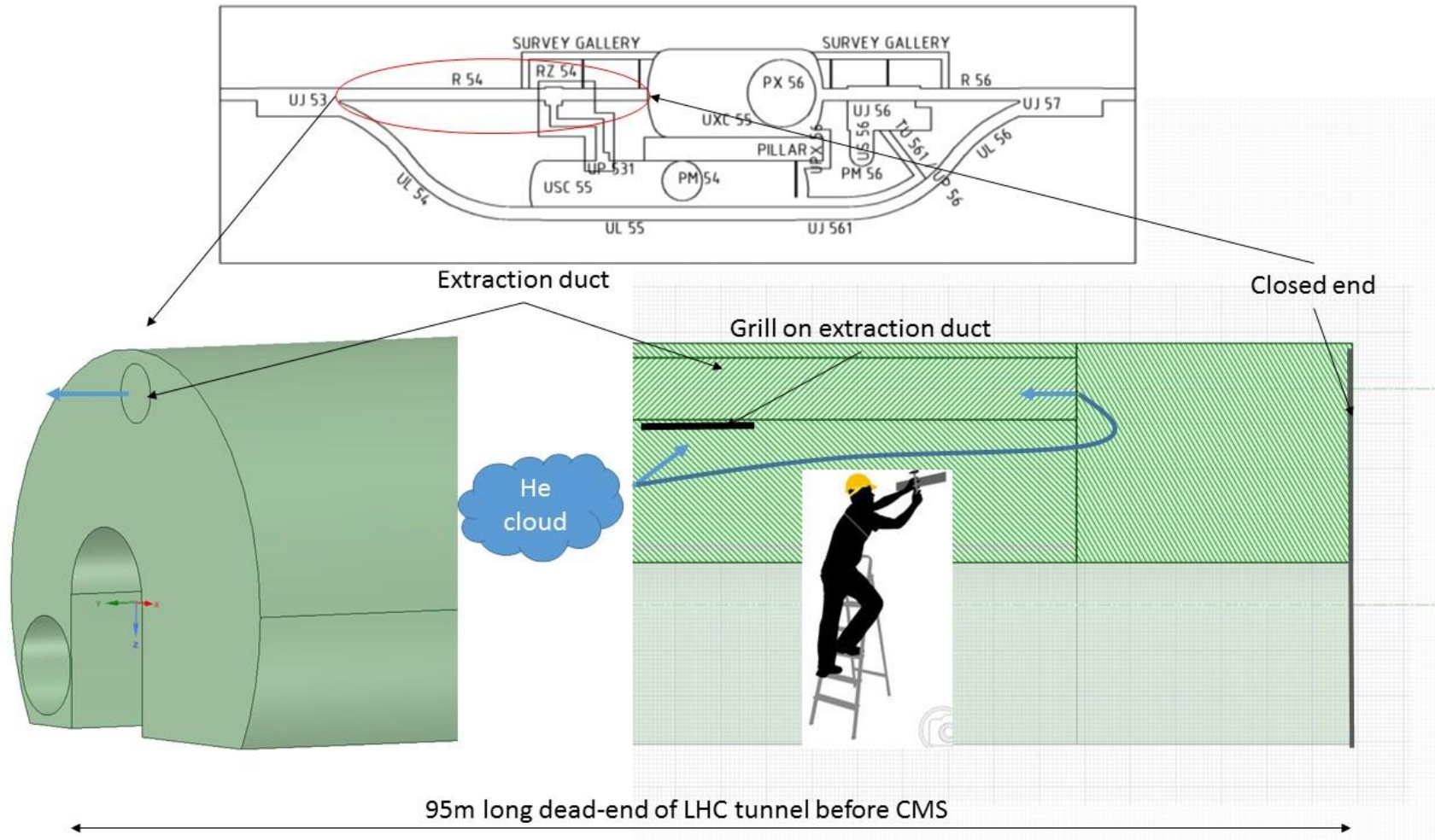


CMS corridor extraction CFD study

EDMS 1704476

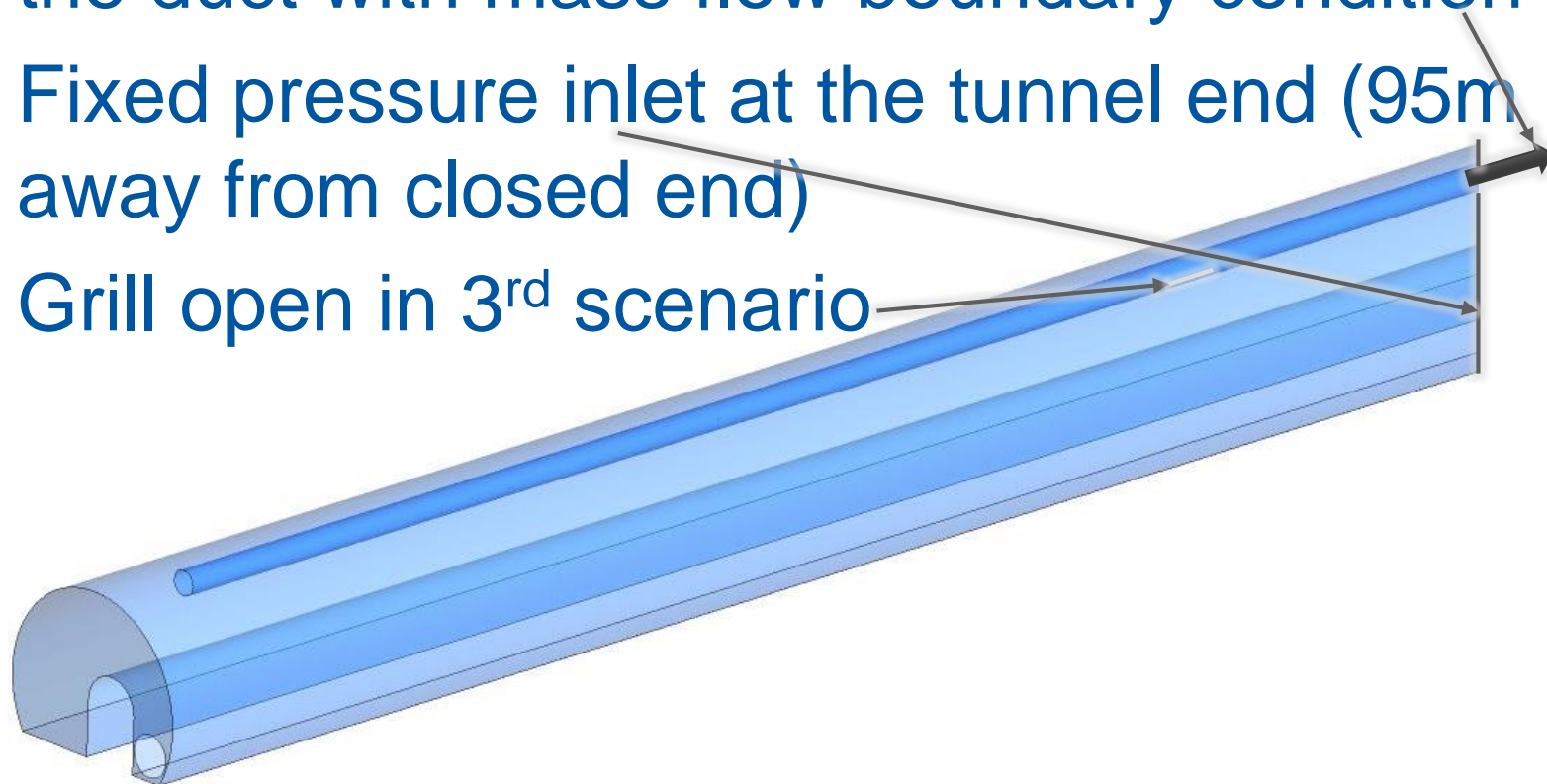
E. Rocco, A. Rakai – EN-CV-PJ

