Energy transport- cfd lab

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Our topic

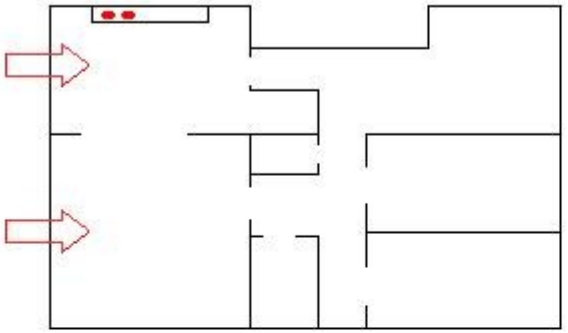
- Energy Transport
  - 2D Navier-Stokes equations
  - Boussinesq approximation
    - Specific heat, viscosity etc.. are constant
    - Boundary condition
  - Specific domain

What to consider?

- Because of the Boussinesq equation we have , the maximal variation of temperature has to be controlled
- The dt is also influenced from the Prandtl nummer
  - This is a characteristic property of every fluid
  - If it is smaller than one, we have to reduce our dt

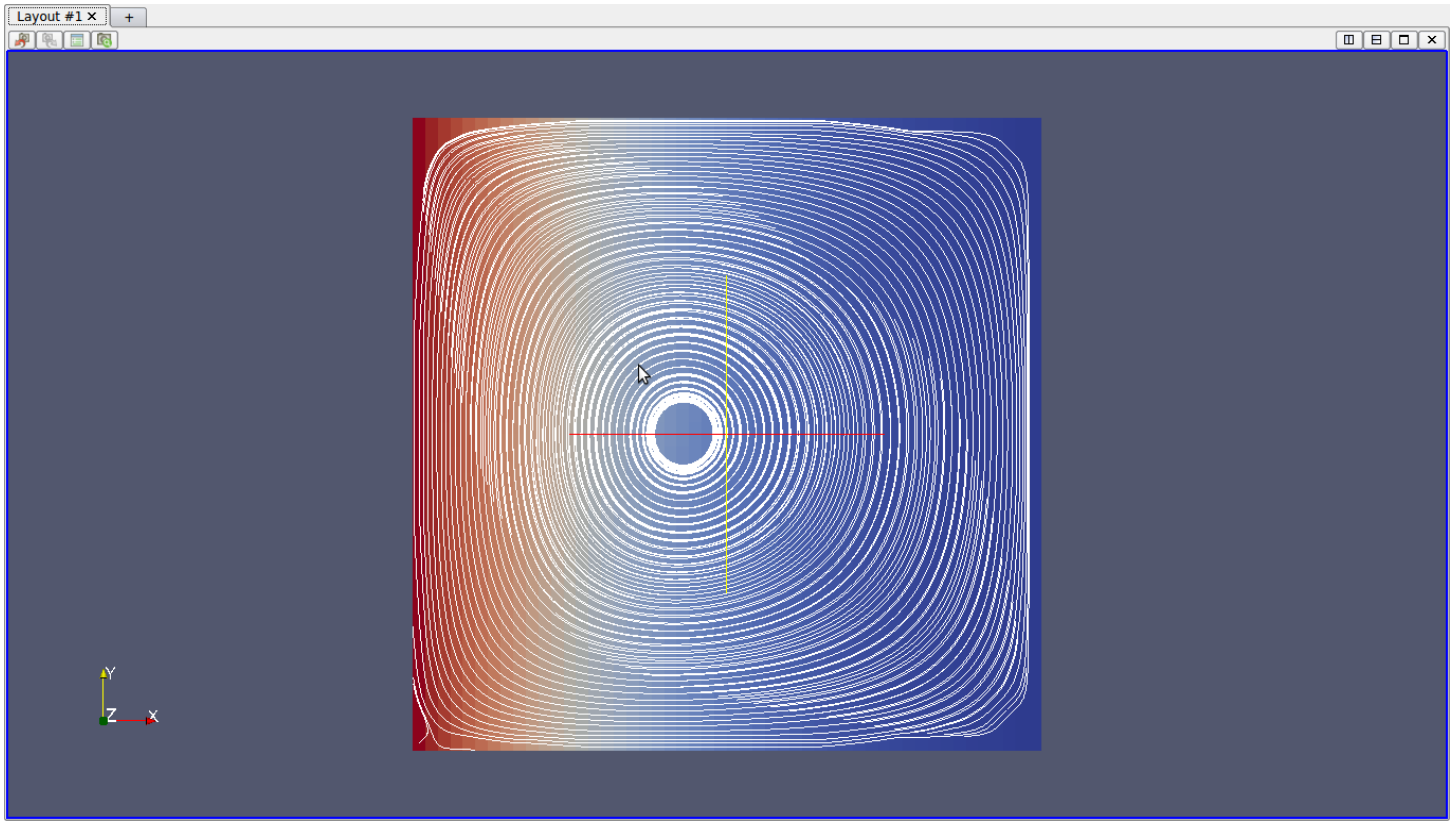
How to begin?

