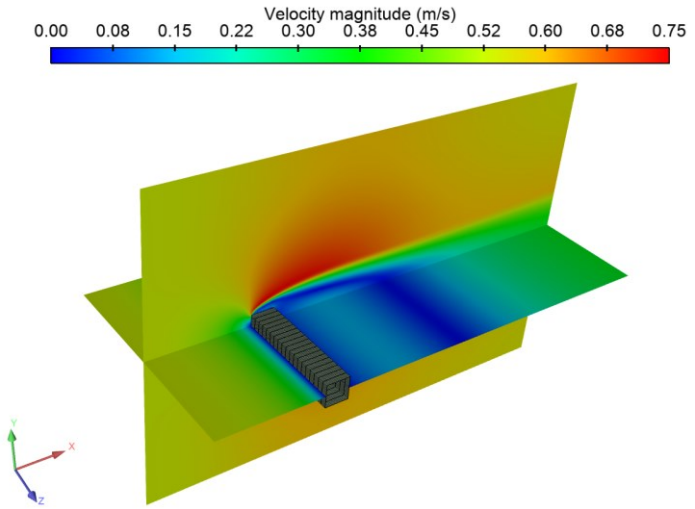
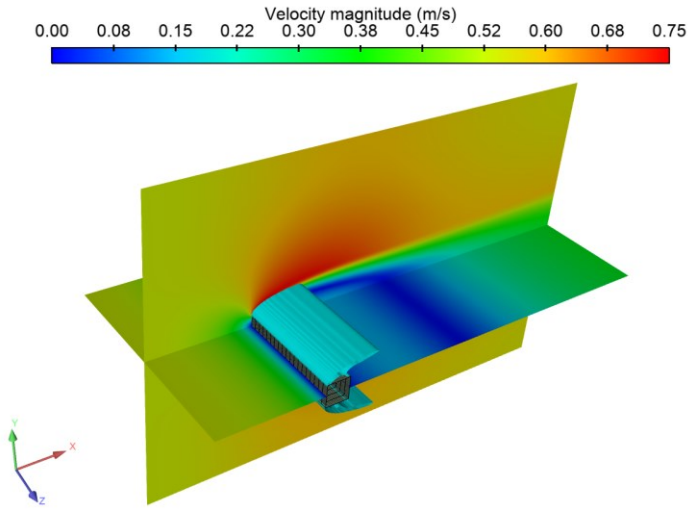
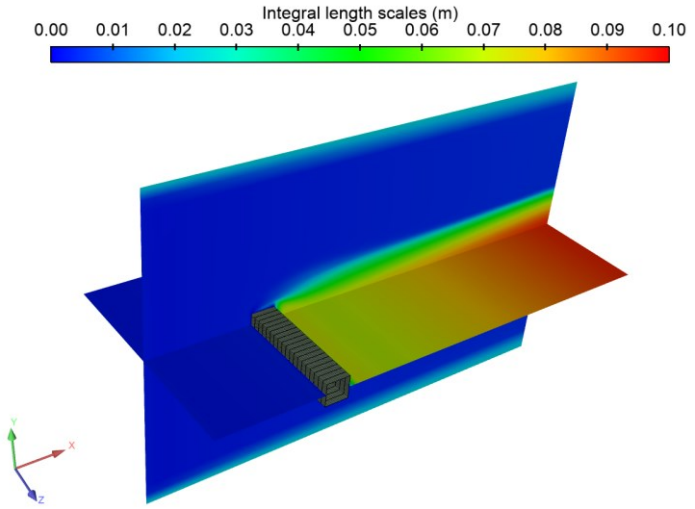
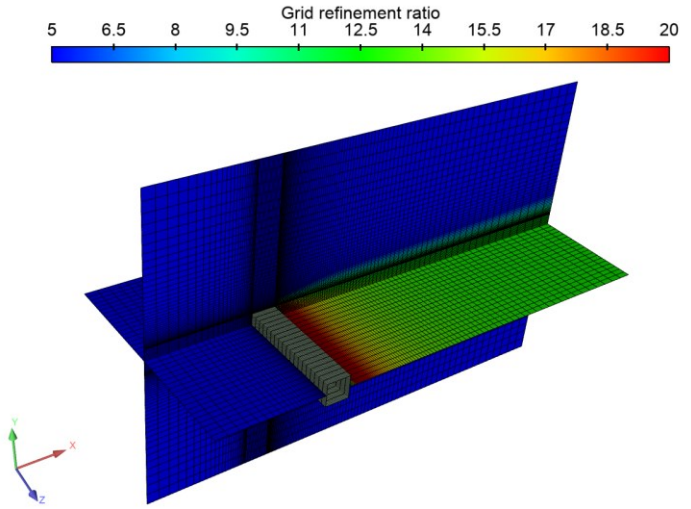
SRS steps

