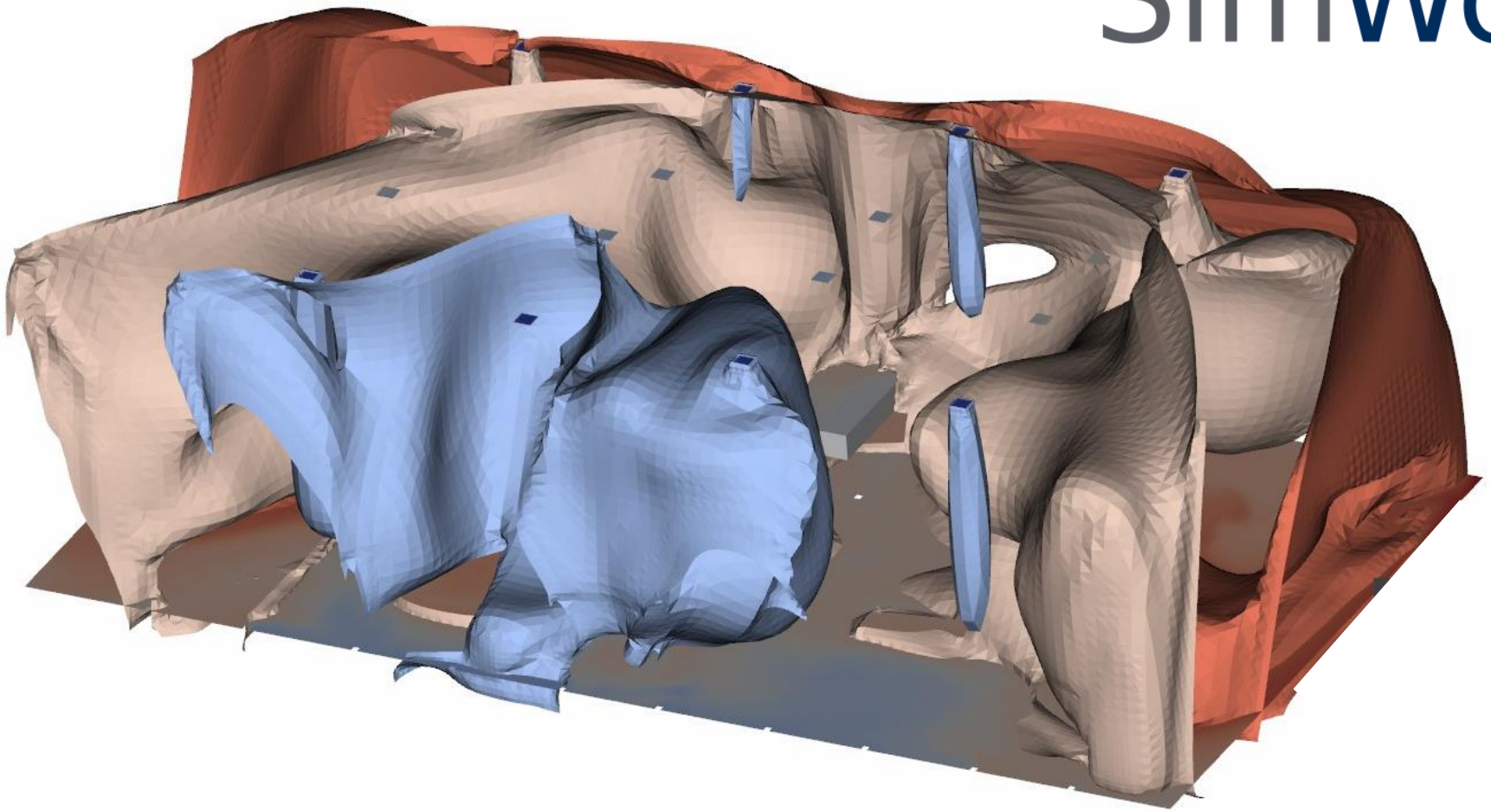
SimWorks



idealsimulations

SimWorks covers the entire CFD process from CAD to results, including pre-processing, meshing, running and post-processing. It is designed to handle multiple simulations at the same time.

SimWorks versions

Licence type	Free	Professional	Pay-per-use
Seats	1	1	1
Processors	1	unlimited	unlimited
Simulations per year	40	unlimited	pay per use
Max concurrent simulations	5	unlimited	unlimited
Turbulence options	RANS only	all	all
Advanced post-processing	Trial only	✓	✓
Online tutorials	✓	✓	✓
Bug fixes and version update	✓	✓	✓
Thermal options	✗	✓	✓
Support	✗	contact us	✗
Custom features	✗	contact us	✗

Free

- Ideal choice for someone who is approaching CFD modelling for the first time or students who want to learn about CFD
- The free version can be used by professionals wanting to test the software; however, we advise to start the 14-day free trial of the commercial version that includes all the additional features

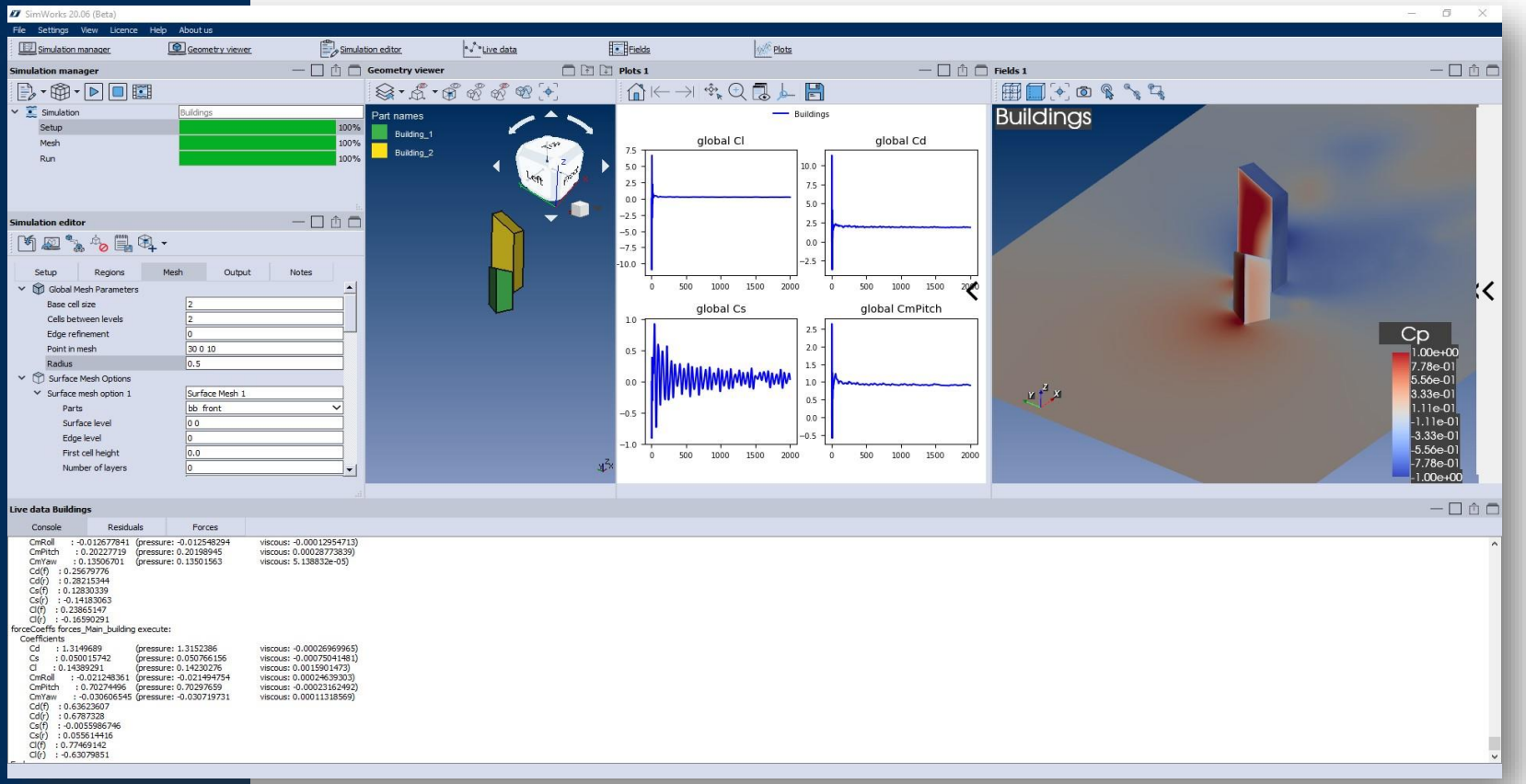
Professional

- The commercial version includes advanced features for professional users and remove any limitations related to modelling, number of simulations and processors.
- It is aimed at consultants and professionals who want to add CFD simulations to their services

SimWorks GUI

SimWorks offers a complete GUI to handle all the simulations steps.