Geometry used for calculations



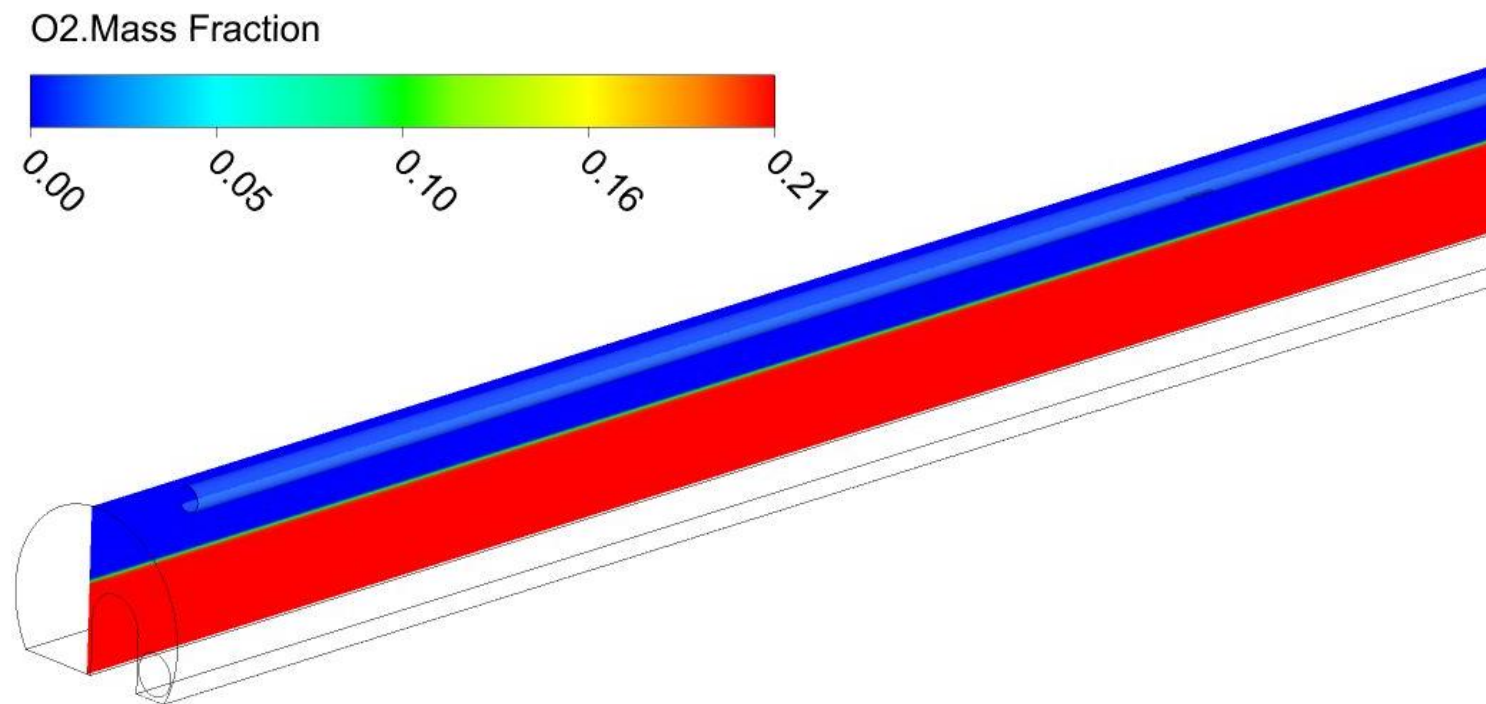
Assumptions used for calculations

- 2300 m³/h or 7500 m³/h extraction from the duct with mass flow boundary condition
- Fixed pressure inlet at the tunnel end (95m away from closed end)
- Grill open in 3rd scenario

