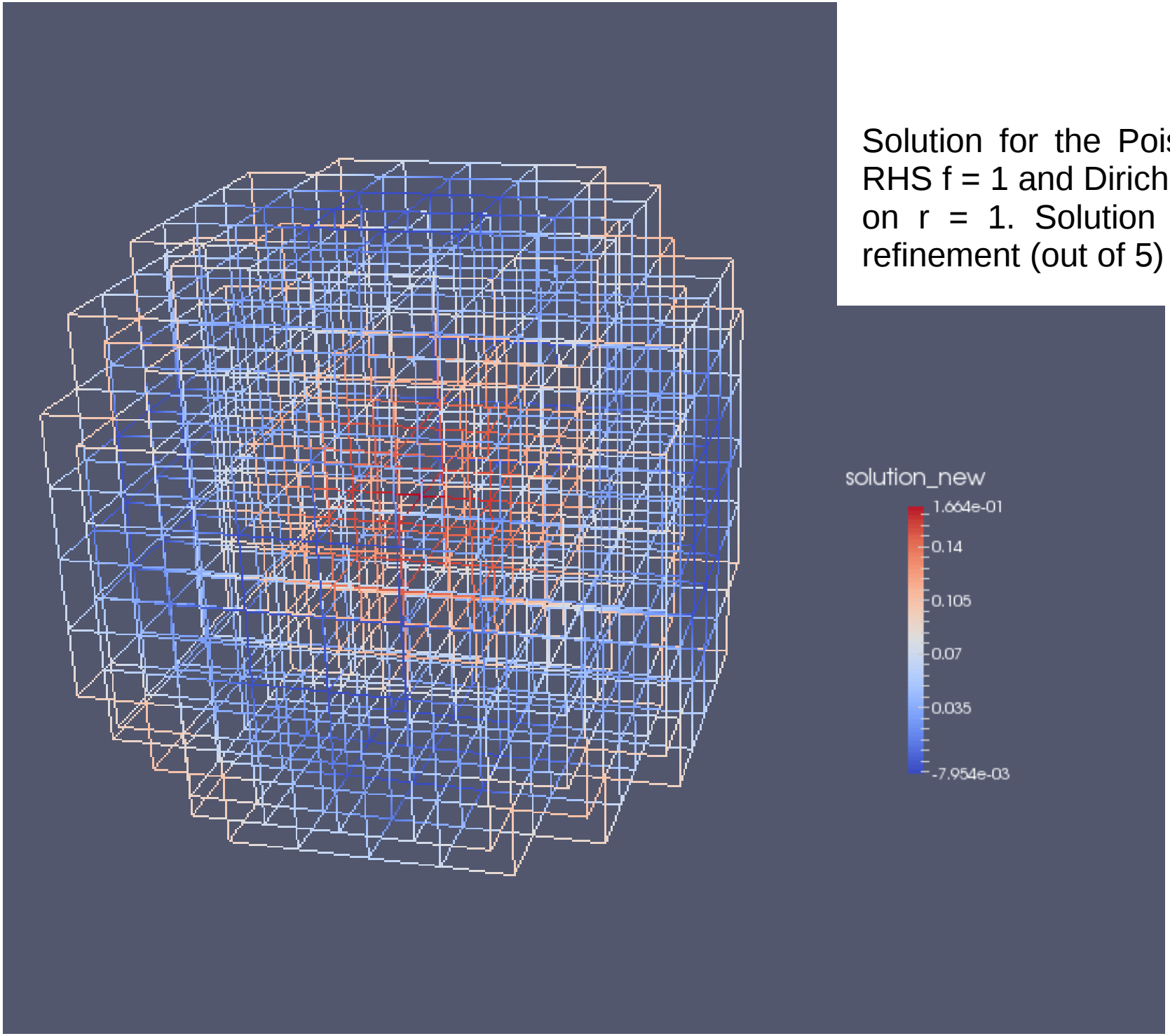
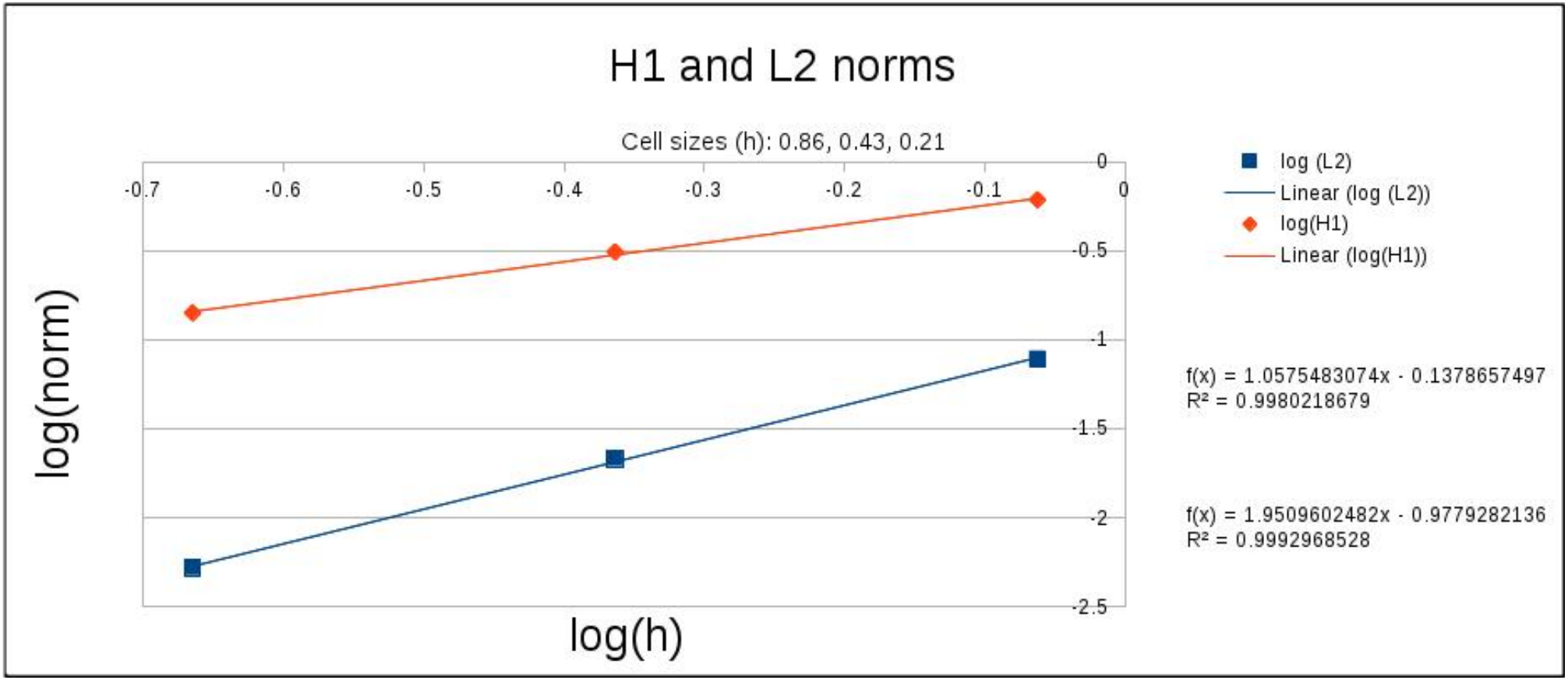
Preliminary results for the Poisson problem in a sphere with radius r = 1.0 embedded in a