Preparing the simulation and changing the simulation settings is quick and intuitive

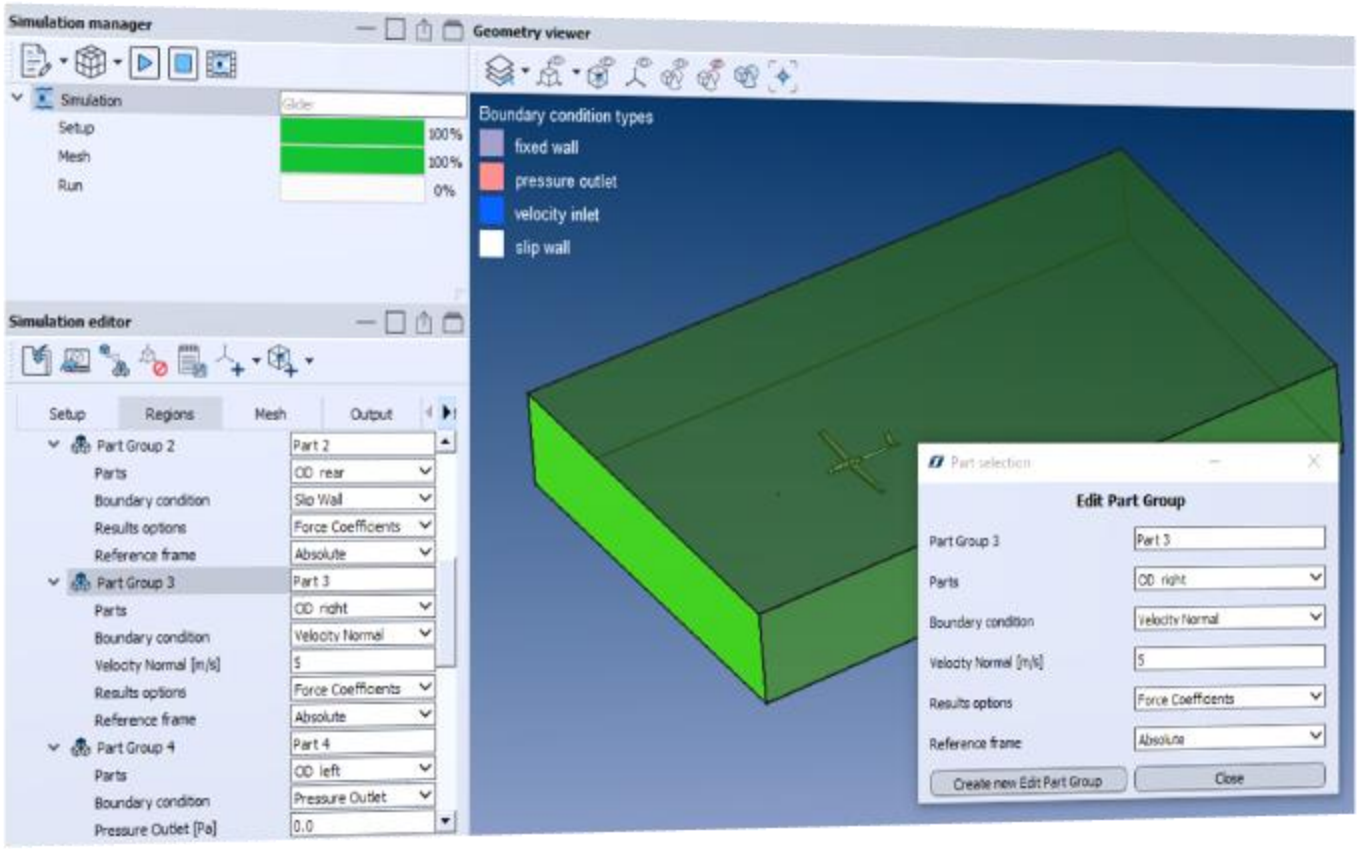


The SimWorks GUI has several independent windows:

- **Geometry viewer:** to interact with the geometry
- **Simulation manager:** to run the phases of the simulation
- **Simulation editor**: to define the simulation settings and parameters
- **Live data:** to follow the simulation progress as it runs
- **Plots and Fields viewers:** integrated post-processor to analyse the results

Each window can be detached and placed anywhere on the screen.

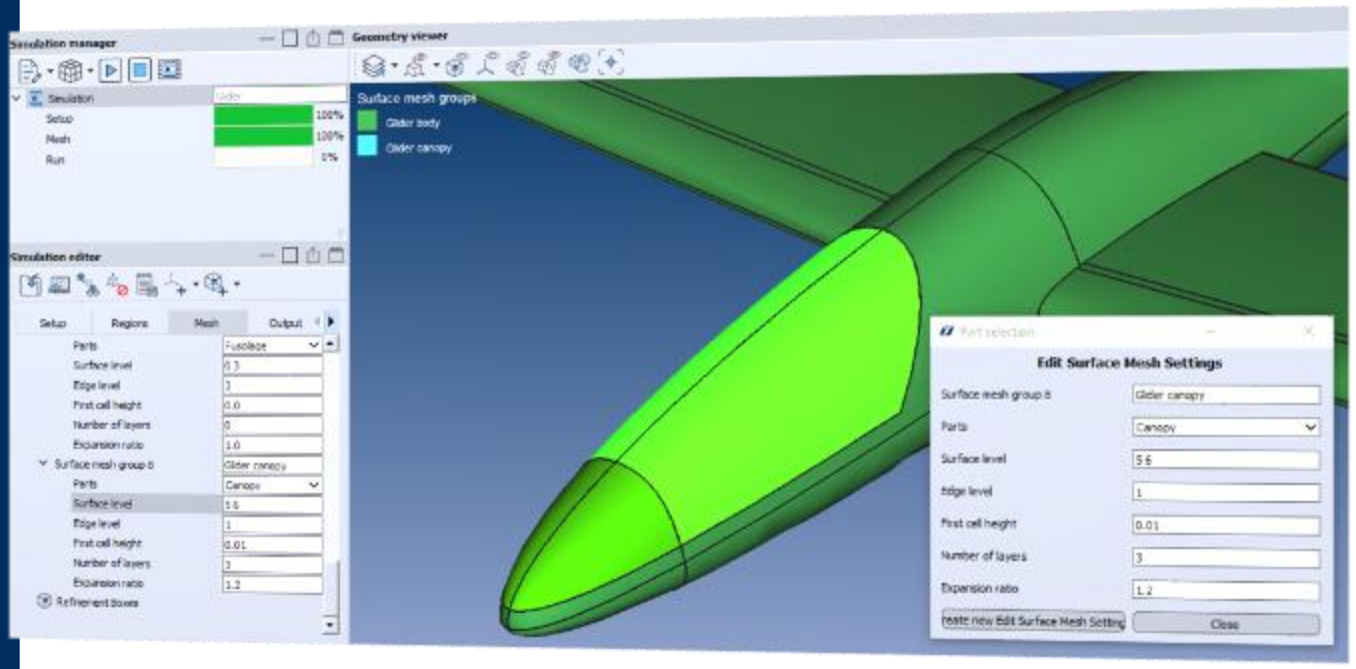
Simulation Setup

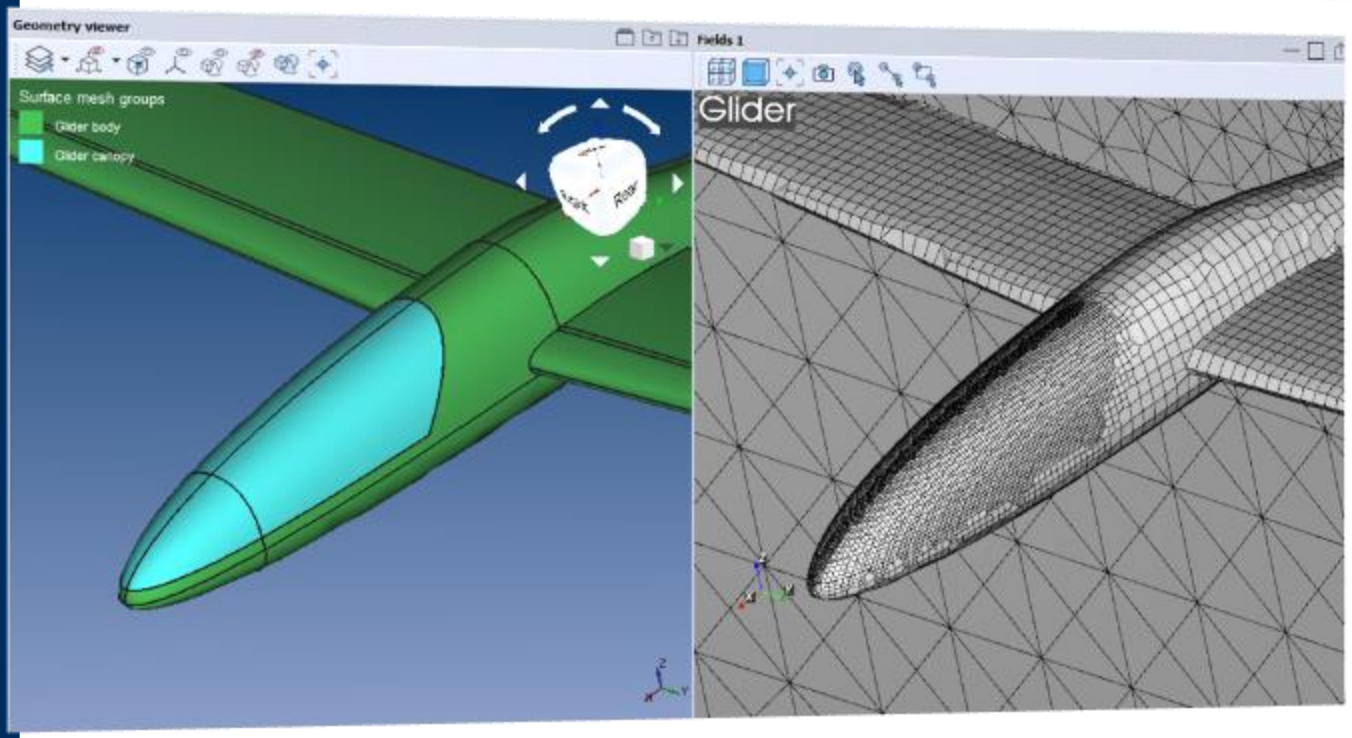


- The **Simulation editor** lets you control the setup
- Physics model and Reference parameters are defined in the **Setup** tab
- The **Regions** tab let you control the **Outer Domain** and **Part Groups**
- It is possible to assign a boundary condition to each **Part Group**
- The user can create **Part Groups** starting from the CAD geometry in the **Regions** tab or directly in the **Geometry viewer**
- Boundary conditions can be defined in the **Simulation editor** window or directly in the **Geometry viewer** by clicking on the **Part Group**

