

# SCIANTIX: A new meso-scale module enhancing fuel performance simulations



**POLITECNICO**  
MILANO 1863

**Davide Pizzocri**

Politecnico di Milano, Department of Energy, Nuclear Reactors Group, Via La Masa 34, Milan

## Introduction and Motivation

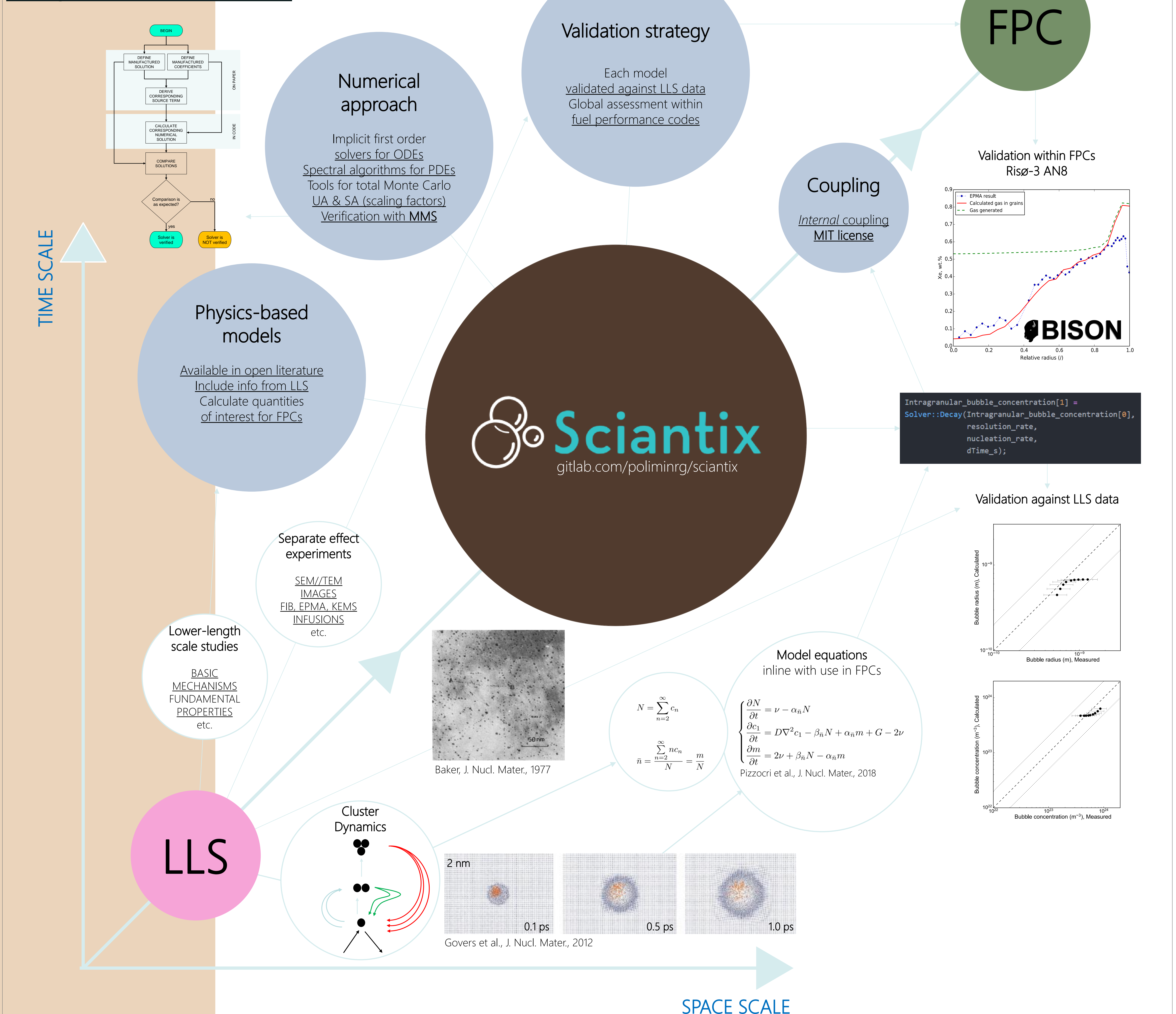
Being able to bridge lower length-scale calculations with the engineering-scale simulations of fuel performance codes requires the development of dedicated intermediate-scale codes. In this work, we present SCIANTIX, a recently developed code which aims to fill this gap. SCIANTIX is a 0D stand-alone computer code under development at Politecnico di Milano since 2016. It is designed to be included as a module in existing fuel performance codes (e.g., TRANSURANUS, BISON, GERMINAL, FRAPCON/FRAPTRAN).

## SCIANTIX Features

SCIANTIX contains models describing inert gas behaviour, fuel microstructure, evolution of minor actinides, thermal and mechanical properties at the scale of a fuel grain, represented as a point (i.e., 0D). The models available in SCIANTIX (covering intra- and inter-granular inert gas behaviour, and high burnup structure formation and evolution as well) are physics-based and not correlation-based. This allows overcoming current limitations in fuel performance codes, where meso-scale phenomena are generally accounted for through correlations.

## Example of multi-scale modelling in SCIANTIX (w/ V&V)

### Intra-granular bubble evolution



**Conclusions** SCIANTIX is recently developed meso-scale module including inert gas behaviour models and extendable to different phenomena/properties. It is available opensource and suitable for coupling with fuel performance codes and for stand-alone use as well (e.g., for the design/interpretation of separate effect experiments). It represents a platform for model development, testing and V&V. (verification embedded via MMS).