- **1. RANS simulation**
  - Run a RANS simulation in a coarse mesh.
  - Understand the physics, adjust the boundary conditions and initial conditions, compare turbulence models.
  - Compute integral length scales and refine the mesh accordingly.
  - Create an interpolation field.
  - You can perturb the interpolation field if deemed necessary.
  - Refine mesh, interpolate the previous solution, and adjust the case setup.
  - Rerun and do a critical analysis of the results.
  - Move to URANS.



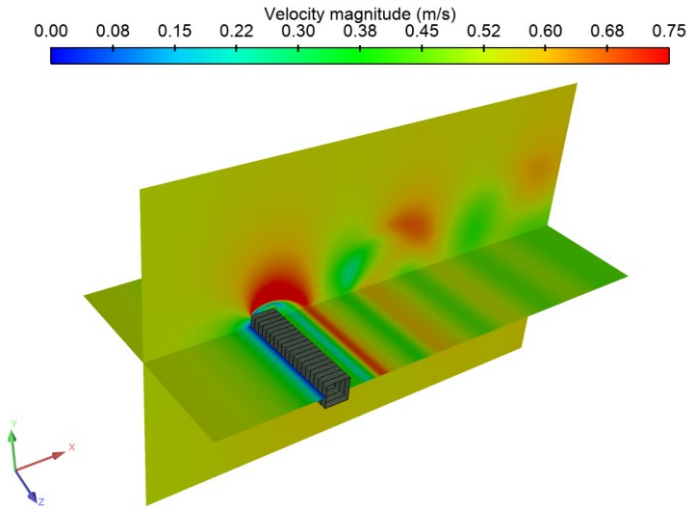


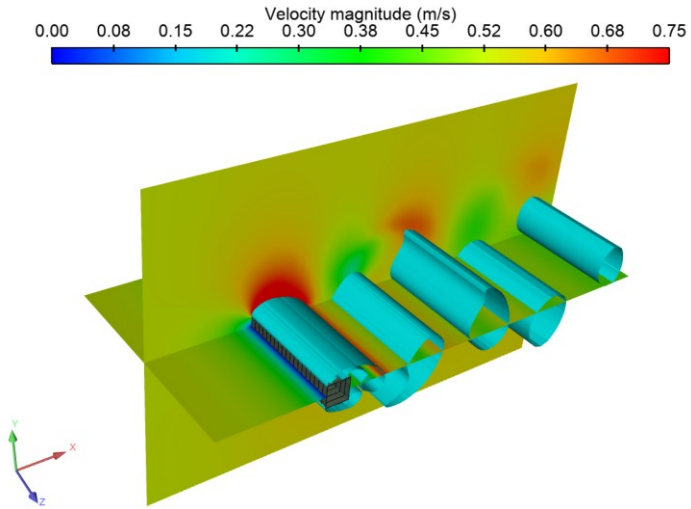


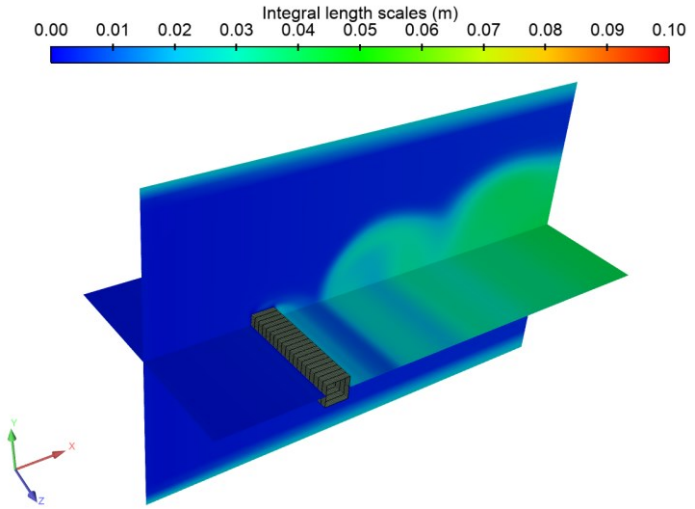