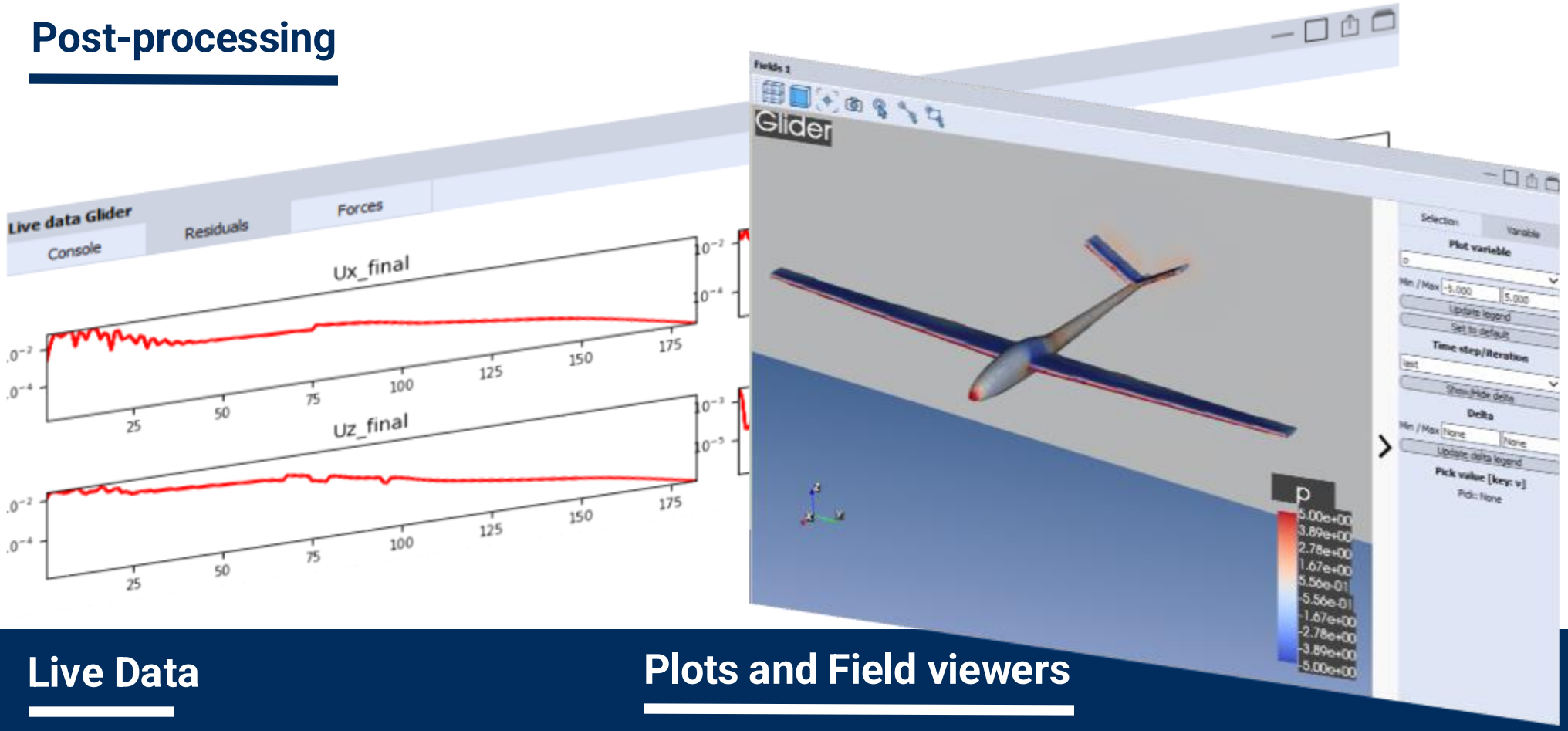
Mesh handling

- The **Mesh** tab lets you create **Surface Mesh Groups** and **Refinement Boxes**
- Each **Surface Mesh Group** can have individual meshing parameters
- You can create **Surface Mesh Groups** starting from the CAD geometry directly in the **Geometry viewer** or in the **Regions** tab
- The **Refinement Boxes** can be created and defined in the **Mesh** tab
- The resulting mesh can be loaded in the **Fields viewer** to visually inspect the mesh before running the simulation





Post-processing



Live Data

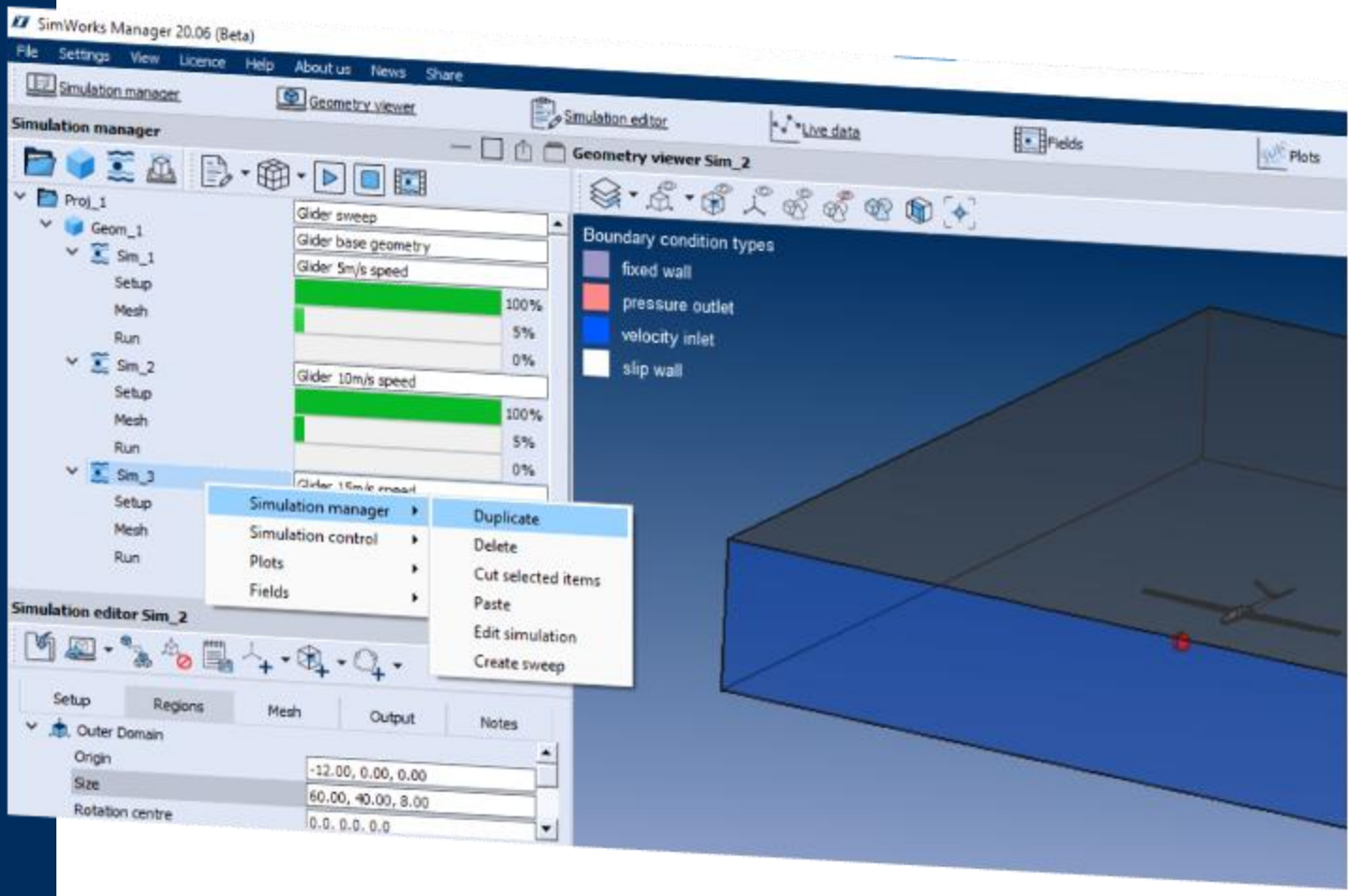
- The **Live data** window gives real time information about the progress of the simulation
- The **Console** tab shows the output of the simulation phases as they run
- The **Residuals** and **Forces** tabs show both the evolution of residuals and of forces coefficients

Plots and Field viewers

- Once the simulation is completed, the results can be loaded in the **Plots viewer** and **Field viewer**
- The **Plots viewer** lets you create 2D plots while the **Fields viewer** lets you inspect the 3D solution on sections and 3D surfaces
- Sectional planes can be moved in three orthogonal directions independently
- It is possible to query the fields values with point, line and area averaged probing

