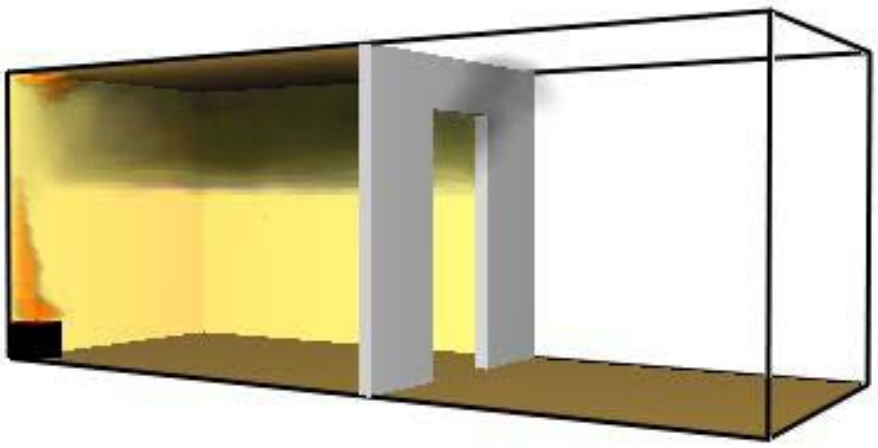
Turbulence exercise on room corner fire

The results are provided in a file for three different grid sizes

1. Coarse
2. Fine
3. Super fine

Table 1 Grid used in simulation, D/dx ratio and calculation time*

Grid	Grid size [cm]	Grid cells	Total number of cells	D*/dx	Calculation time using 4 OpenMP threads (using 2 threads) [hours]
Coarse	10	64 x 24 x 24	36,864	3.8	0.89 (1.29)
Fine	5	128 x 48 x 48	294,912	7.6	15.6 (17.97)
Super fine	2.5	256 x 96 x 96	2,359,296	15.2	286 (-)



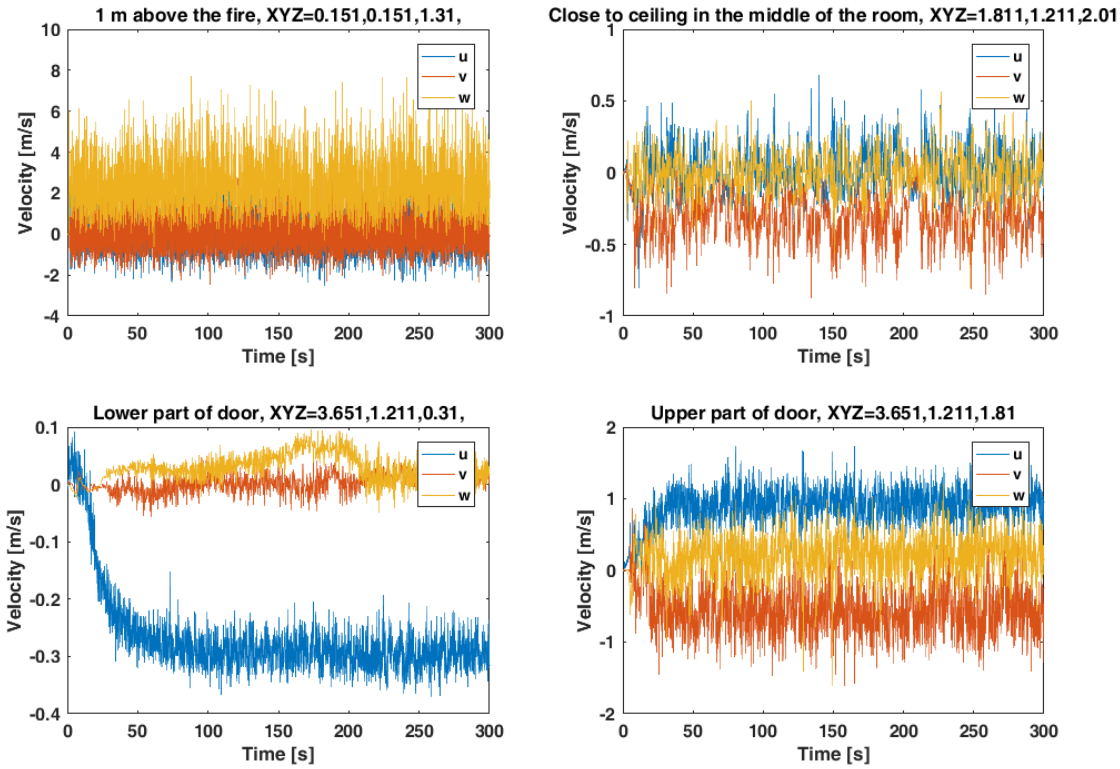


Figure 1 Velocity at four different point for super fine grid

Use a time interval where the results are quasi steady state.

A). 4 measuring devices, which measures the velocities in all three directions, u, v and w.
One device 1 meter above the fire, one in the middle of the room, one in the door opening in the lower part where cold air enters, one in the upper part, where the hot gases leave the fire room.

Calculate the turbulence intensity in these 4 points based on all three directions. Then half the cell size (8 times as many cells) and do the same again.

B). In the same way as in A) do you own "Measure of turbulence resolution" in the 4 points. Calculate the ratio between the turbulent energy on the sub grid scale and on the total turbulent energy in these four point. Also refine the grid in the same way as in part A). Compare and discuss the results.

C) Do a fft analysis of the frequencies. (optional)