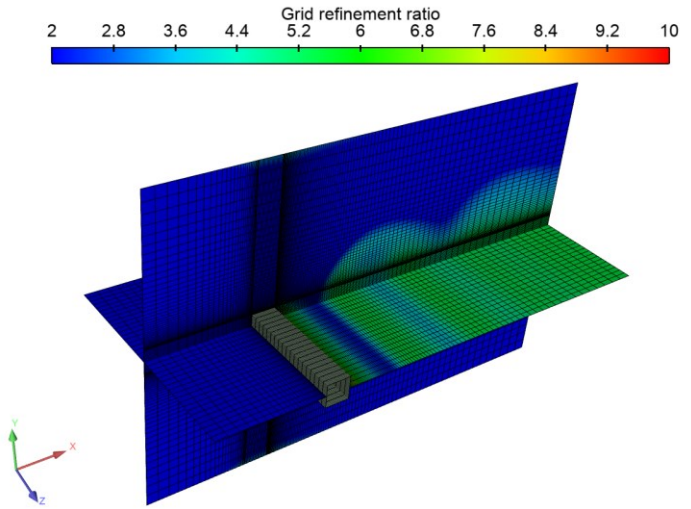
SRS steps

- **2. URANS simulation**
  - Run an URANS simulation in an improved mesh.
  - Use as starting point the interpolation field obtained from a RANS simulation (coarse or finer mesh).
  - You can use a smooth field or a perturbed field.
  - Set all the monitors and compute the solution.
  - Turn on the unsteady statistics.
  - Assess the mesh adequacy using the integral length scales and grid refinement ratio fields (mean and instantaneous values).
  - Do a critical analysis of the results.
  - Create an interpolation field and perturb it if deemed necessary.
  - Move to LES.



