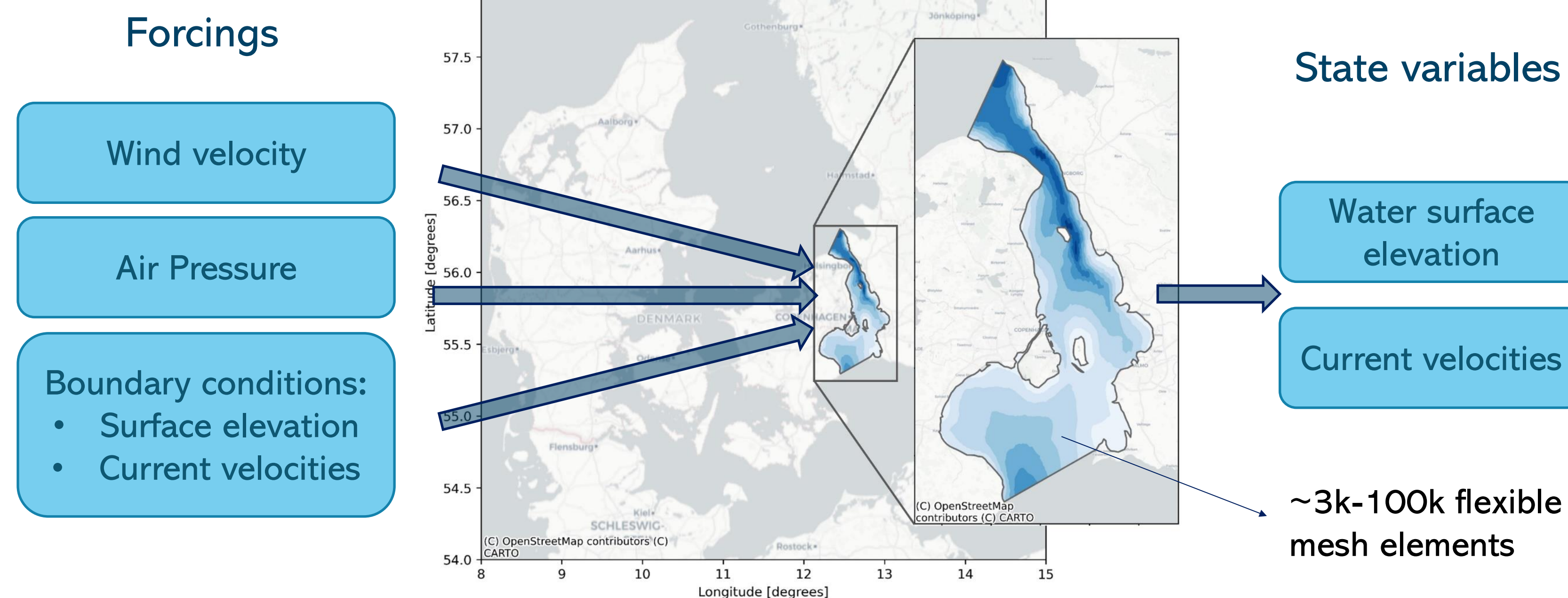
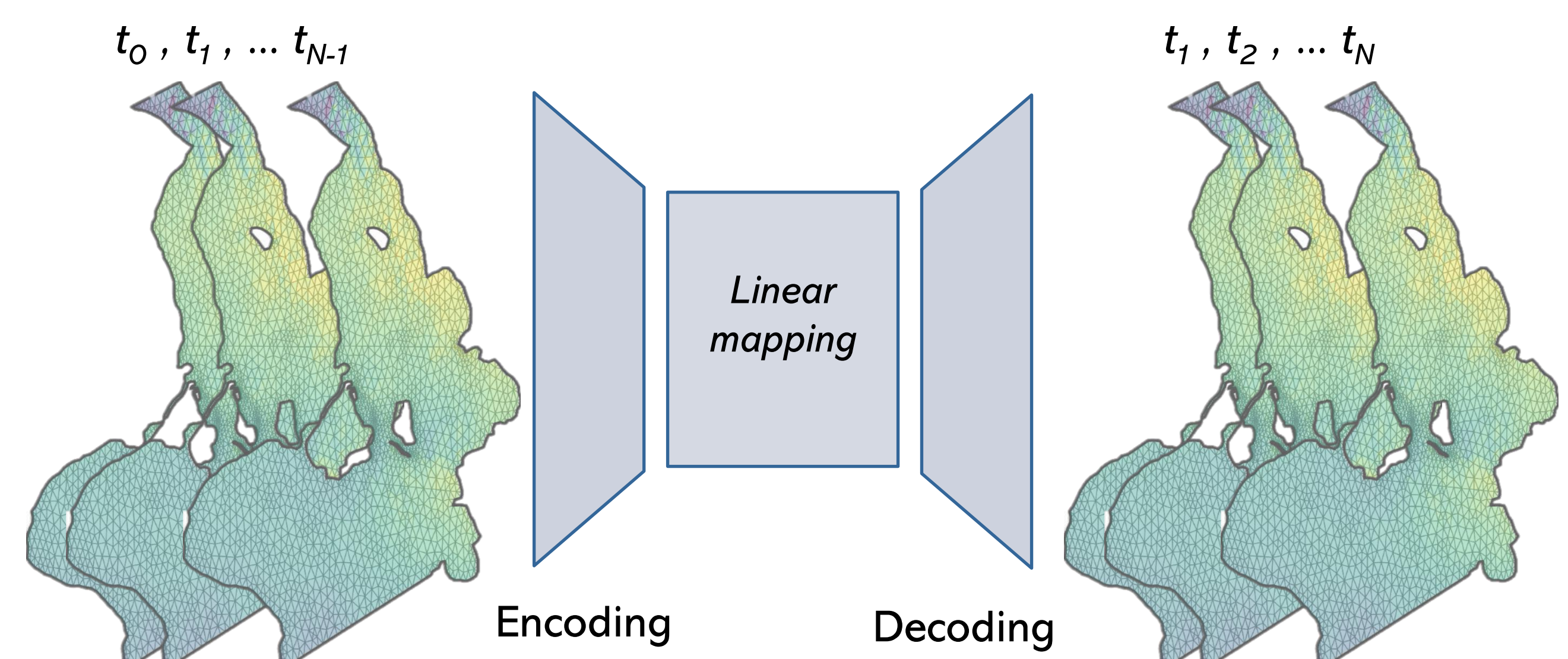


