DE LA RECHERCHE À L'INDUSTRIE

Physical-statistical methodology for the quantification of uncertainties on the multi-physics simulation of a nuclear reactor accidental transient

Paolo Olita (paolo.olita@cea.fr)

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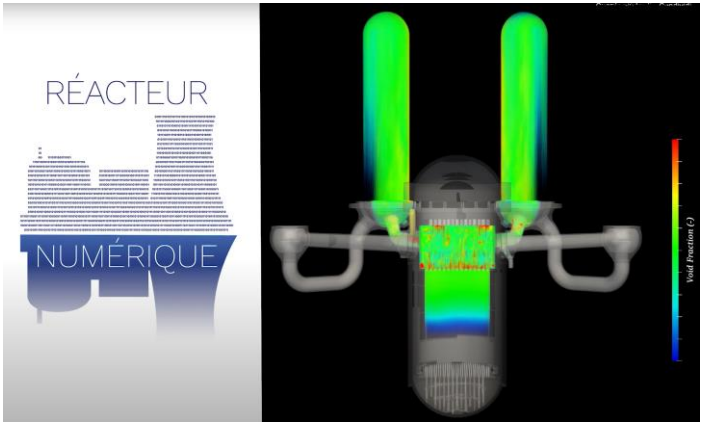
***IRESNE** I DER I SESI I LEMS*

Institut de recherche sur les systèmes nucléaires pour la production d'énergie bas carbone

- In the framework of the **Numerical Reactor** project, a significant effort is put into the development of a methodology for the qualification (i.e. the Verification, Validation and Uncertainty Quantification) of multi-physics coupled tools.
- The goal of the numerical reactor is to simulate the behavior of a nuclear power plant in real time. Confidence intervals on the results of the simulation must also be provided according to the uncertainty sources of the model.
- The multi-physics coupled modelling for the simulation of accident scenarios in Pressurized Water Reactors (PWR) is performed at CEA through a coupling platform named CORPUS, which integrates the tools APOLLO3 (for core neutronics) and CATHARE3 (for core and reactor system thermal-hydraulics).
- The PhD work aims at proposing and testing on a PWR accident scenario some advanced methods for the quantification of the uncertainties associated with a multi-physics coupled model developed in CORPUS.



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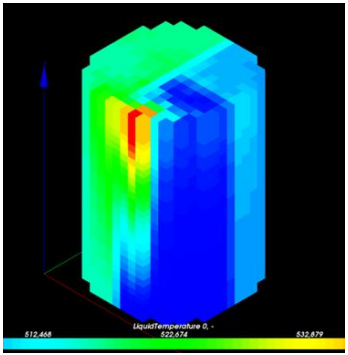
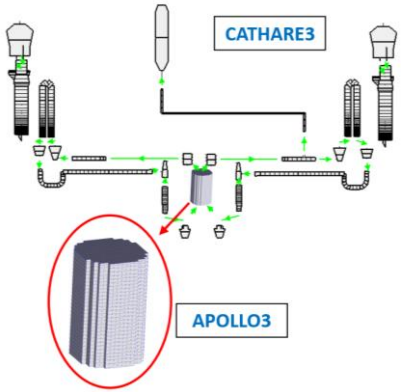
- The accident scenario on which the PhD will focus is the Main Steam Line Break (MSLB). The target of the PhD is not to provide an extensive quantification of all the uncertainties on the key parameters of the transient (like the Critical Heat Flux Ratio), but to define a procedure for the estimation and propagation of the uncertainties associated to multi-physics coupled modelling.

- This PhD subject may be suitable for you if:
  - ❑ You would like to improve the current state of the art of 2nd ant 3rd generation reactors modeling tools
  - ❑ You like programming (especially in Python)
  - ❑ You are not afraid of learning some Statistics



3D field representing the coolant temperature after the MSLB accident



Reactor model used for the MSLB simulation

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