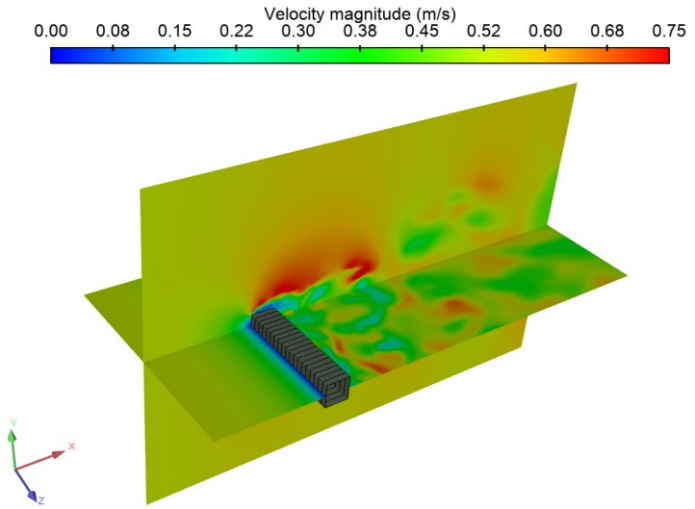


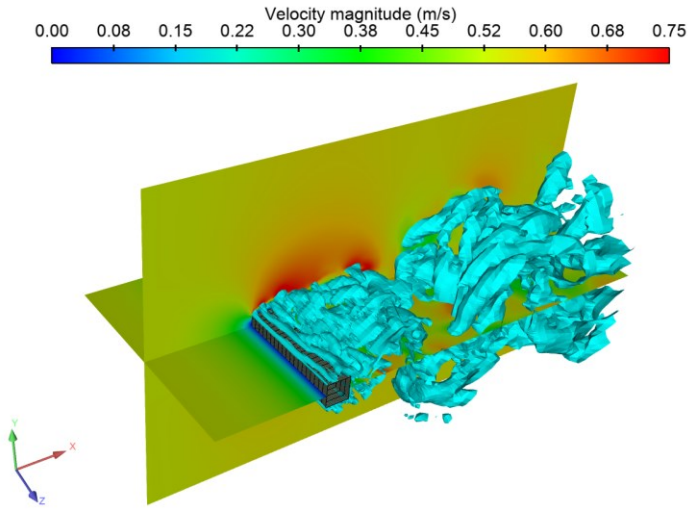


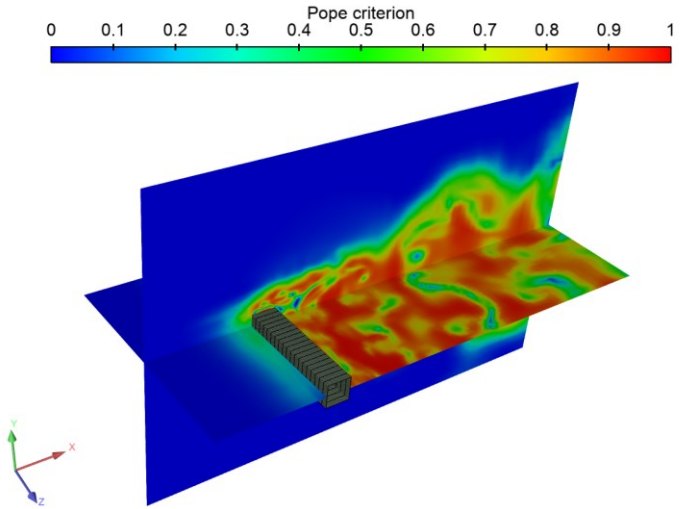


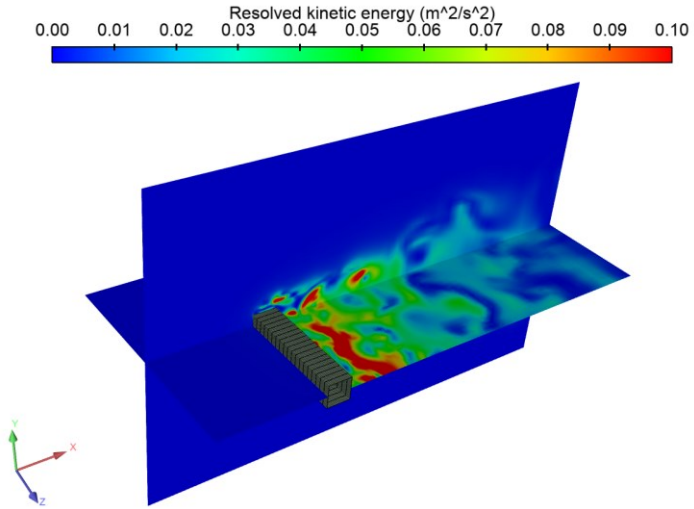
SRS steps

- **3. LES simulation**
  - Run the LES simulation using the mesh built during the RANS/URANS phase (precursor simulations)
  - Use as starting point the interpolation field from a good URANS simulation.
  - You can use a smooth field or a perturbed field.
  - Set all the monitors and compute the solution.
  - Turn on the unsteady statistics.
  - Assess the mesh adequacy using the Pope criterion or similar criterion (mean and instantaneous values).
  - Plot the TKE power spectrum at different locations and assess the quality of the LES simulation.
  - Remember, a good LES should resolve at least 80% of the turbulent spectrum.