Forced physics-based model MIKE 21 Flow Model FM

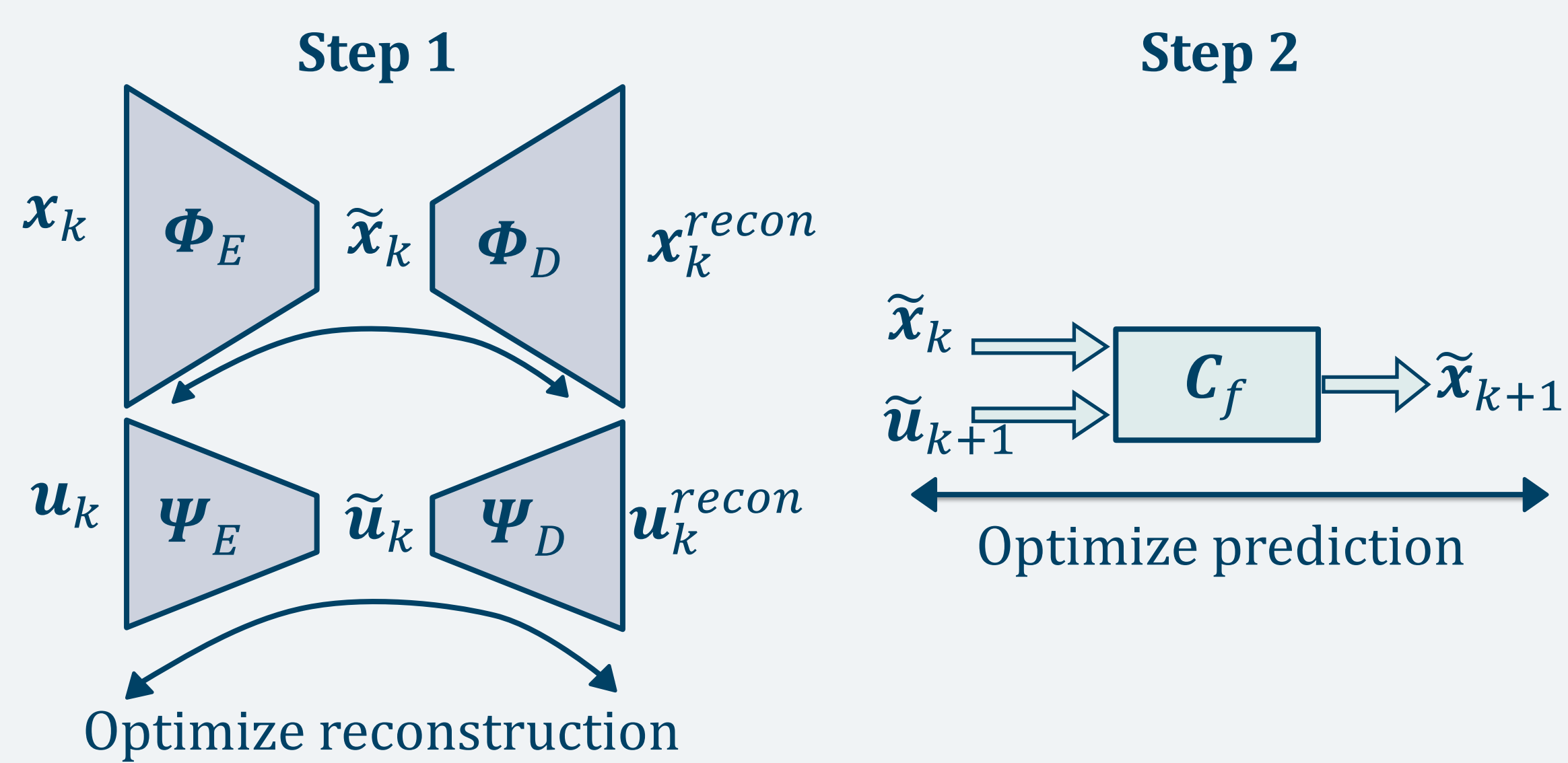


Surrogate model



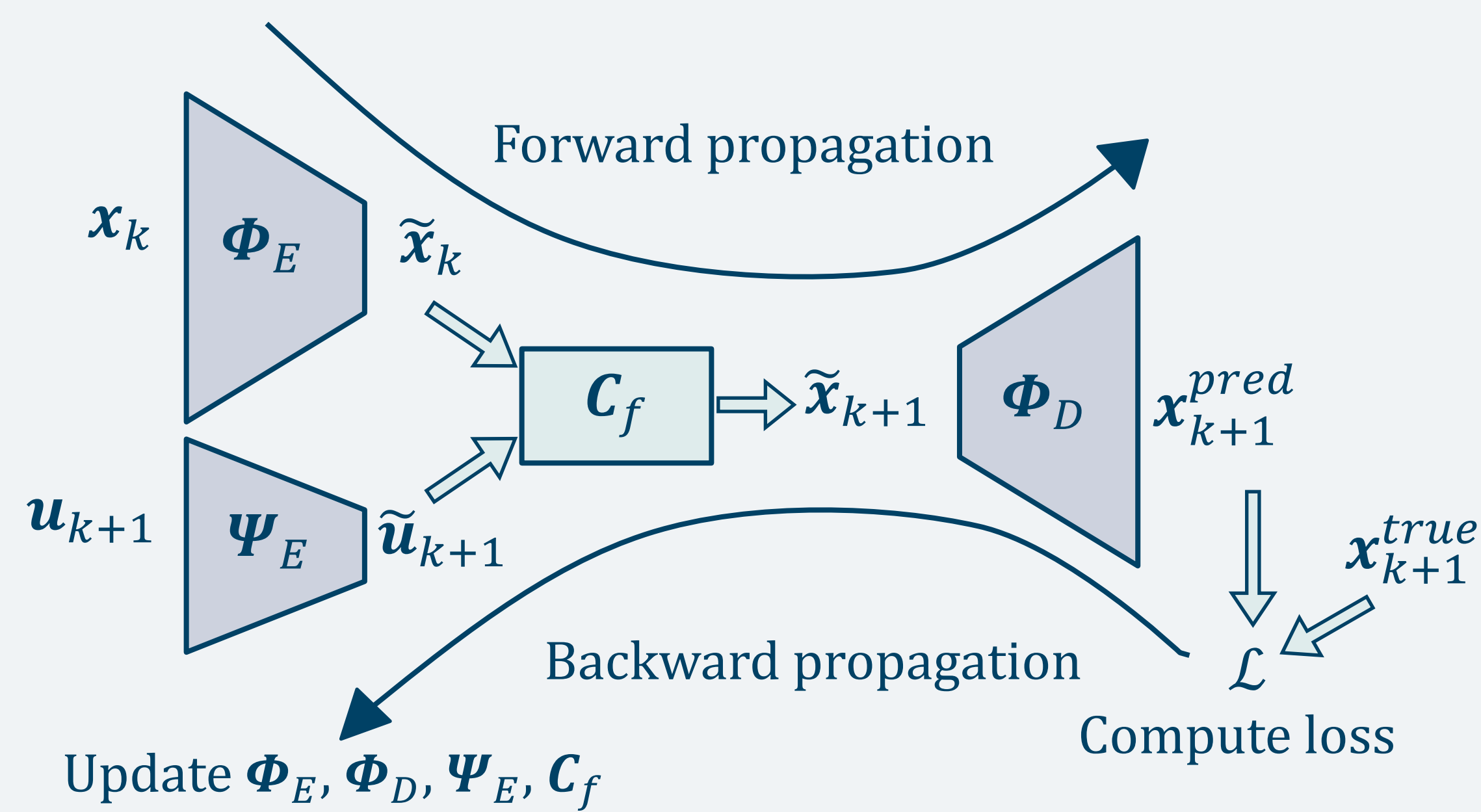
Autoencoders for spatio-temporal modeling

Proper orthogonal decomposition with linear regression (PODLR)



- Non-differentiable autoencoder, differentiable training of LR
- Fast, but sometimes unstable

Koopman Autoencoder



- End-to-end differentiable training
- Slower training, but more stable

Temporal stability

Impose stability properties during training.