uniform Cartesian grid [-2,2] x [-2,2]

$$-\Delta u = 1 \ \text{in} \ \Omega$$
$$u = 0 \ \text{on} \ \Gamma$$

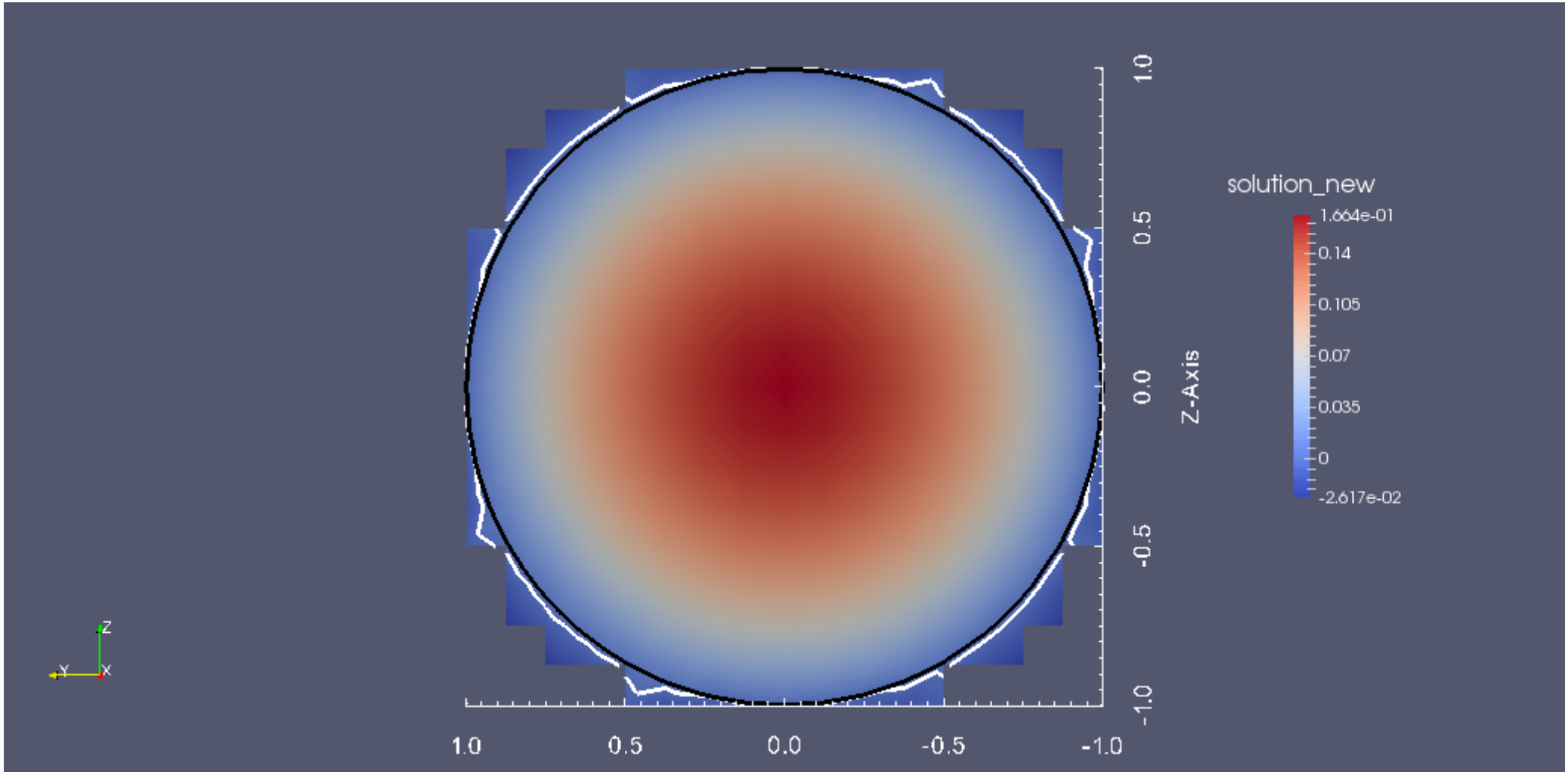
FEM formulation based on the stabilized Nitsche's method (see Burman and Hansbo (2012), http://www.sciencedirect.com/science/article/pii/S0168927411000298).
By Afonso Alborghetti Londero, August 2015.



