

Sensitivity analysis and uncertainty in CFD simulations of multiphase flow

Christophe Henry¹, Aurore Dupré¹, Mireille Bossy¹

¹ *Université Côte d'Azur, INRIA, CaliSto laboratory, Sophia-Antipolis, France*

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Abstract

We present recent developments that have been made within the framework of the [VIMMP](#) EU project (Virtual Materials Market Place). Our objective is to set up a methodology to analyse the sensitivity and then quantify uncertainty in numerical simulations of multiphase flows to a number of input variables.

In this talk, we start by introducing the workflow used for the multiphase flow simulations. The physical case studied here consists in the point-source dispersion of particles by a turbulent pipe flow. Numerical simulations are performed by coupling a CFD simulation of the turbulent pipe flow (using standard turbulence models) to a particle-tracking simulation (using a stochastic Lagrangian model). The simulations are performed in *Code_Saturne CFD* [1]. The workflow is launched using tools from the [Salome Platform](#), which allows to handle the coupling of the fluid phase simulation and the particle-phase simulation.

The results obtained are then analysed using existing tools within OpenTurns [2]. For that purpose, a dataset is obtained by running the workflow with a range of input variables (e.g. the fluid velocity, number of particles injected, size of particles) and accounting for the intrinsic stochasticity of each run. Then, we use sensitivity analysis techniques (especially Sobol sensitivity index [3] through meta-model) to identify the key parameters affecting the observed results. By considering several observables, we also highlight the need to define a clear observable before running such analysis.

References

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