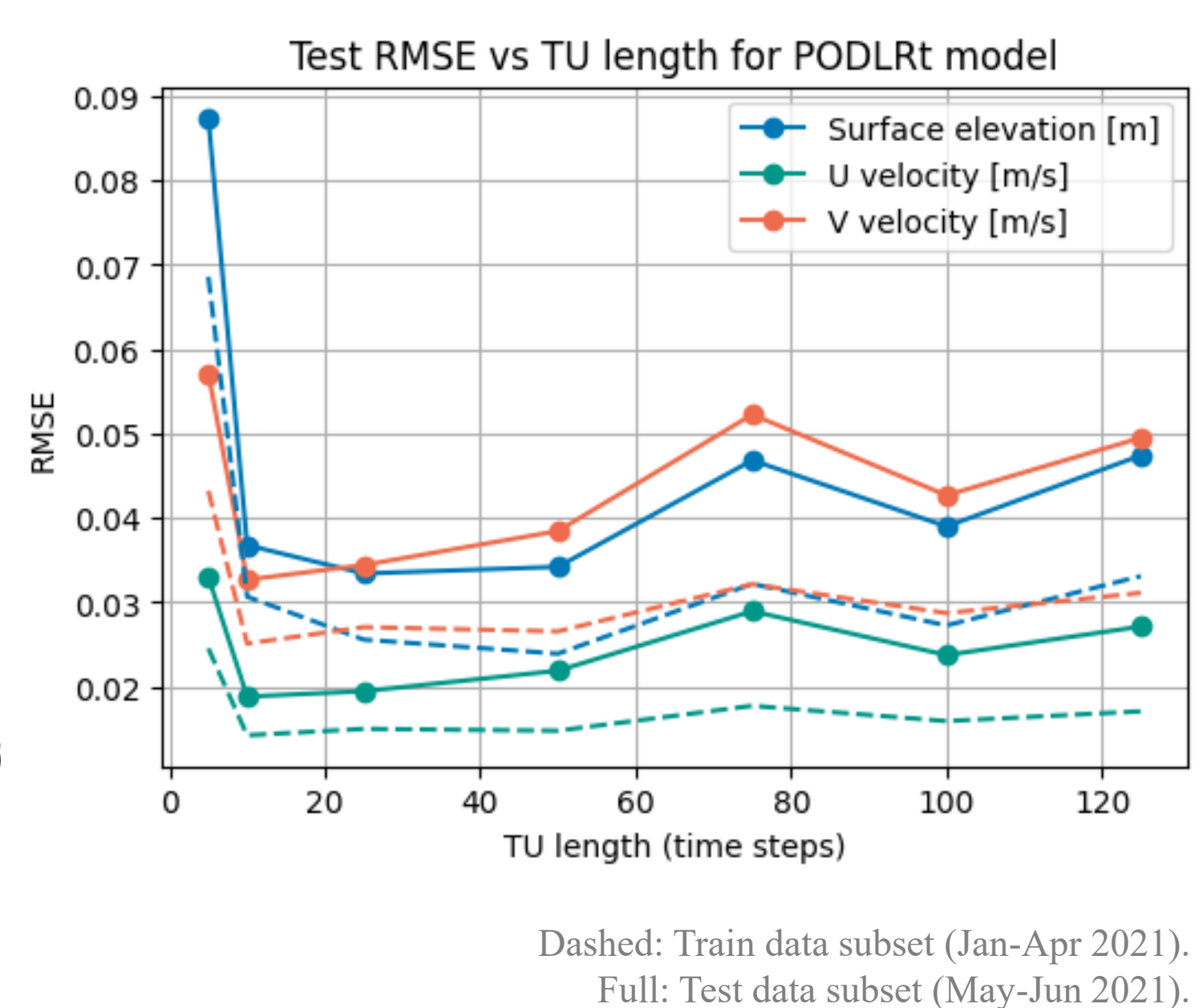
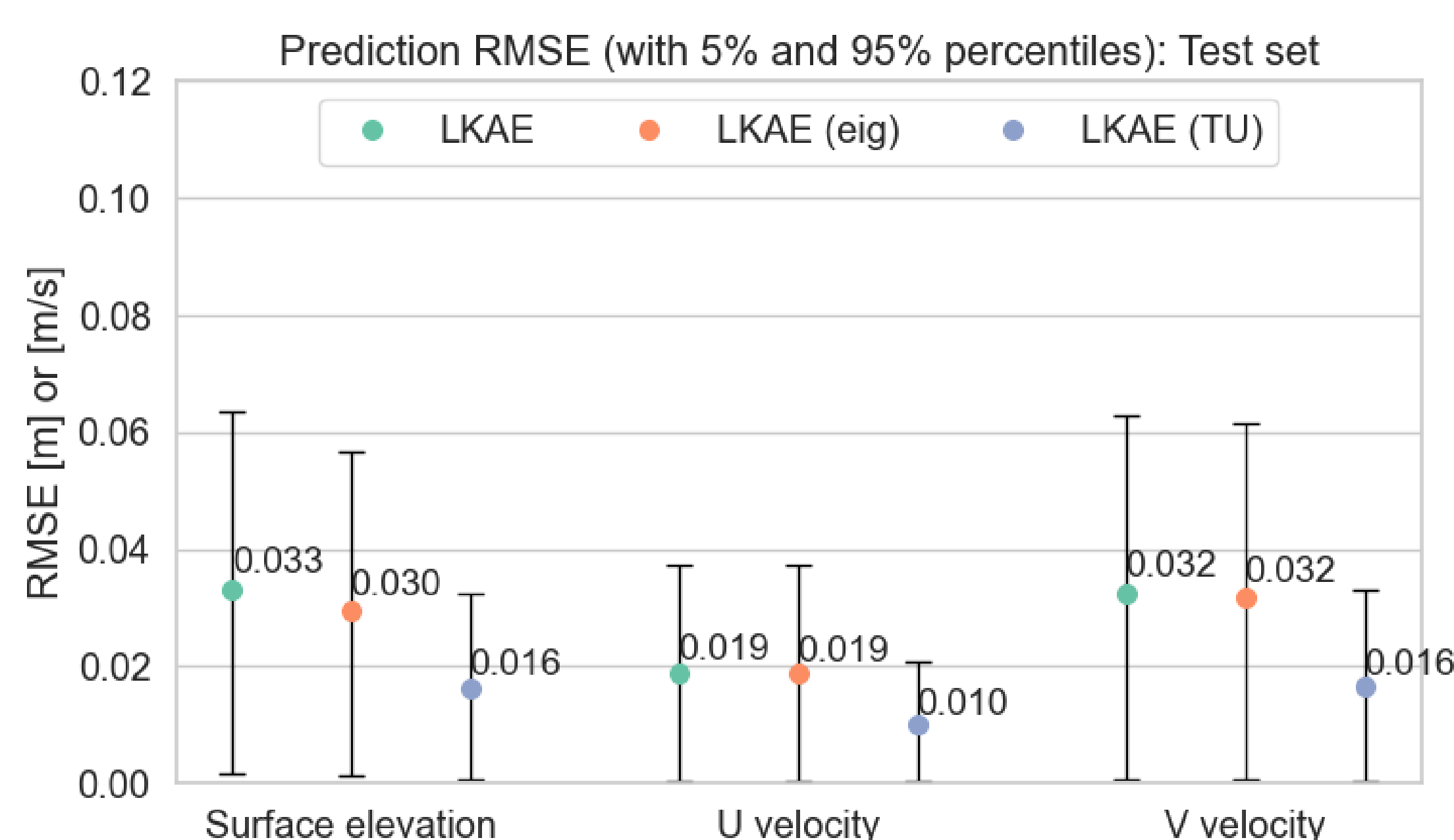