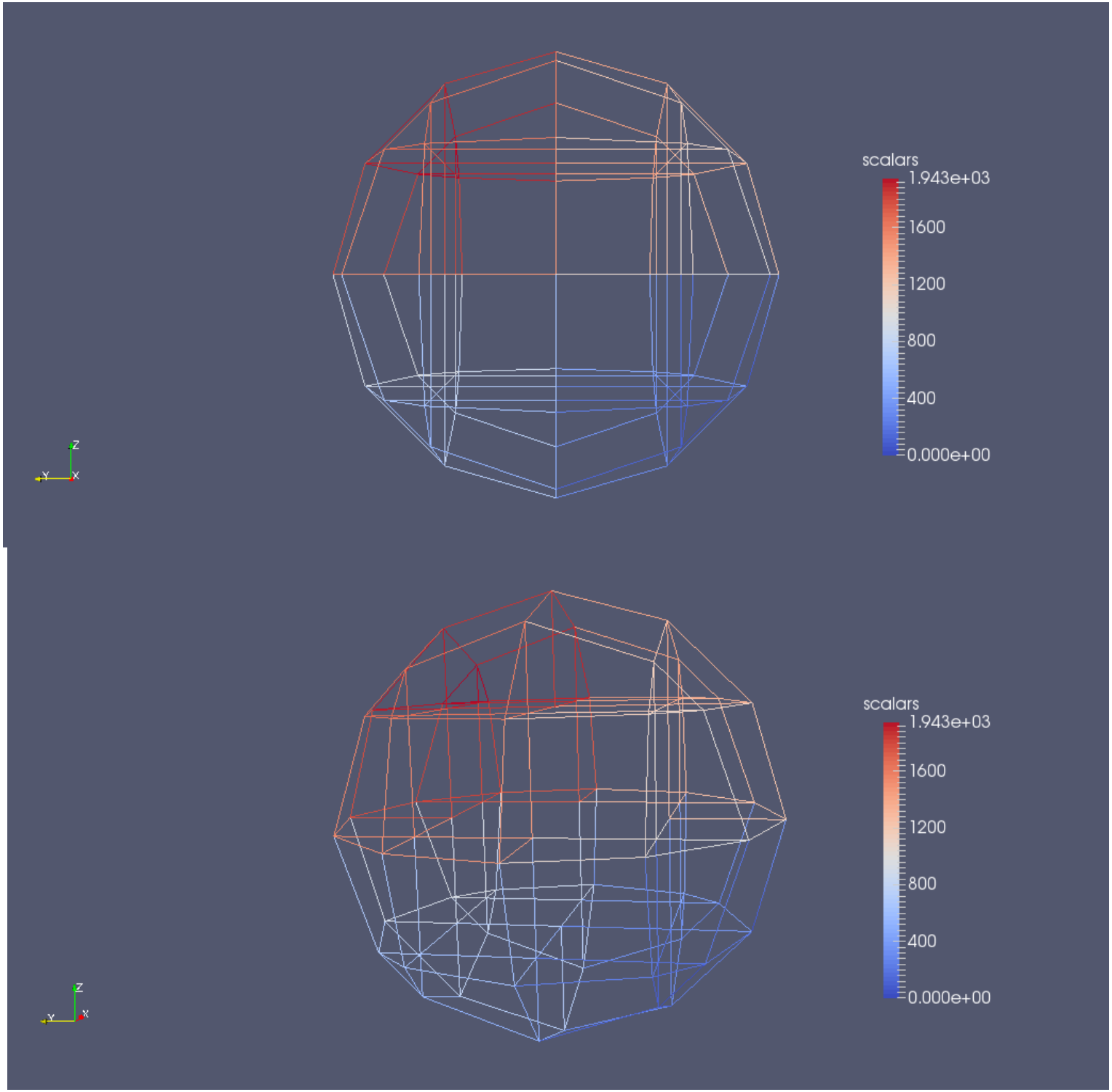
Solution for the Poisson problem, RHS f = 1 and Dirichlet B.C., g = 0 on r = 1. Solution shown for 4th refinement (out of 5)


H1 and L2 norms
Cell sizes (h): 0.86, 0.43, 0.21
log(norm)
log(h)
-0.7
-0.6
-0.5
-0.4
-0.3
-0.2
-0.1
0
0
-0.5
-1
-1.5
-2
-2.5
log (L2)
Linear (log (L2))
log(H1)
Linear (log(H1))
f(x) = 1.0575483074x - 0.1378657497
R² = 0.9980218679