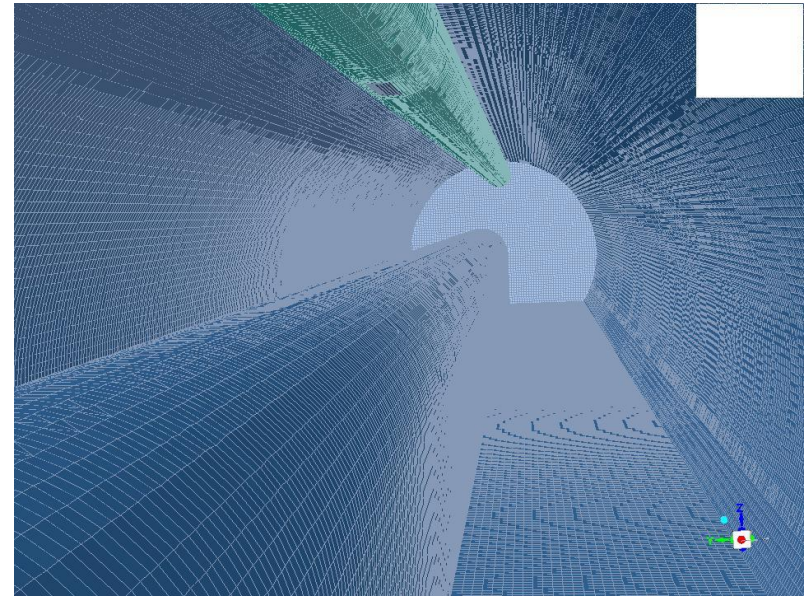
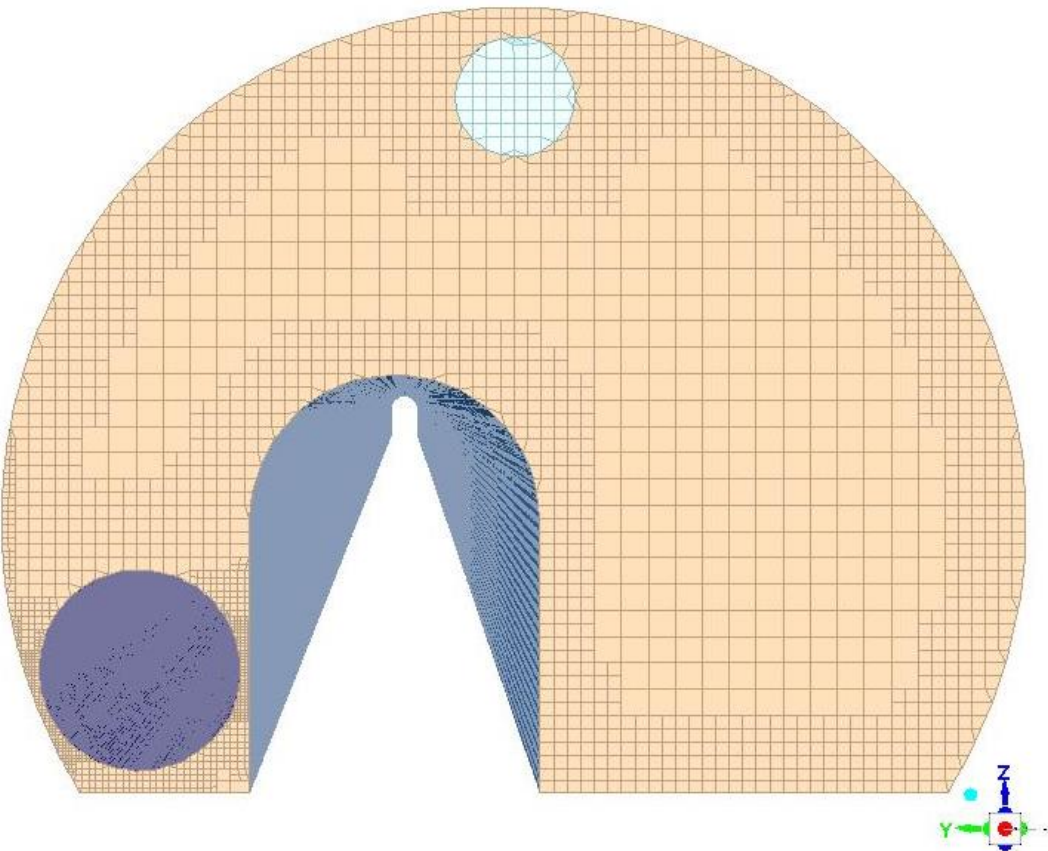