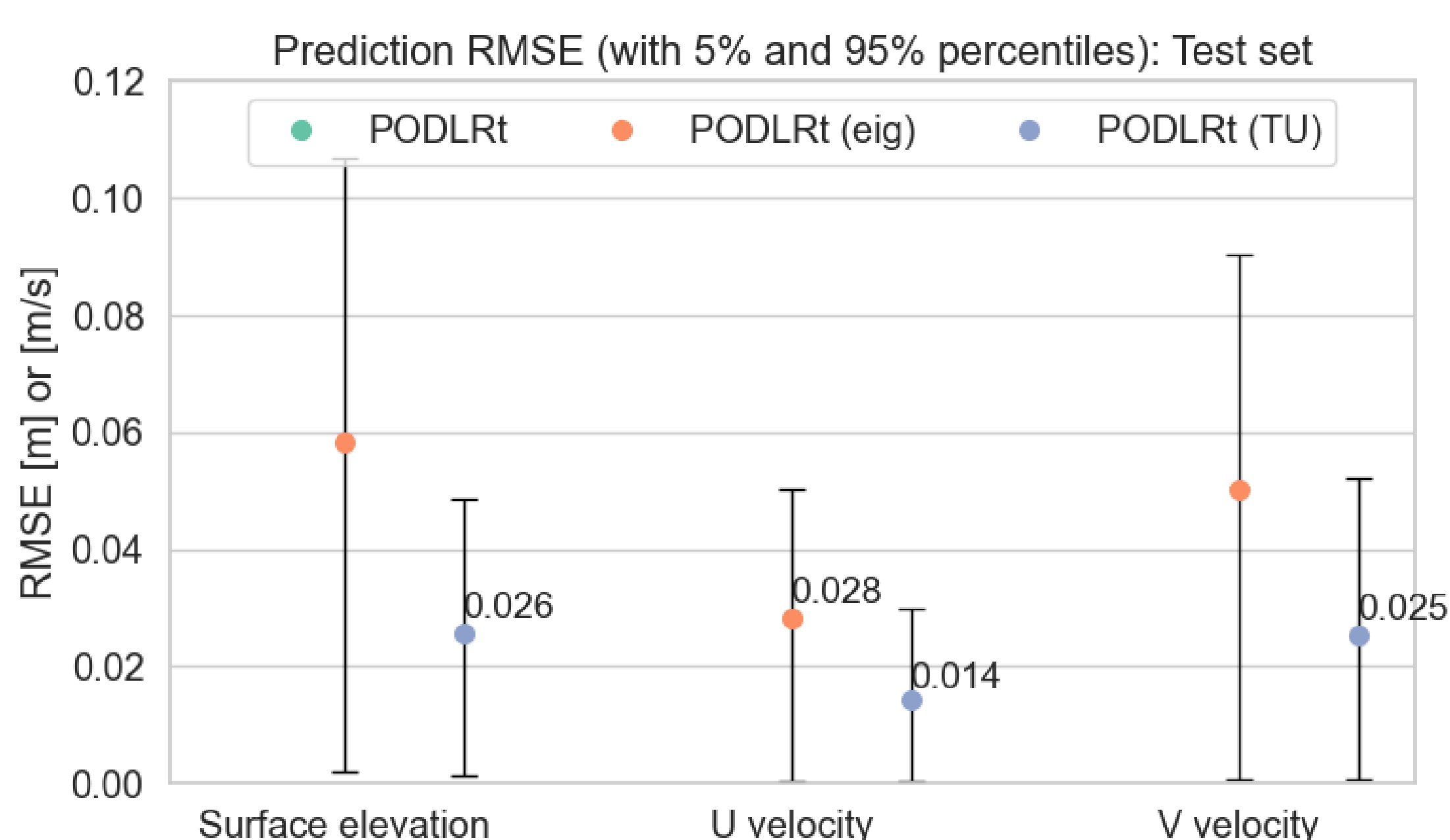
Approach 1:
Eigenvalue regularization:

$$\lambda(C_f) < 1$$

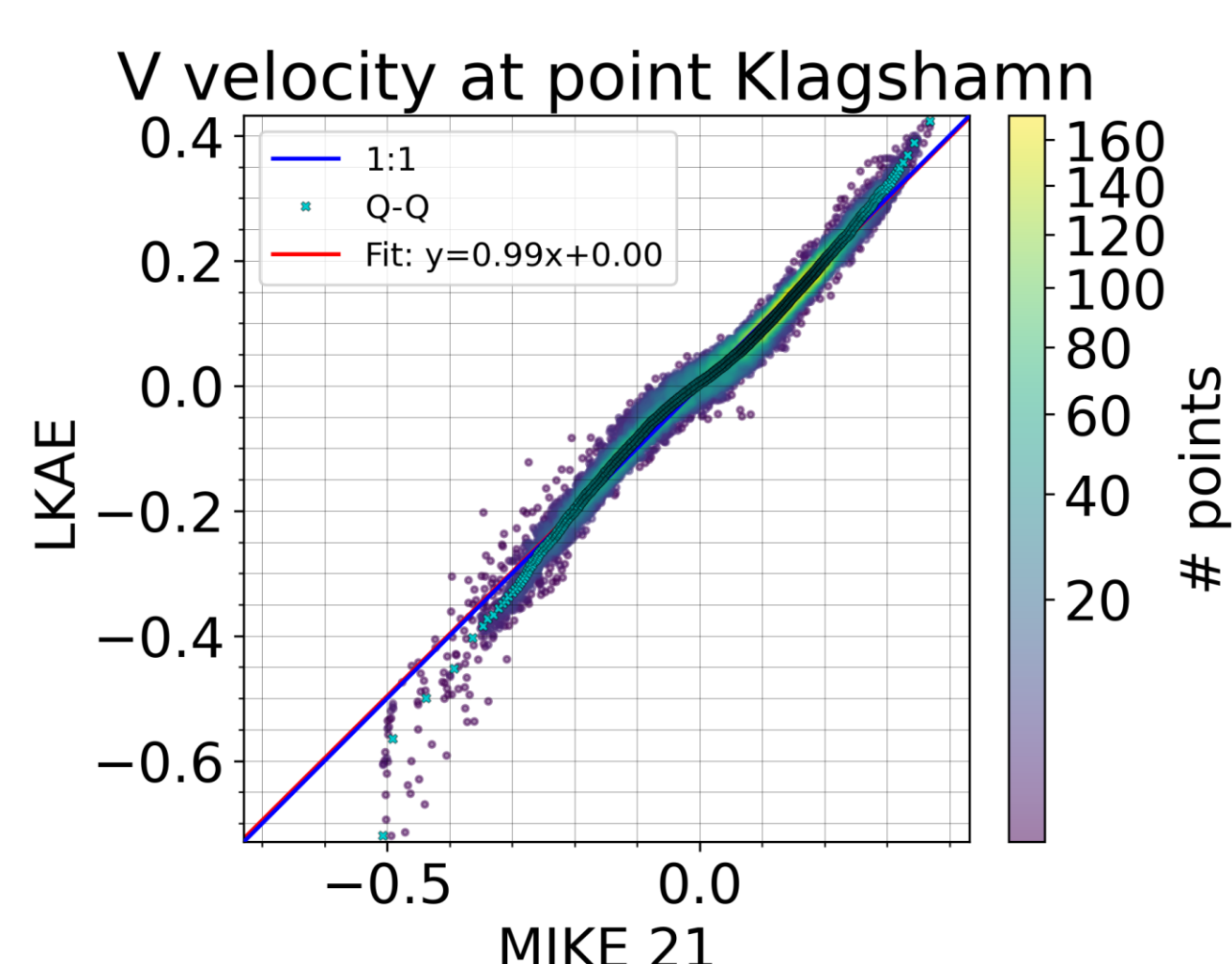