f(x) = 1.9509602482x - 0.9779282136
R² = 0.9992968528

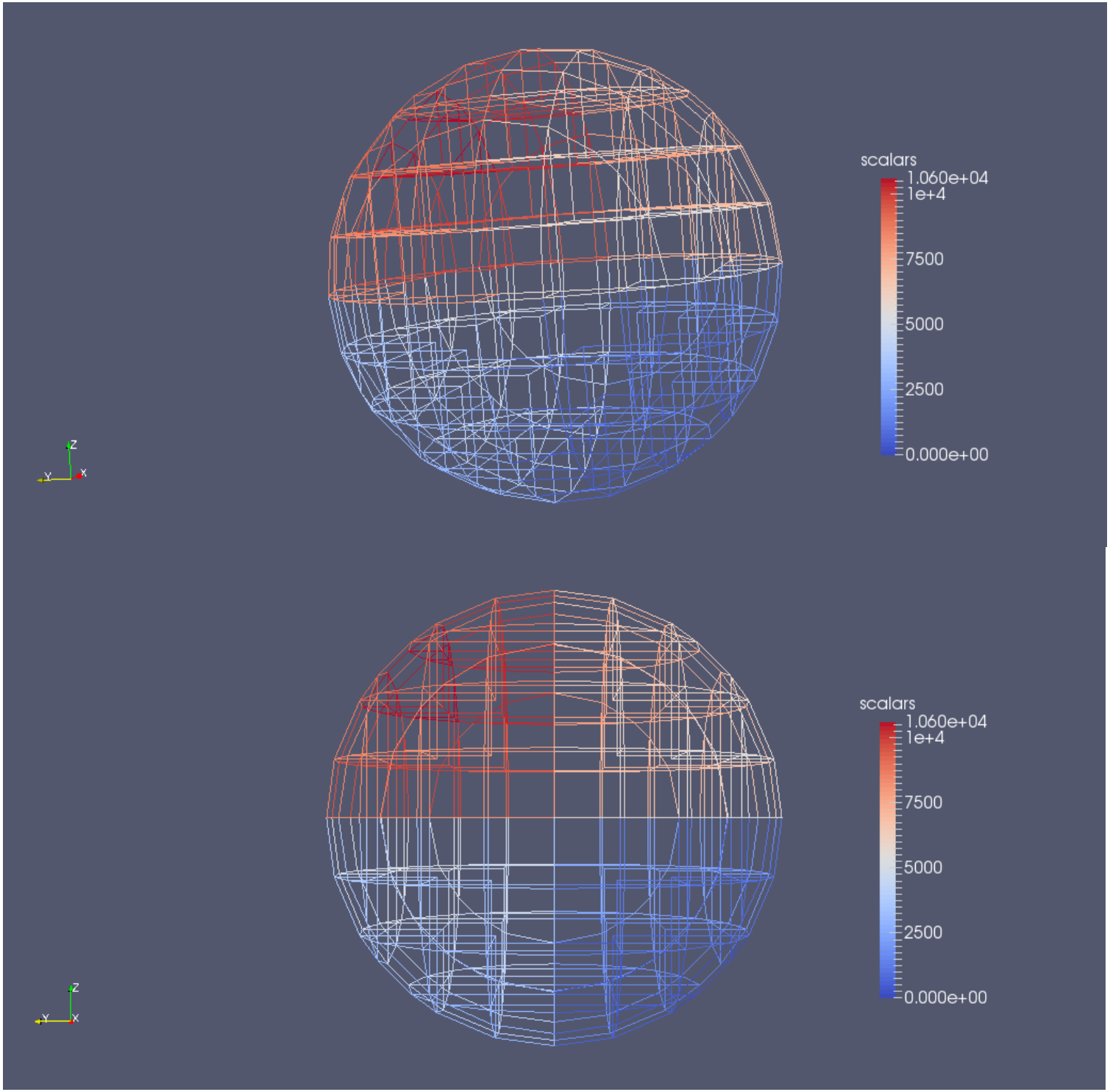
Slice of the solution taken at the middle (X = 0). The black line represents the zero level set contour, and the white line the zero contour of the solution.



3rd Refinement, Cut-cell mesh (Node values are not relevant; only used to plot mesh better)



4th Refinement,
Cut-cell mesh



5th Refinement,
Cut-cell mesh