Simulations database

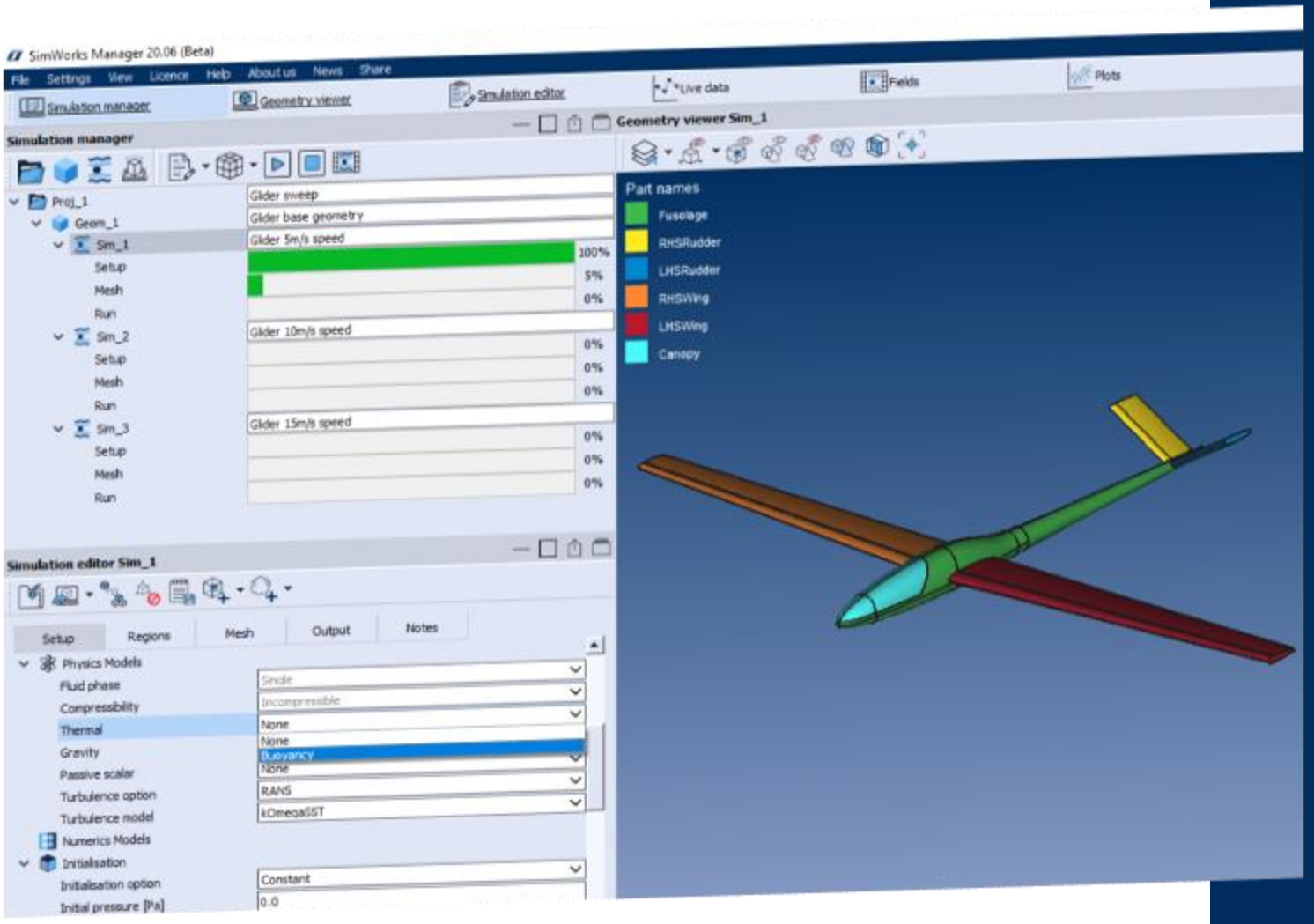
- SimWorks allows the user to **define and run multiple simulations at the same time**. The simulations are organised in Projects and Geometry sets
- **Each simulation can be moved (cut and paste) from a Geometry set to another** and each geometry set can be also moved from a Project to another
- The **simulation duplication functionality reuses the settings of the original one** and it is possible to quickly change any parameter to evaluate its effect
- Once a simulation is duplicated and a new CAD file is imported, **SimWorks will automatically recognise the parts and re-apply the settings from the original simulation**. This way it is possible to efficiently simulate different design iterations



The duplication functionality saves the user from having to redefine manually the entire setup every time a new simulation is required.

Simply duplicate a simulation and change the required parameters or the geometry before running the new one.

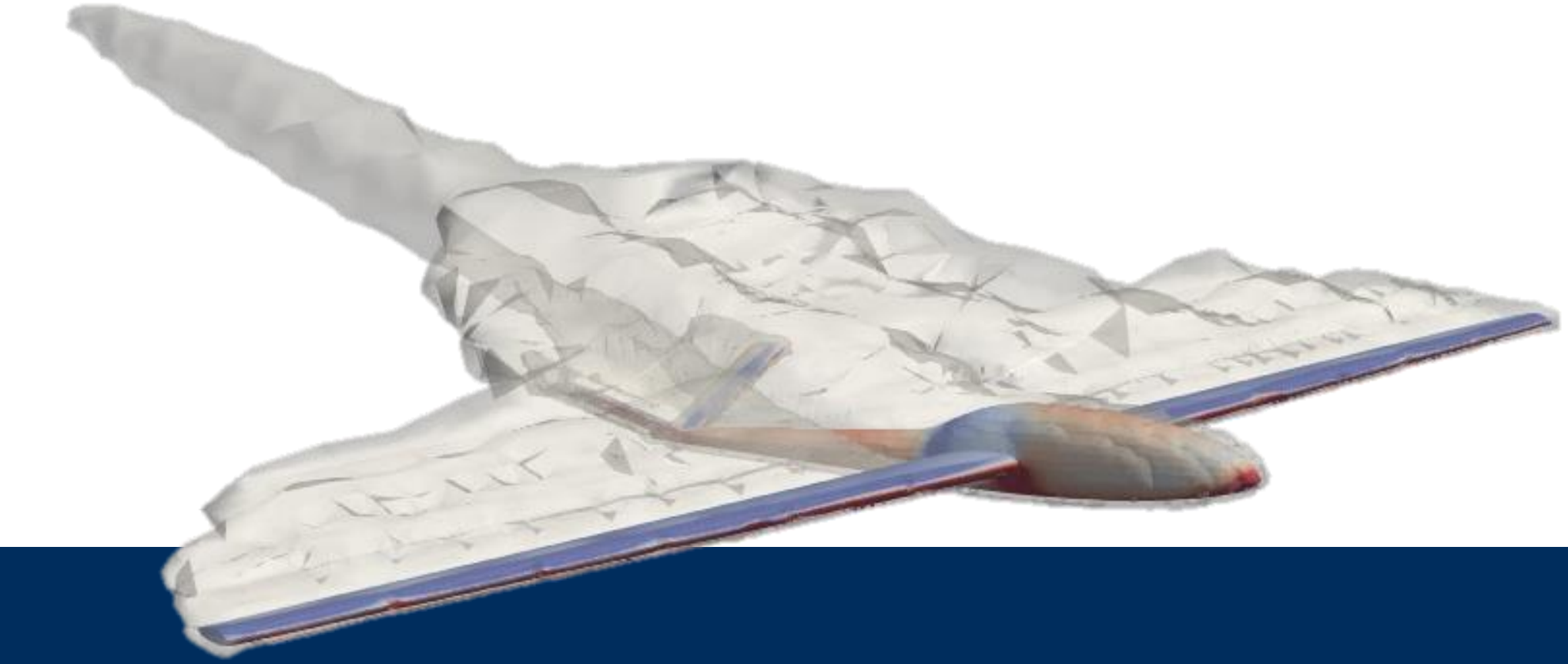
Advanced modelling



Physics models

- SimWorks can be used for both **internal and external** fluid dynamics simulations, in **steady-state or transient**
- It offers the most popular **RANS, DES** and **LES** turbulence models
- It can deal with incompressible and weakly compressible flows
- It can handle **single-phase flows** only
- It allows for **thermal modelling**, for example considering the buoyancy or running **CHT** simulations
- Moreover, additional modelling like **porous regions, moving reference frames** and **moving mesh regions** can be included

