

(a)

Process Systems

Partial Mechanism Knowledge \downarrow \uparrow Hybrid Modeling
 Sparse Labeled Data \downarrow \uparrow Forward Acceleration

Physics-Aware Proxy Model (PAPM)

Process Model

Conservation Relations

Constitutive Relations

Boundary Conditions

Physics-Aware

Temporal-Spatial Stepping Method (TSSM)

Temporal

Eular or R-K Scheme

Spatial

Structure-Preserved
Spatial Operation

(b)

Initial conditions

$$\mathbf{U}(0; x, y) \sim a(-\Delta + bI)^{-3}$$

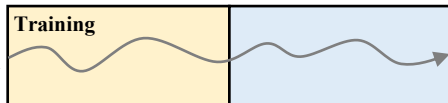
Coefficients

$$v \sim U[A, B]$$

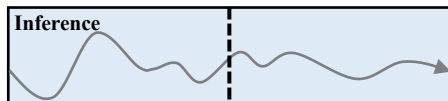
Multiple Inputs



Train



Test



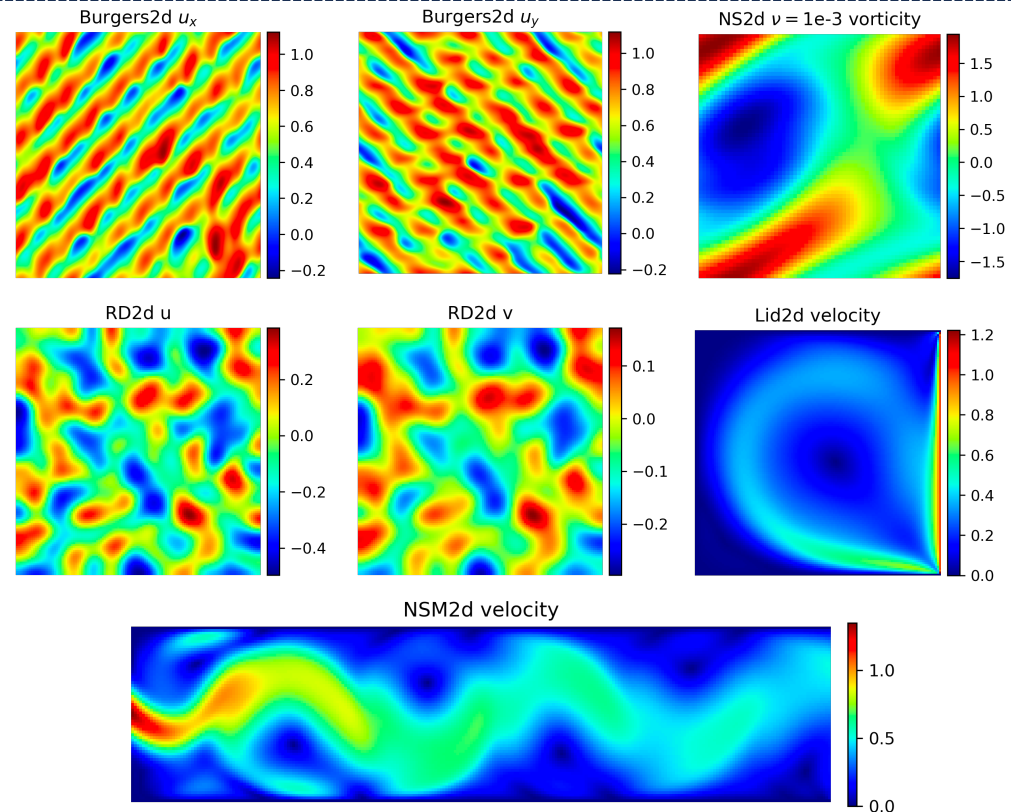
0

T'

T_{end}

T

(c)



Multiple Non-trivial Benchmark Process Systems Datasets