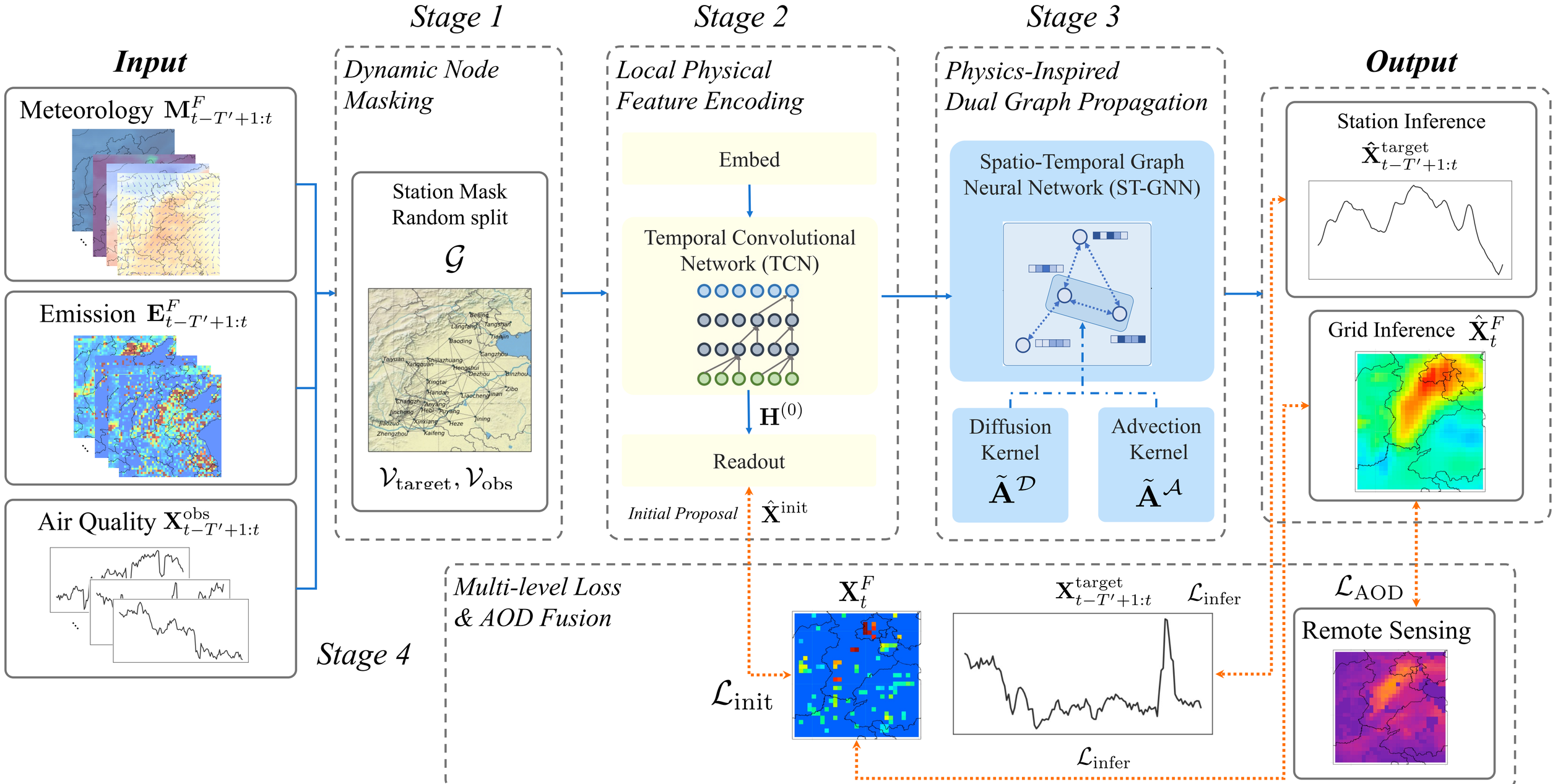
Stage 1
Stage 2
Stage 3
Input
Dynamic Node Masking
Local Physical Feature Encoding
Physics-Inspired Dual Graph Propagation
Output
Meteorology $\mathbf{M}^F_{t-T'+1:t}$
Emission $\mathbf{E}^F_{t-T'+1:t}$
Air Quality $\mathbf{X}^{\text{obs}}_{t-T'+1:t}$
Station Mask Random split
$\mathcal{G}$
$\mathcal{V}_{\text{target}}, \mathcal{V}_{\text{obs}}$
Embed
Temporal Convolutional Network (TCN)
$\mathbf{H}^{(0)}$
Readout
Initial Proposal $\hat{\mathbf{X}}^{\text{init}}$
Spatio-Temporal Graph Neural Network (ST-GNN)
Diffusion Kernel $\tilde{\mathbf{A}}^{\mathcal{D}}$
Advection Kernel $\tilde{\mathbf{A}}^{\mathcal{A}}$
Station Inference $\hat{\mathbf{X}}^{\text{target}}_{t-T'+1:t}$
Grid Inference $\hat{\mathbf{X}}^F_t$
Stage 4
Multi-level Loss & AOD Fusion
$\mathbf{X}^F_t$
$\mathbf{X}^{\text{target}}_{t-T'+1:t}$
$\mathcal{L}_{\text{infer}}$
$\mathcal{L}_{\text{AOD}}$
Remote Sensing
$\mathcal{L}_{\text{init}}$
$\mathcal{L}_{\text{infer}}$