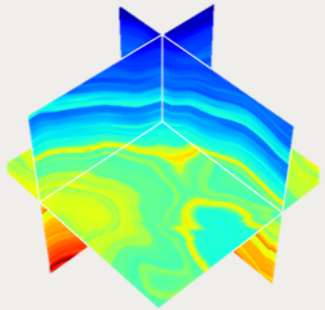
GEMS-3D pipeline for physically consistent multiphysics geophysical model generation



Background velocity V_p^{bg}



Stratigraphy Prior L

- a Anomaly Class
- r Realization index
- s Grid spacing

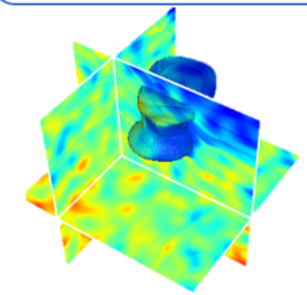
Geology condition

Facies-aware Property Builder

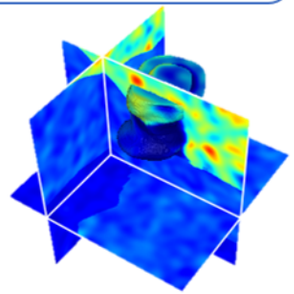
$\mathcal{G}(V_p^{bg}, L, a, r, s)$

Model Generation

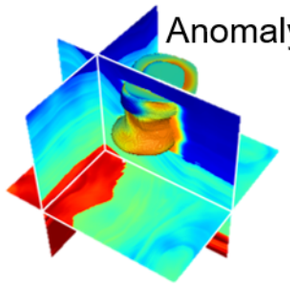
$\{\rho, \phi, \chi, V_p, Y\}$



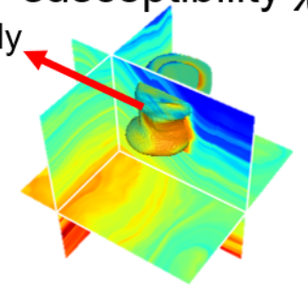
Density ρ



Magnetic susceptibility χ

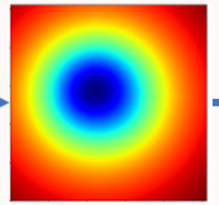


Resistivity ϕ

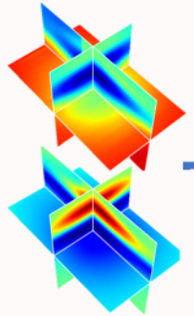


Velocity V_p

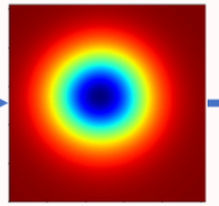
ρ → $\mathcal{F}_G$ → Gravity Solver → d_g



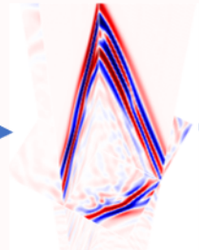
ϕ → $\mathcal{F}_E$ → Electrical Solver → d_e



χ → $\mathcal{F}_M$ → Magnetic Solver → d_m



V_p → $\mathcal{F}_S$ → Seismic Solver → d_s

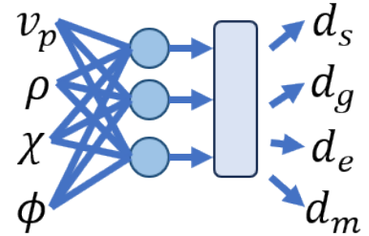


Multiphysics Forward Solver

Unified Data Package

Downstream Tasks (Benchmarks)

Operator Learning

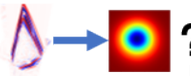


Inverse Interpretation



Multiphysics inversion

Robustness



? Inference from missing modalities