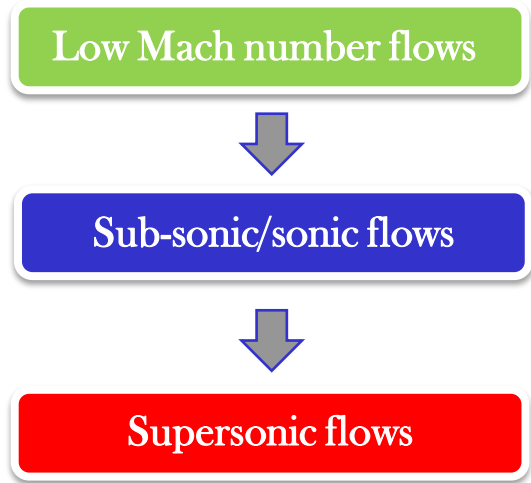
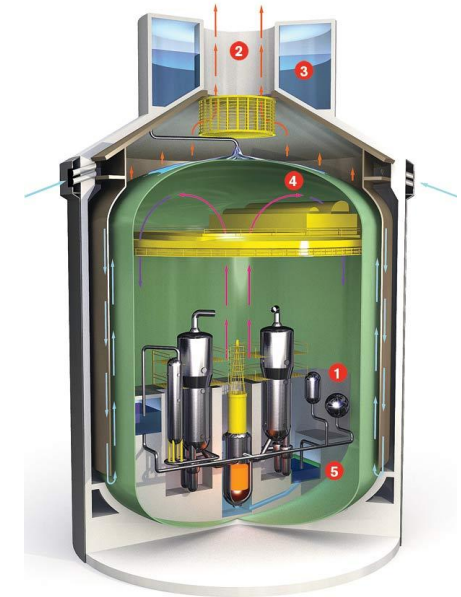
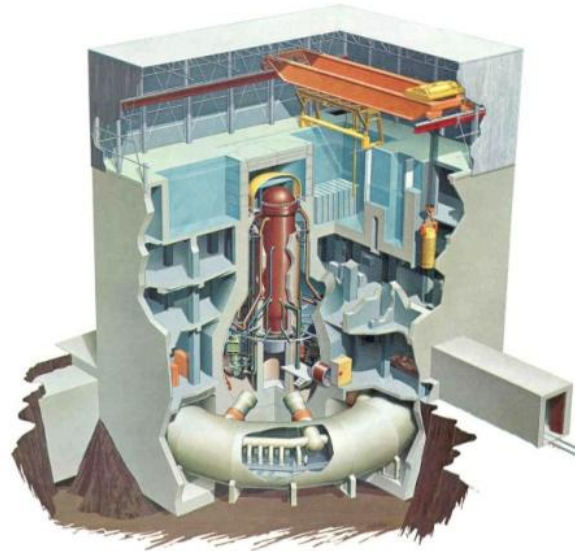


# PARALLELIZATION OF PRESSURE-BASED SEMI-IMPLICIT ALL-SPEED CFD CODE GASFLOW FOR NUCLEAR SAFETY ANALYSIS

Jianjun Xiao\*, Karlsruhe Institute of Technology (KIT), Germany

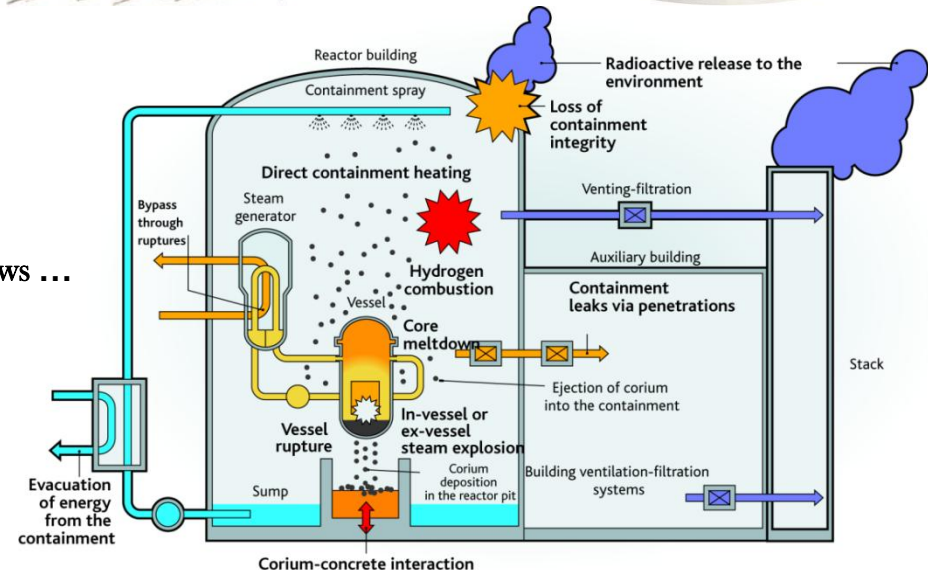
## 1. What we are solving?



Slow deflagration, plume ...

Fast deflagration, critical flows ...

Detonation ...



\* Institute of Nuclear and Energy Technologies, Karlsruhe Institute of Technology, P.O. Box 3640, 76021 Karlsruhe, Germany

Email: jianjun.xiao@kit.edu

# PARALLELIZATION OF PRESSURE-BASED SEMI-IMPLICIT ALL-SPEED CFD CODE GASFLOW FOR NUCLEAR SAFETY ANALYSIS

Jianjun Xiao\*, Karlsruhe Institute of Technology (KIT), Germany

## 2. A successful application of PETSc library in Nuclear Engineering

### 3-D CFD code GASFLOW

- Los Alamos and KIT (> 120 man-years)
- Fully verified and validated
- Widely used in Europe and Asia
- Compressible Navier-Stokes
- Finite volume, pressure based
- Semi-implicit, all-speed flows
- Structured staggered grid
- Sequential code (no perspective)
- Fortran 90 over 120,000 lines

### Application of PETSc

- Data management: DMDA
- Solving large scale sparse symmetrical matrix generated from elliptic pressure equation:
- Matrix type: MATMPISBAIJ
- Preconditioner: block Jacobi
- Linear solver: conjugated gradient