Assumptions used for calculations

- Tunnel filled with room temperature helium above 1.6 m height



Computational mesh and details



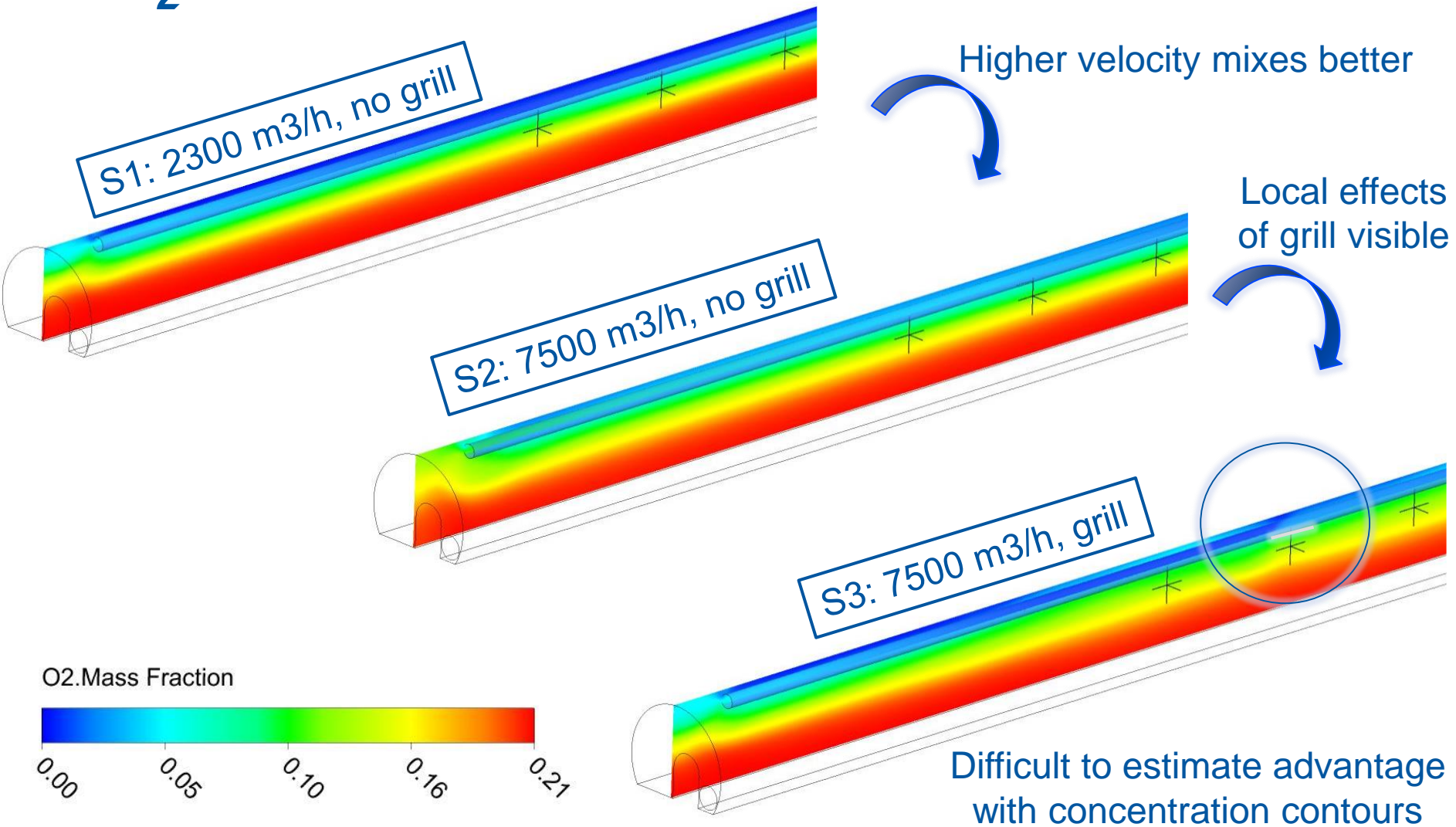
Computational fluid dynamics:

- ANSYS Fluent v17.1
- Standard k- ϵ turbulence model
- Incompressible ideal-gas model
- SIMPLE pressure velocity coupling
- Body force weighted pressure scheme