Unsteady Simulations



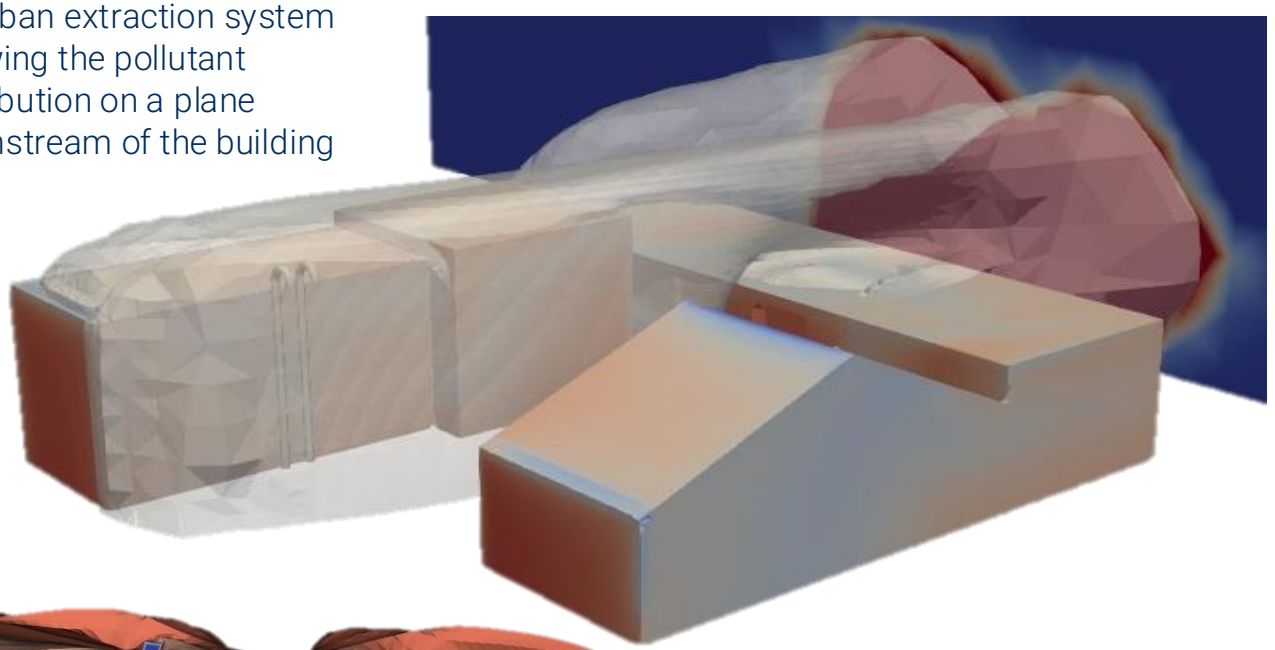
Transient models

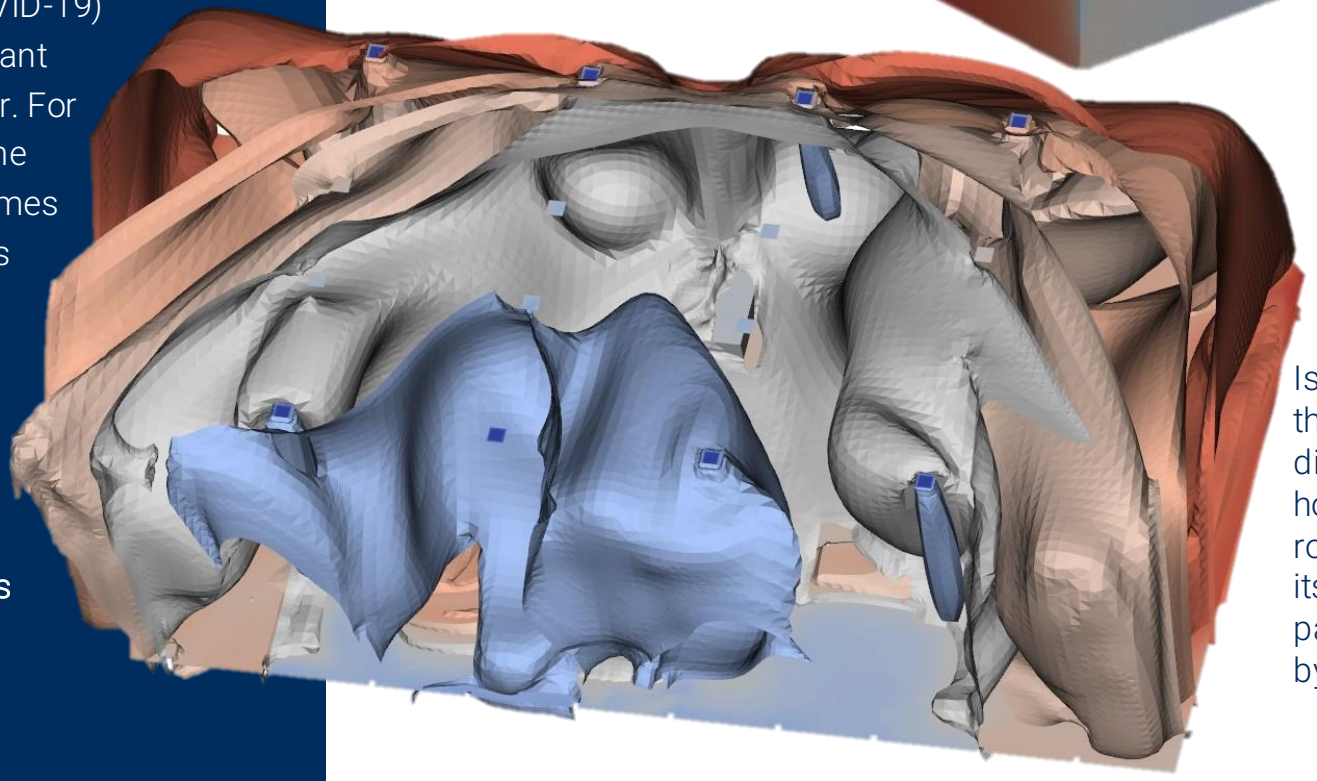
- SimWorks supports transient simulations. This can be used with unsteady turbulence models, from URANS to DES and LES
- Time dependent simulations allow to capture all the aerodynamic structures that evolve in time, like aerodynamic wakes. Knowing the level of unsteadiness of the flow provides a good idea of the overall aerodynamic stability of a design.

Substance Tracking

- SimWorks allows the simulation of the **transport of a passive scalar**. This can be used to study how a volatile substance spreads in a space subject to convection and diffusion by a flow field
- This approach can be used to **check the spreading of pathogens** and diseases indoor (like the COVID-19) and to check pollutant distribution outdoor. For example to verify the effectiveness of fumes extraction solutions
- The distribution of the passive scalar can be shown with **iso-surfaces of difference concentration levels**

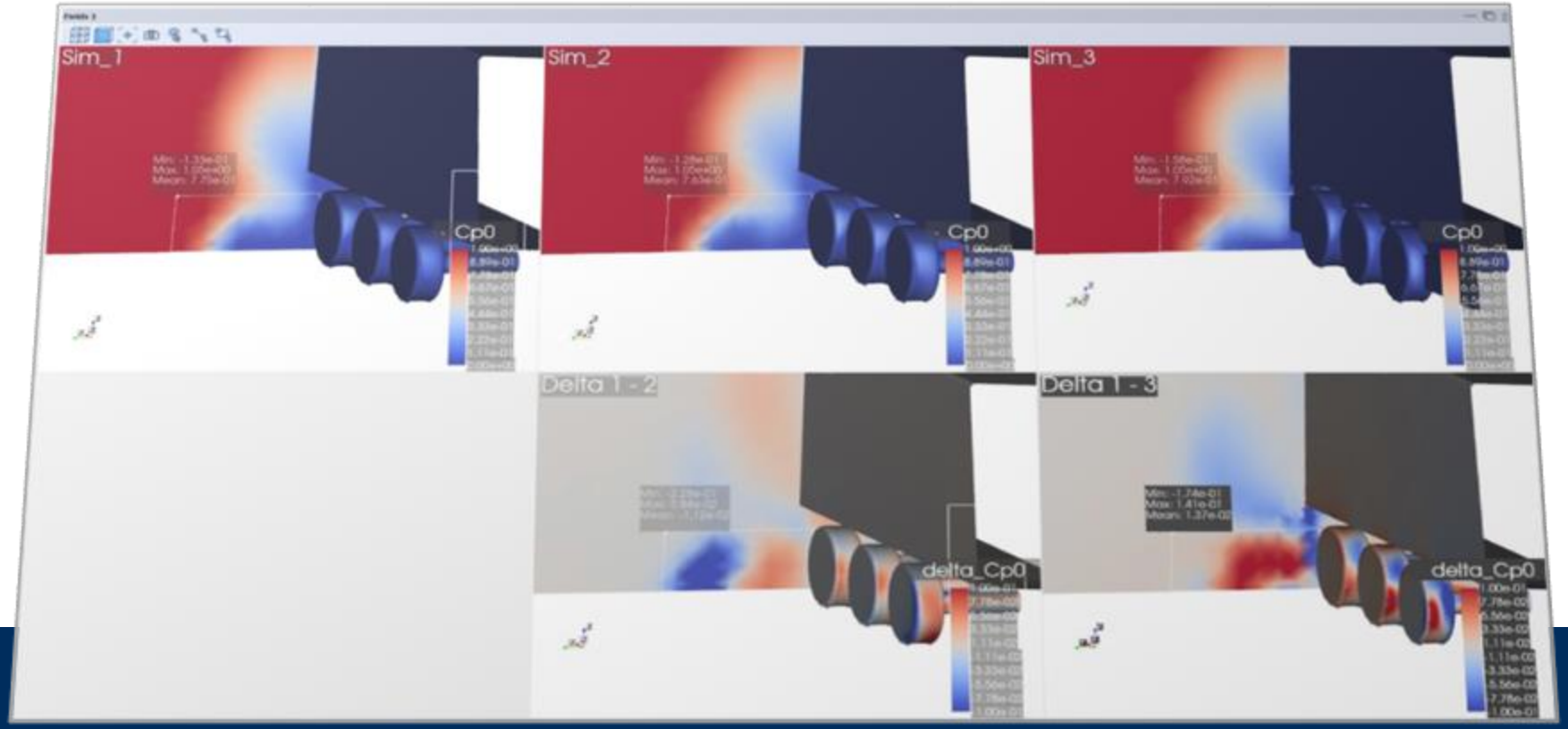
Fumes pollutant released by an urban extraction system showing the pollutant distribution on a plane downstream of the building





Iso-surfaces showing the pathogen distribution inside an hospital emergency room. The pathogen itself is modelled using a passive scalar released by the patient's mouth

