

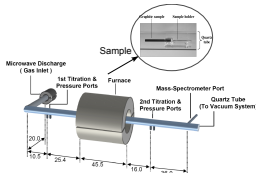
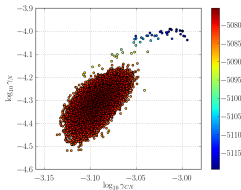
# Enabling the “Outer Loop” with PETSc, libMesh, QUESO, and GRINS

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# Outer Loop of a Data Reduction Model



$$\pi_{post}(m) = \frac{\pi_{prior}(m)\pi(d|m)}{\pi(d)}$$

$$\bar{X}_N = \frac{1}{|\partial\Omega_b|} \int_{\partial\Omega_b} \chi_N dS$$

$$\Delta m = \Delta t \int_{\partial\Omega_b} \rho_N \frac{M_C}{M_N} \gamma_{CN}(T) \sqrt{\frac{\hat{R}T}{2\pi M_N}} dS$$

$$\nabla \cdot \mathbf{u} = \frac{1}{T} \frac{DT}{Dt} - \frac{1}{M} \frac{DM}{dt}$$

$$\rho \frac{\partial w_i}{\partial t} = -\rho \mathbf{u} \nabla w_i - \nabla \cdot \mathbf{j} + \dot{\omega}_i \quad i = 1 \dots N_s$$

$$\rho \frac{D\mathbf{u}}{Dt} = -\nabla p + \nabla \cdot \boldsymbol{\tau}$$

$$\rho c_p \frac{DT}{Dt} = \nabla \cdot (k \nabla T) + \sum_i h_i \dot{\omega}_i$$

$$p^0 = \rho RT$$