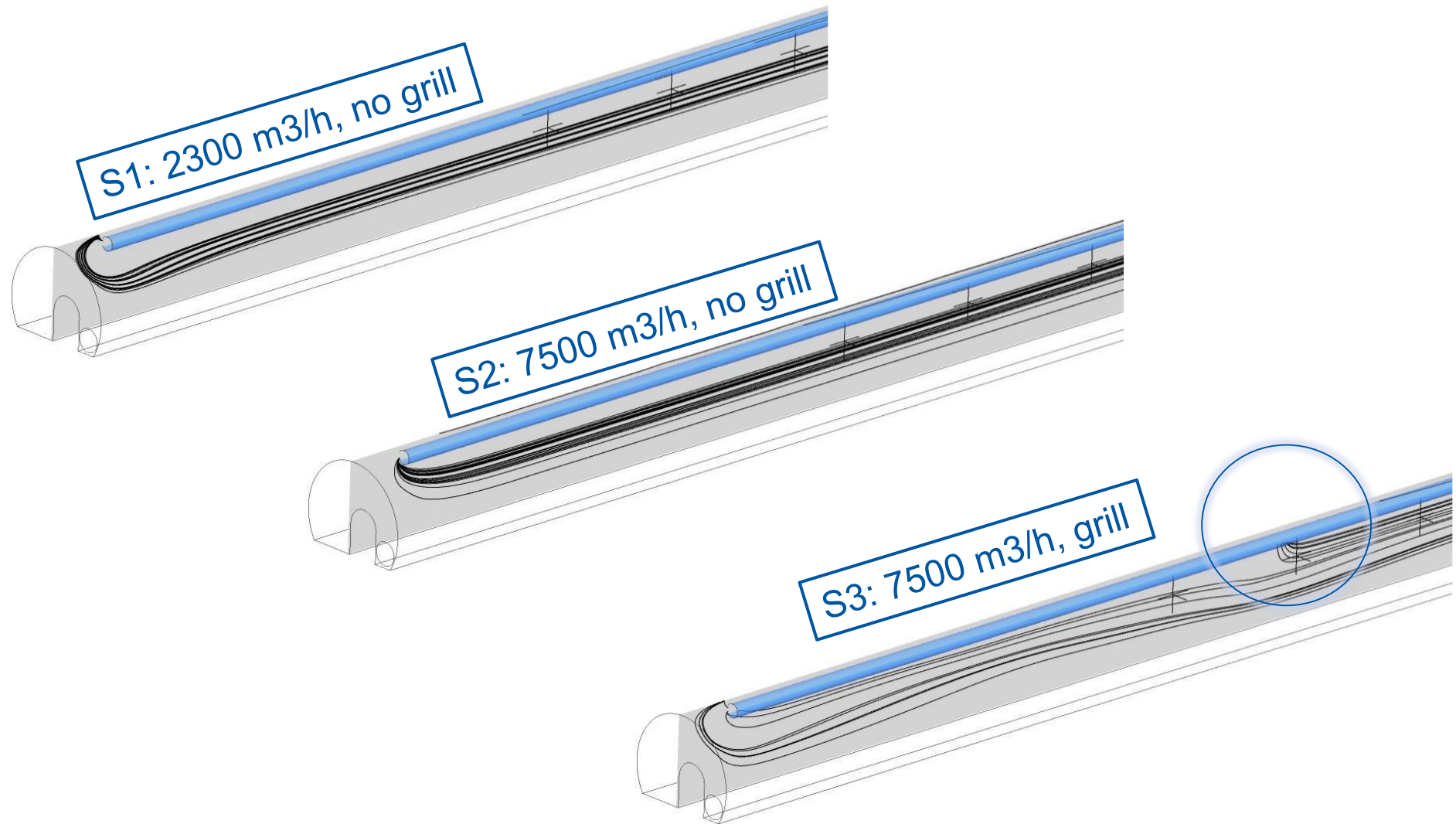
Scenarios

Scenarios	Extraction	Duct grills
S1	2300	No
S2	7500	No
S3	7500	yes

O₂ concentration after 8 min

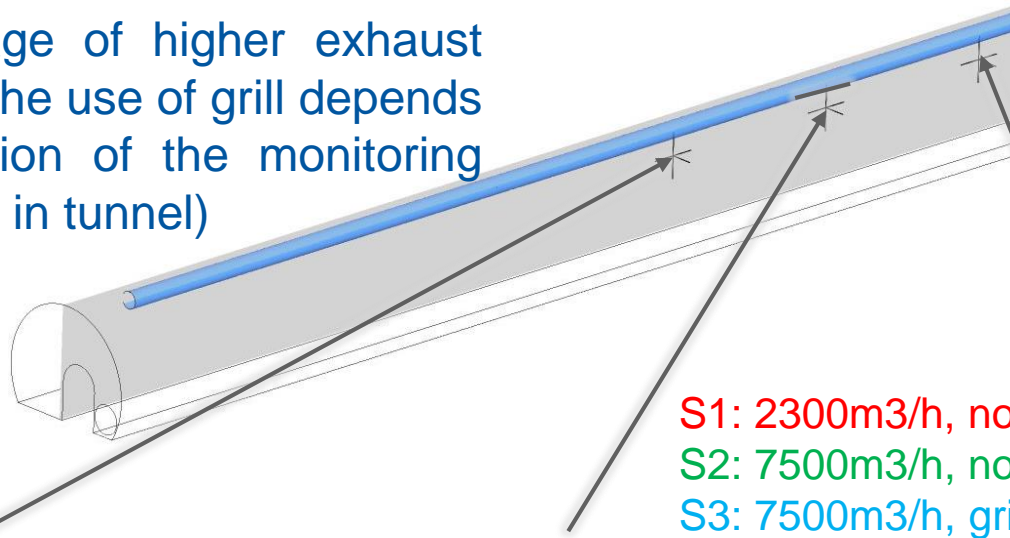


Flow structure difference



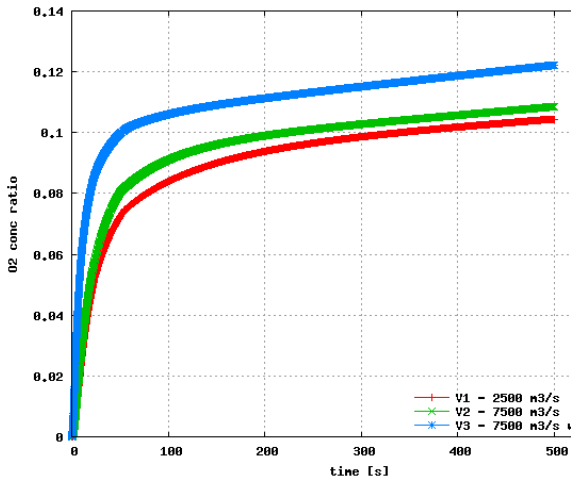
Monitoring points

The advantage of higher exhaust velocity and the use of grill depends on the location of the monitoring point (person in tunnel)

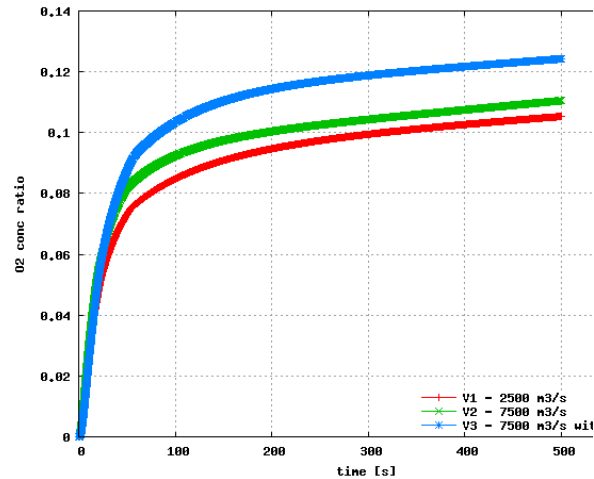


S1: 2300m³/h, no grill
S2: 7500m³/h, no grill
