

# Alleviate the Curse of Dimensionality in SSFEM using Domain Decomposition in HPC

*Ajit Desai*, Carleton University, Canada

Mohammad Khalil, Sandia National Lab., USA

Abhijit Sarkar, Carleton University, Canada

Chris Pettit, United States Naval Academy, USA

Dominique Poirel, Royal Military College, Canada

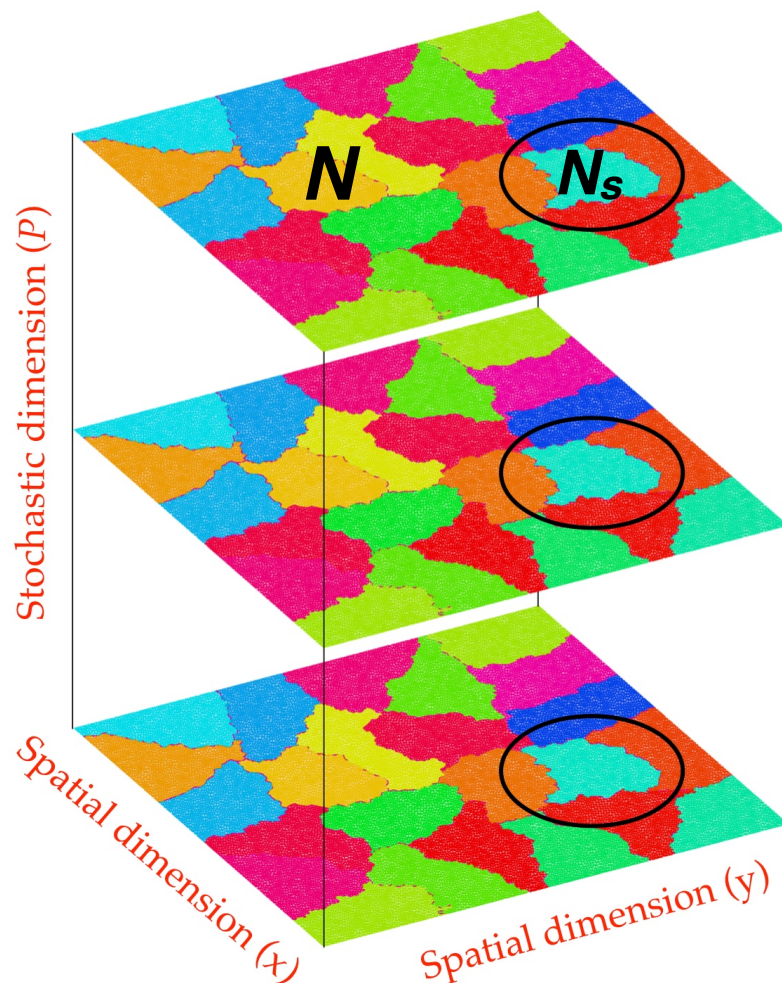


Quantification of Uncertainty:  
Improving Efficiency  
and Technology



# Motivation

- ◆ Scalable Solvers for uncertainty quantification of **high-dimensional** stochastic-PDEs using **HPC**.



Global : **DDM**  
( $N \times P$ )

Interface : **NNC/BDDC**  
( $N_I \times P$ ) : MPI

Local : **Block-Jacobi**  
( $N_s \times P$ ) : PETSc, FEniCS  
UQTK

# Key Results

- ◆ Stochastic diffusion equation with diffusion coefficient is modelled as a lognormal stochastic process.
- ◆  $N=52000$ ,  $\sigma = 0.3$ ,  $b = 1.0$ ,  $order = 3$ .
- ◆ Exponential covariance function.