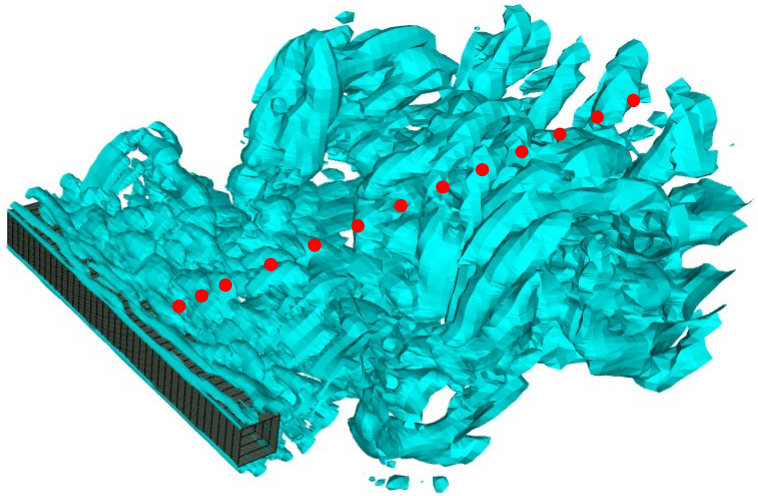


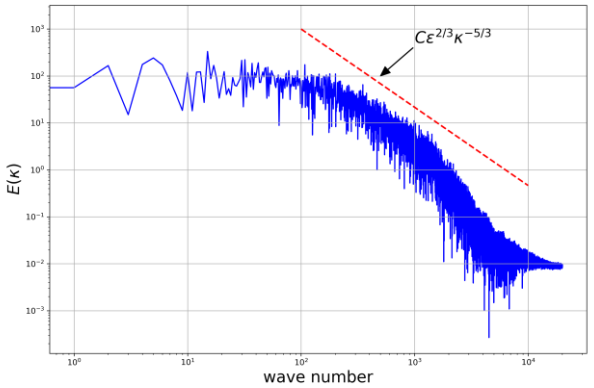


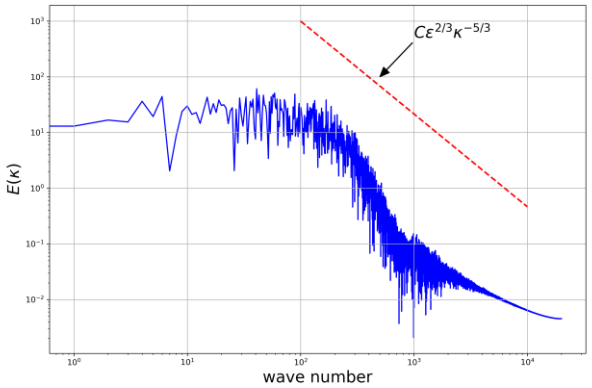


SRS steps

- **3. LES simulation**
  - Remember, before launching the simulation it is very important to set all monitors.
  - When running LES simulations there are many things that you must monitor, such as,
    - Resolved Reynolds stresses, resolved kinetic energy, Pope criterion, velocity fluctuations, forces, wall distance units, sub-grid scales fields, and so on.
  - Again, do not forget to compute the unsteady statistics.
  - Remember to limit the numerical diffusion.
  - This means that you need to use a CFL number in the order of one and low dissipative numerical schemes.







SRS steps

- **3. LES simulation**
  - Finally, you will need to analyze the time series and compute the descriptive statistics.
  - There is a lot signal processing involved.
  - This is more important than the pretty colors.
  - By the way, you need to run LES simulations for long times, so you get meaningful statistics.