S3: 7500m³/h, grill

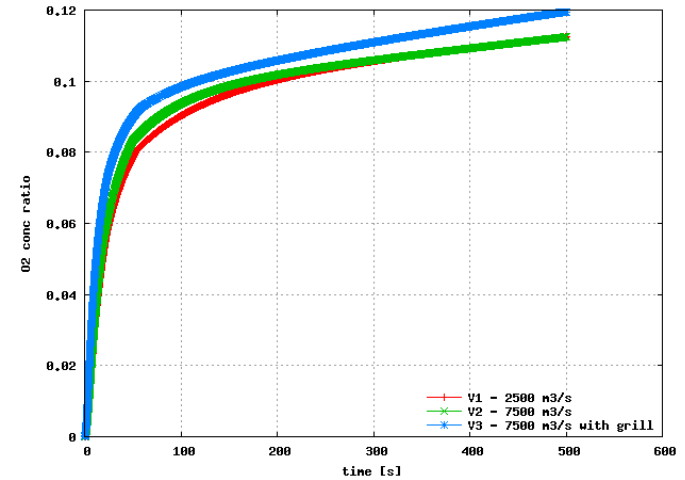
O₂ conc over time in point 1



O₂ conc over time in point 2



O₂ conc over time in point 3



Conclusions

- With a very simplified case the global effects of extraction flow rate and use of grills can be observed.
- Higher flow rate extraction can increase mixing and deteriorate stratification of He.
- In monitoring points close to the grills O_2 fraction recovers clearly faster than without.
- This phenomena is highly location dependent.