Multi-simulation post-processing

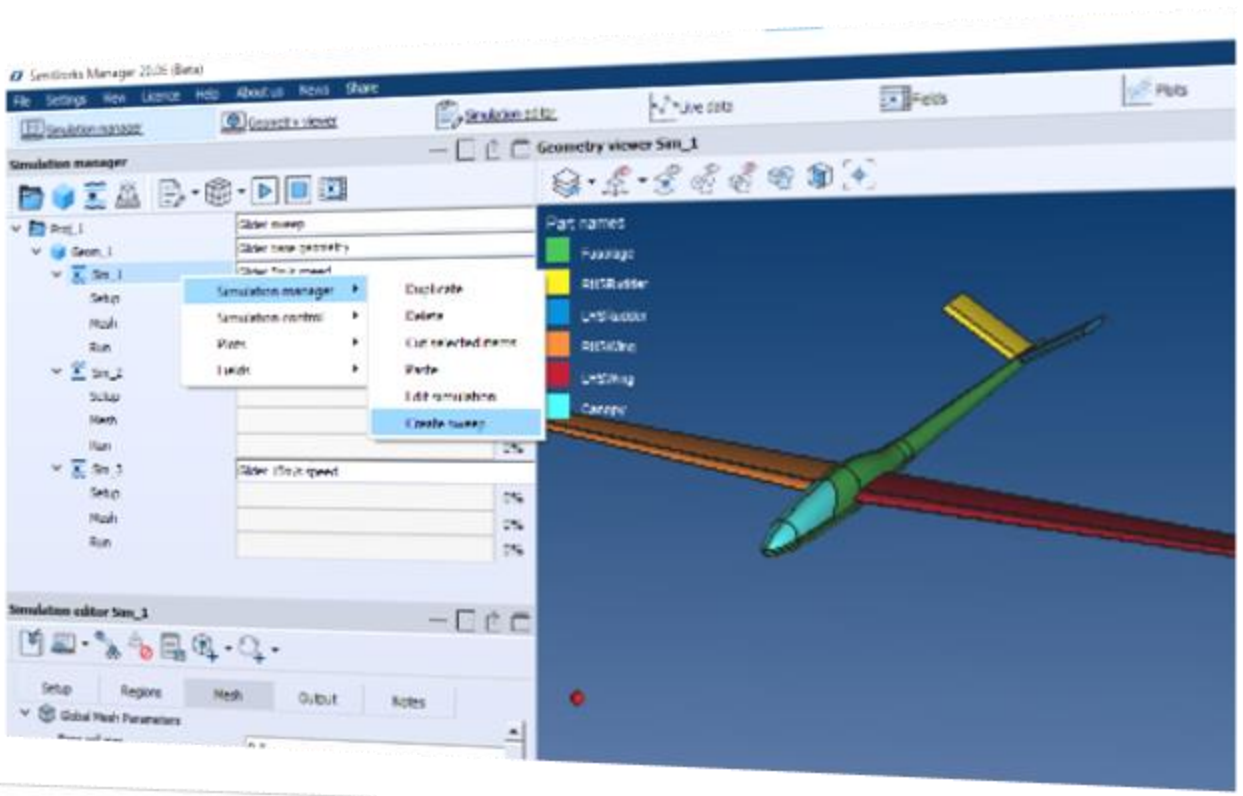


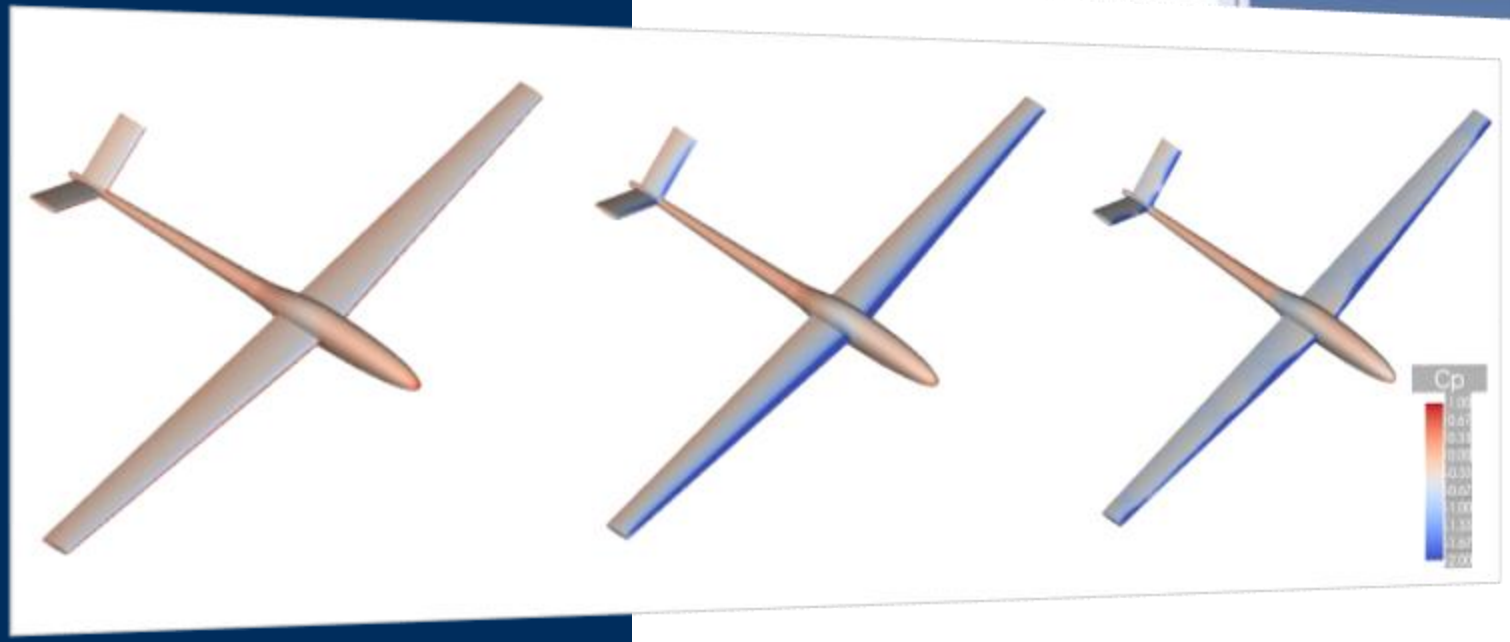
Field viewer

- SimWorks supports the **analysis of the results of multiple simulations concurrently**
- It is possible to **create delta plots to see and evaluate the difference in flow fields between cases**
- Delta plots can be shown on movable 2D planes, which show the difference in the flow field surrounding the geometry, and directly on the 3D surface of the geometry
- It is also possible to **get numerical values and their local and average difference in certain areas** of the flow field with the probing functionality that supports single point, line and a square probing