- We can start with a very easy example with some kind of boundary condition
- We can obtain, only introducing some kind of obstacle cells, complex geometries like this

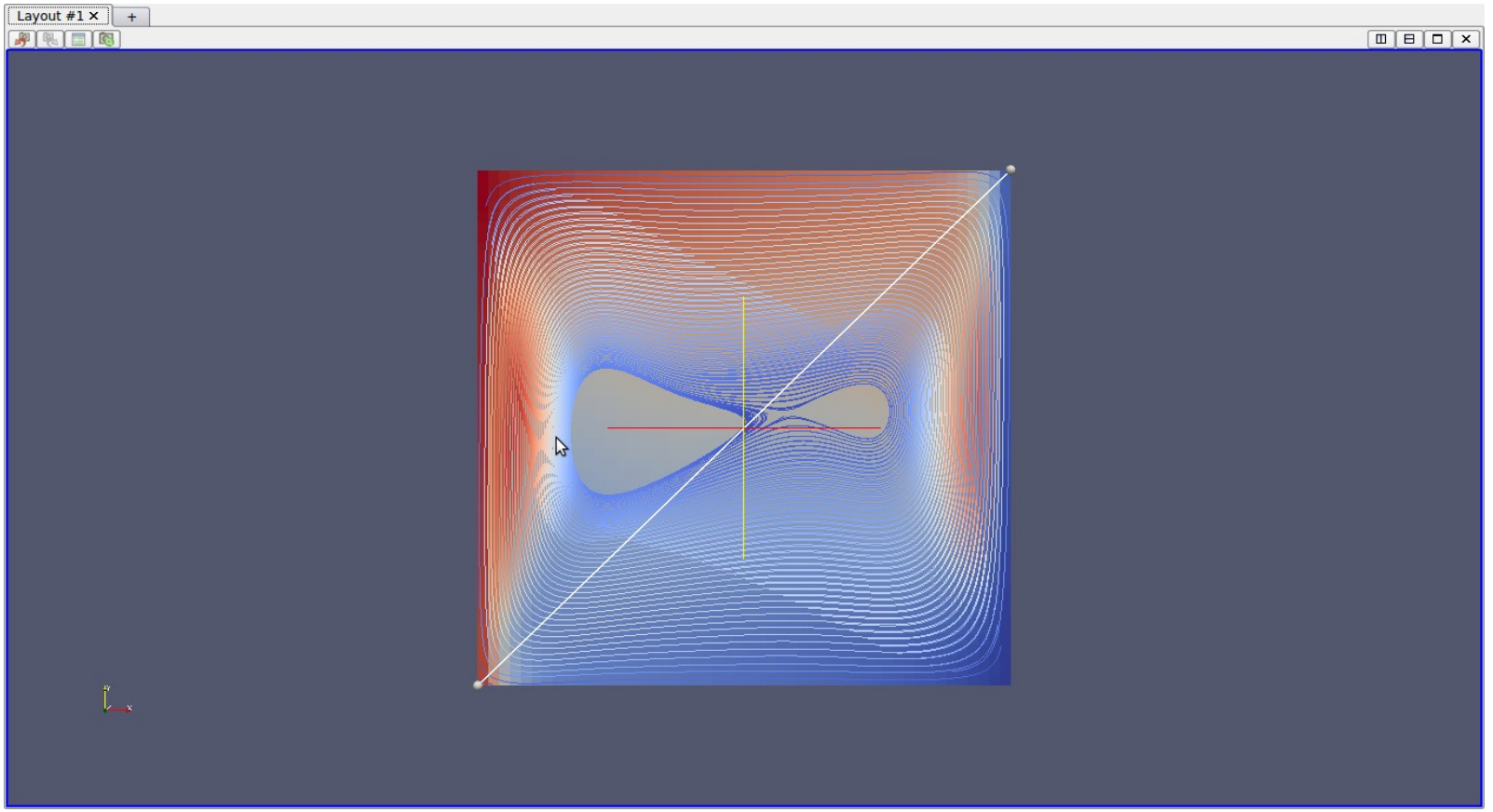


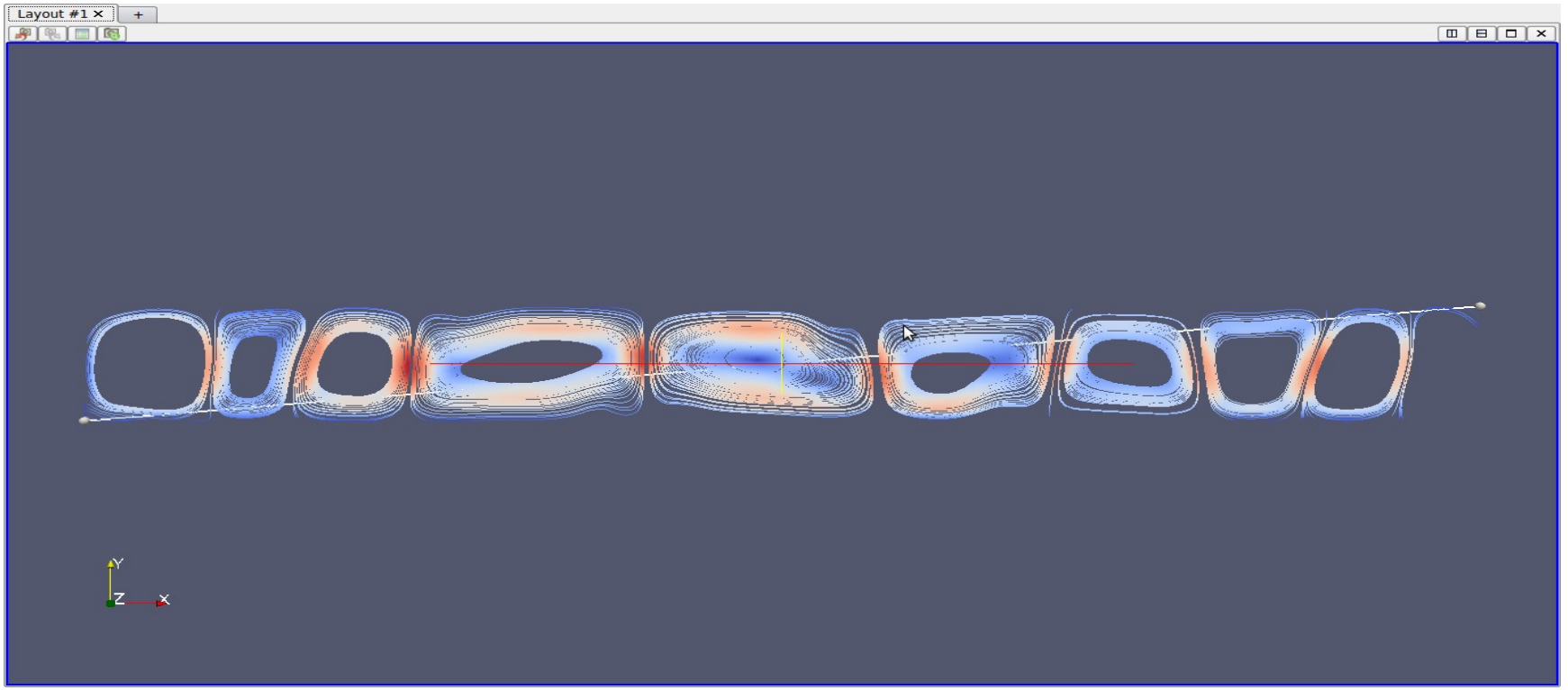
Test cases

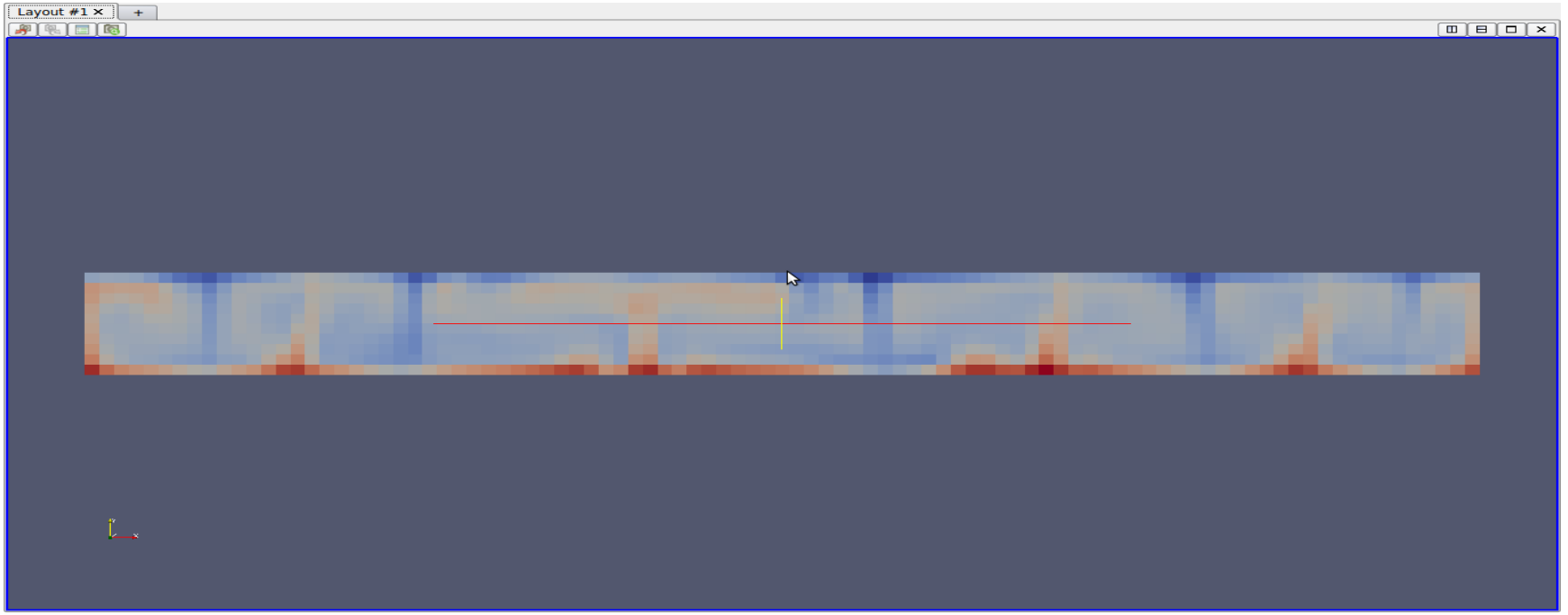
- Natural Convection with Heated Lateral Wall



- Change of the Rayleigh number.

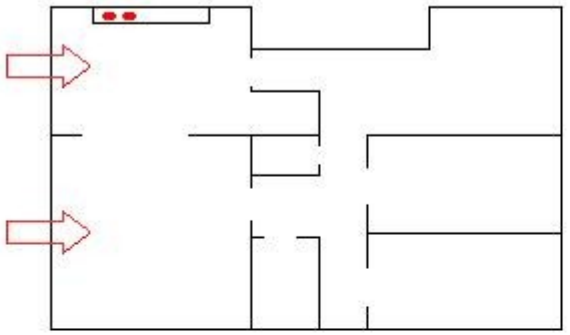



Layout #1
Y
Z
X


Layout #1

What we will see??

- How evolves the temperature depending from the sun
- How does the temperature change in the house because of the fridg, the oven....
- What about if the temperature of the wall changes..



Neumann or Dirichlet???

- We will take the both condition
- Dirichlet for the temperature of the wall in which the sun doesn´t shine
- We will calculate how much heat is transferred to from the sun to the house with radiation subtracted with the convenction

What ´s else?

- We decide to optimize the code with the modify of the sor file
  - With the conjugate gradient
  - Multigrid