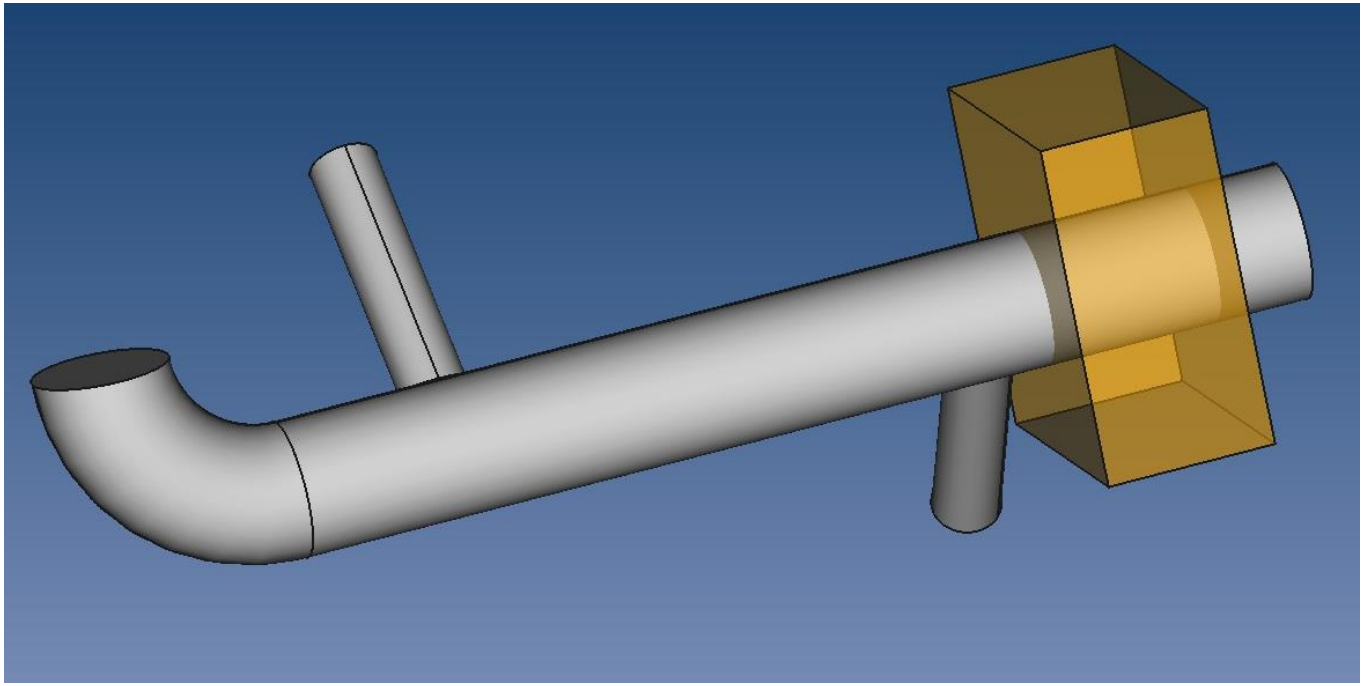
Sweep functionality

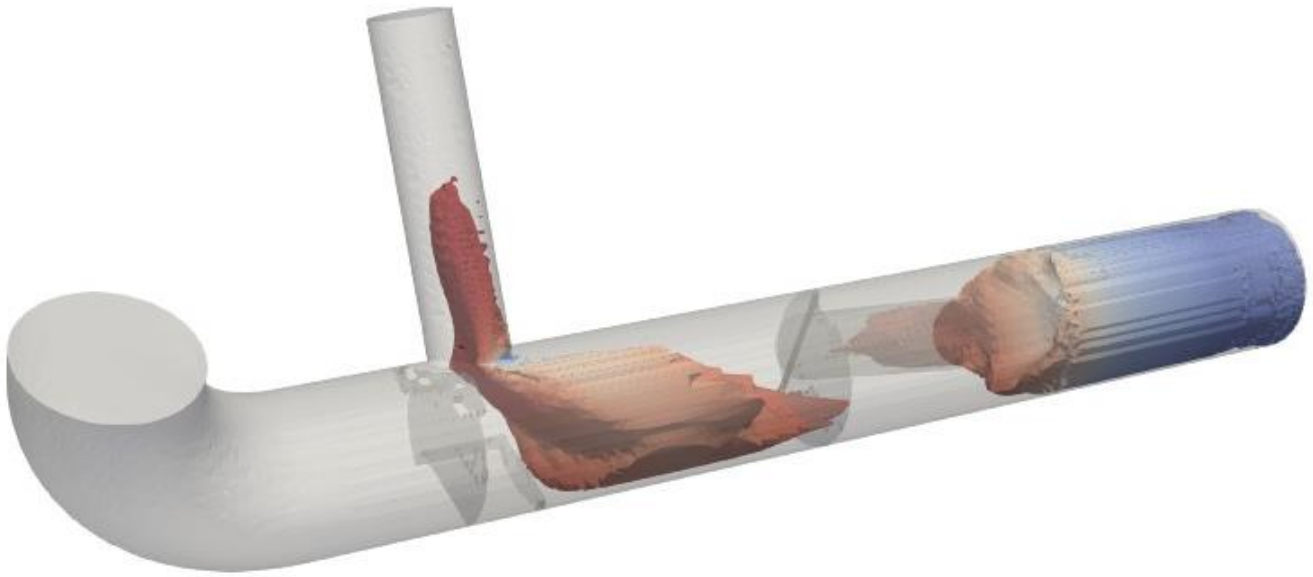
- The new sweep functionality **creates automatically a full sequence of CFD cases** changing an individual parameter defined by the user
- For example, the sweep functionality allows to **create automatically an aerodynamic mapping of a given geometry**





The sweep functionality has been used to create an angle-of-attack map of a glider



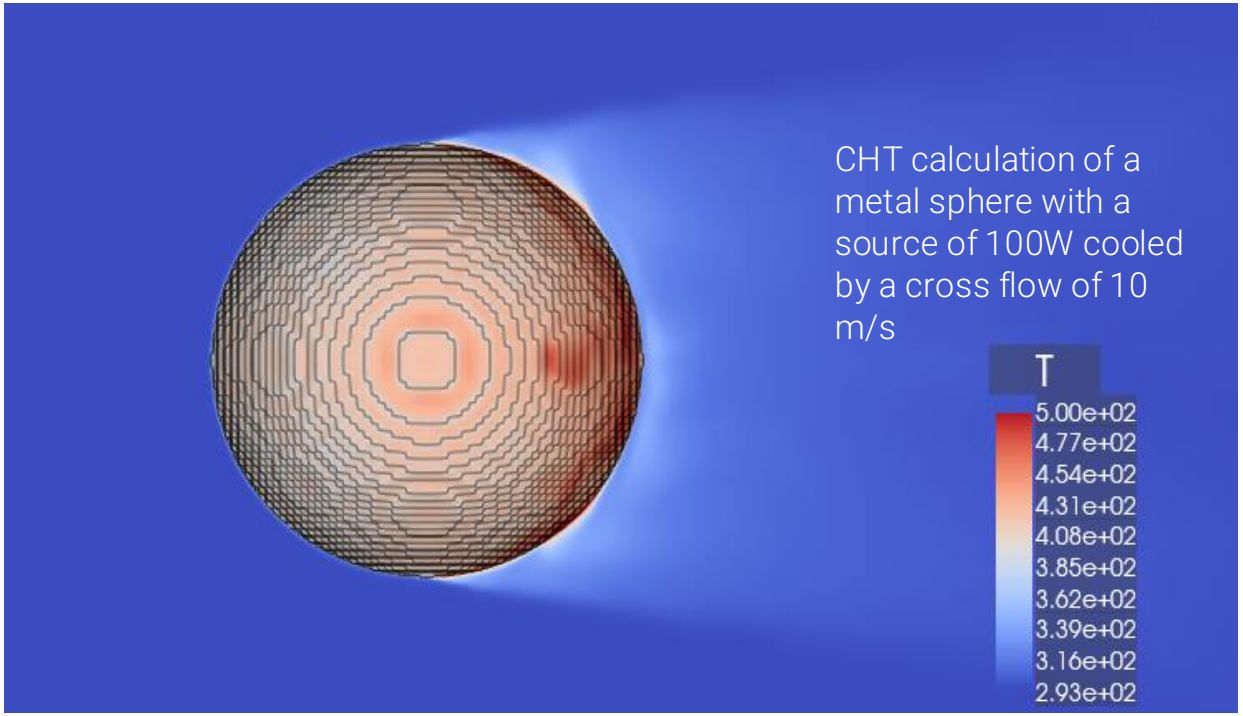


Porous Media

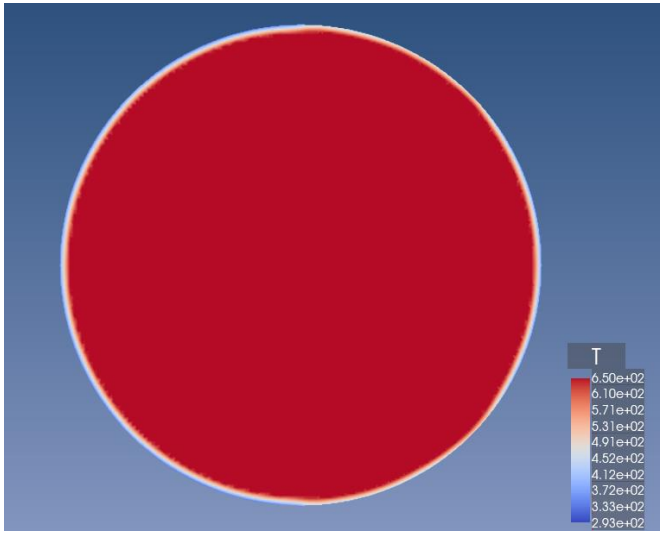
- SimWorks includes the **porous media option** to simulate the blockage from many engineering components like radiators, grids, filters without having to model them explicitly
- The porosity model uses the **Darcy-Forchheimer law** that allows the user to define resistance terms with a linear and quadratic dependency to flow velocity
- With the combination of the two terms any porous media can be effectively modelled

Conjugate-Heat-Transfer

- The new Conjugate-Heat-Transfer (CHT) functionality allows to calculate the flow and thermal properties in both the fluid and solid regions concurrently
- For example, it is possible to calculate the temperature distribution inside a solid region and see the effect of the flow around it
- In the example on the right, a solid sphere heated by a source of 100W is cooled by a cross flow of air at 20deg C

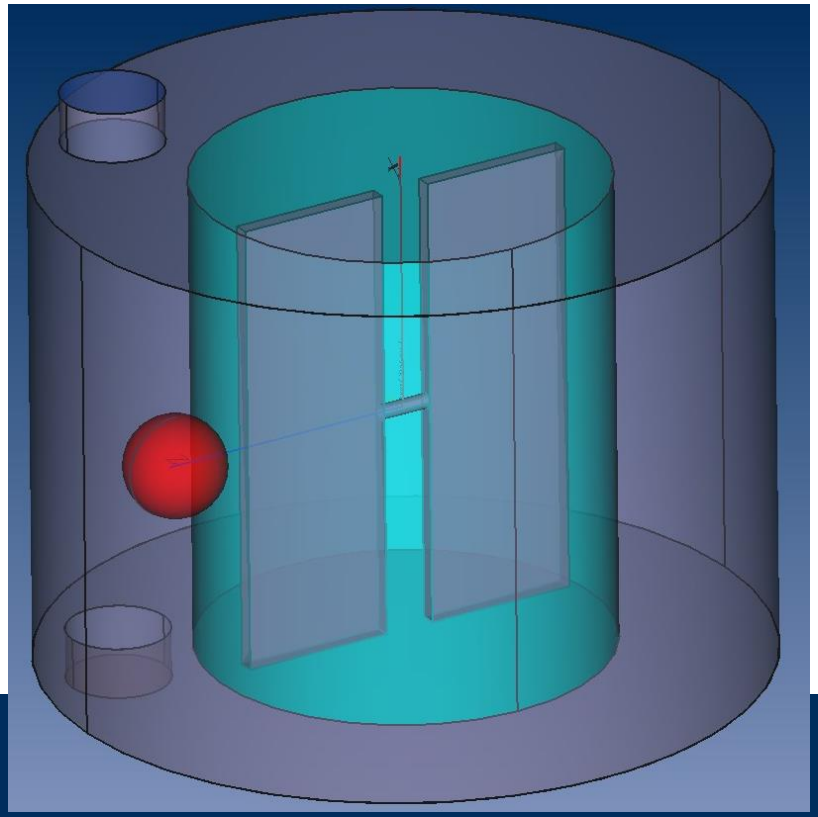


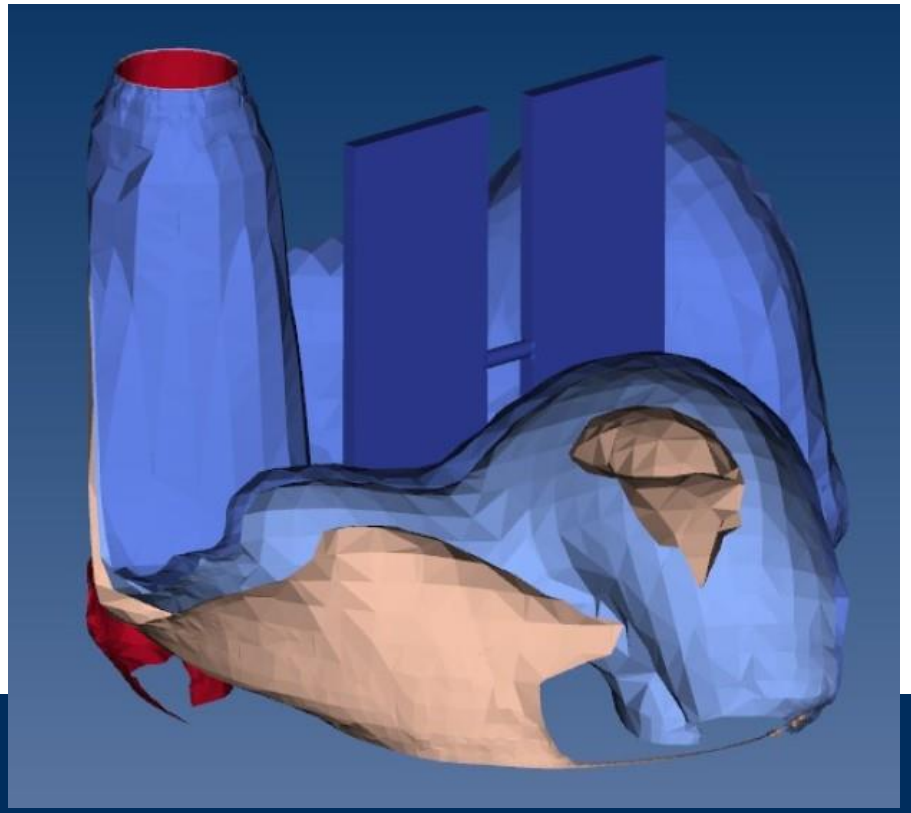
CHT calculation of a metal sphere with a source of 100W cooled by a cross flow of 10 m/s



Temperature distribution within the solid sphere

Rotating mesh and MRF



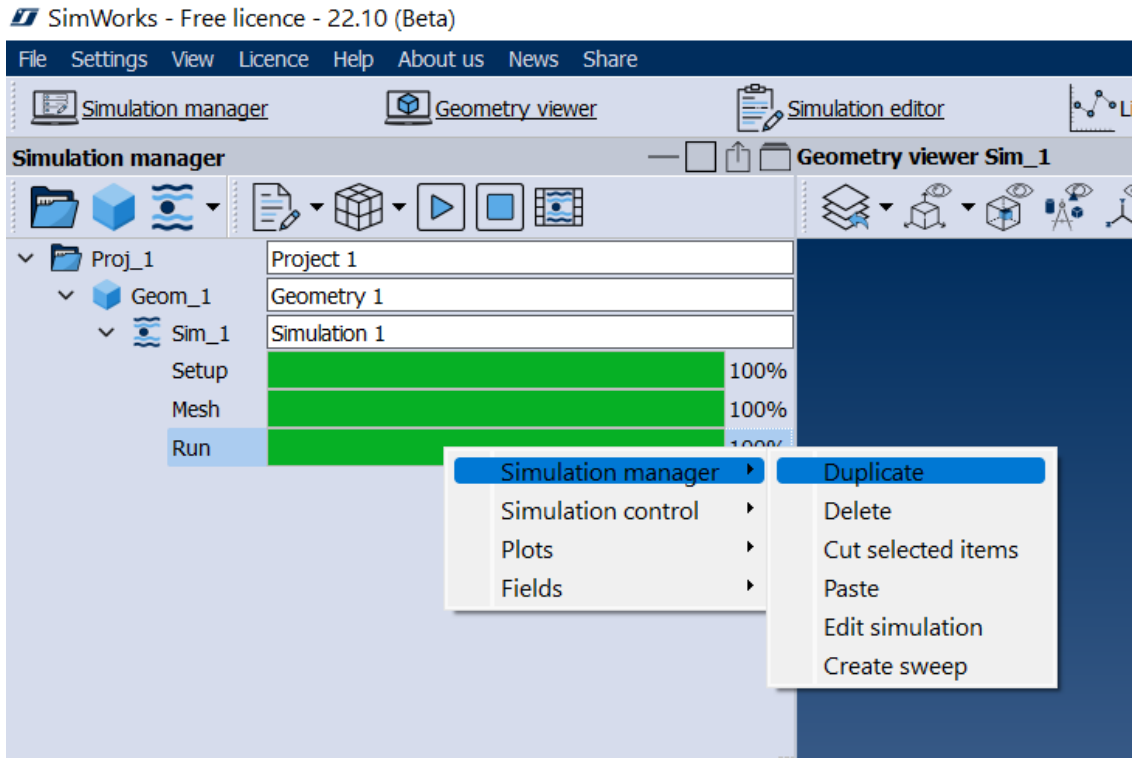


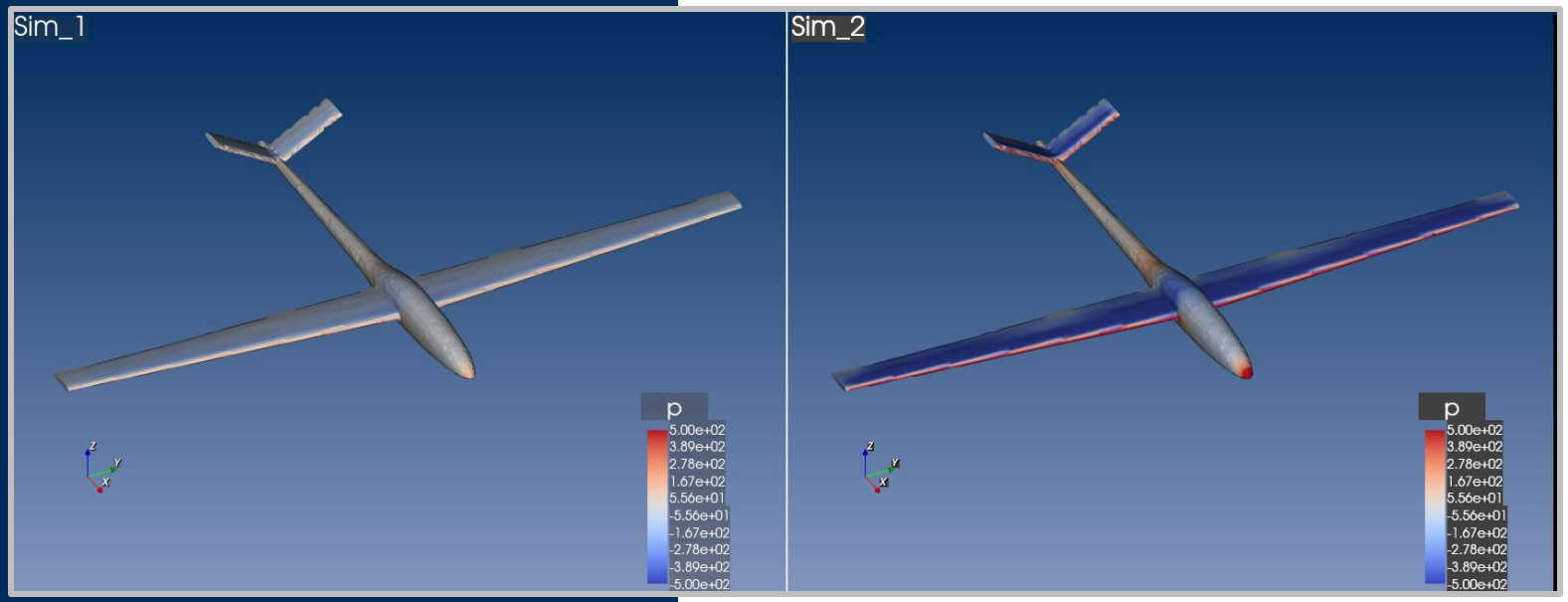
Rotating mesh

- SimWorks supports the simulation of rotating components both using the **rotating mesh capability** and the **Multiple Reference Frames (MRF)** approach
- The rotating mesh approach is computationally expensive, but it is the most accurate modelling of rotating components. On the other hand, the MRF approach is much more efficient and gives comparable results in terms of effect on the surrounding field

Mesh reuse and simulation extension

- SimWorks now allows to duplicate simulations and change most of the simulation parameters **reusing the existing mesh**
- SimWorks also allows the user to **extend an existing simulation** in case it has not fully converged





Both the duplication capability reusing the existing mesh and the simulation extension capacity can lead to significant time savings for the user

Get in touch!

We would love to hear your feedback about SimWorks.

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https://www.idealsimulations.com/quote/

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