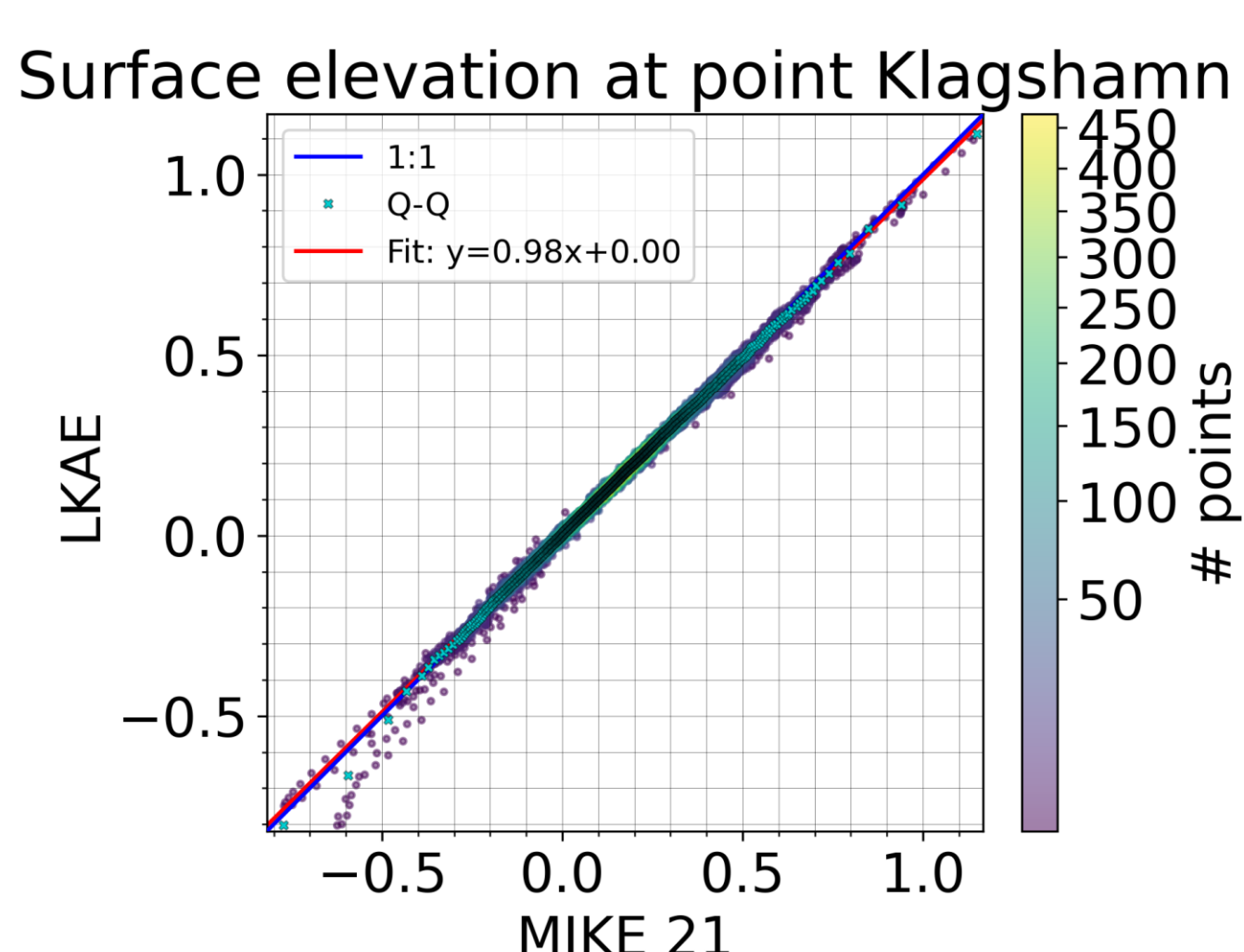
Approach 2:
Temporal unrolling:

$$\mathcal{L} = \sum_{i=1}^S \mathcal{L}(x_{i+s}, \mathcal{N}^s(x_i))$$

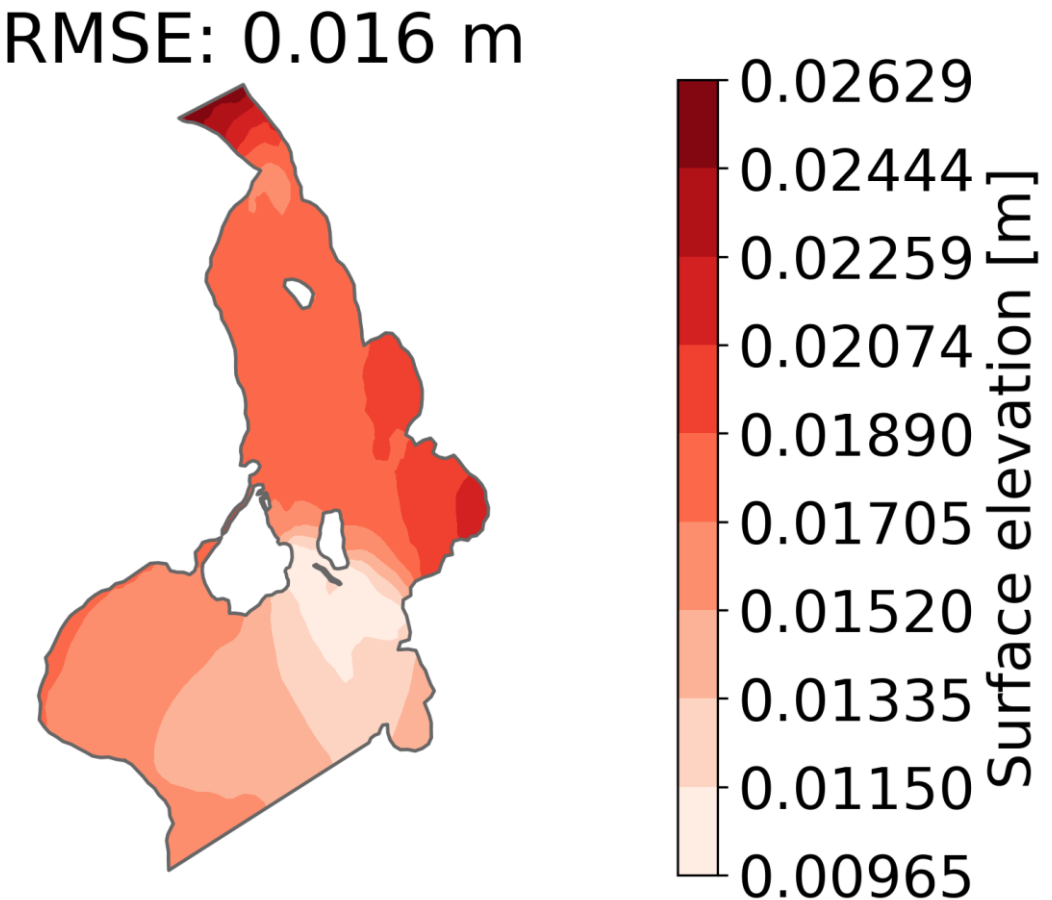
Results



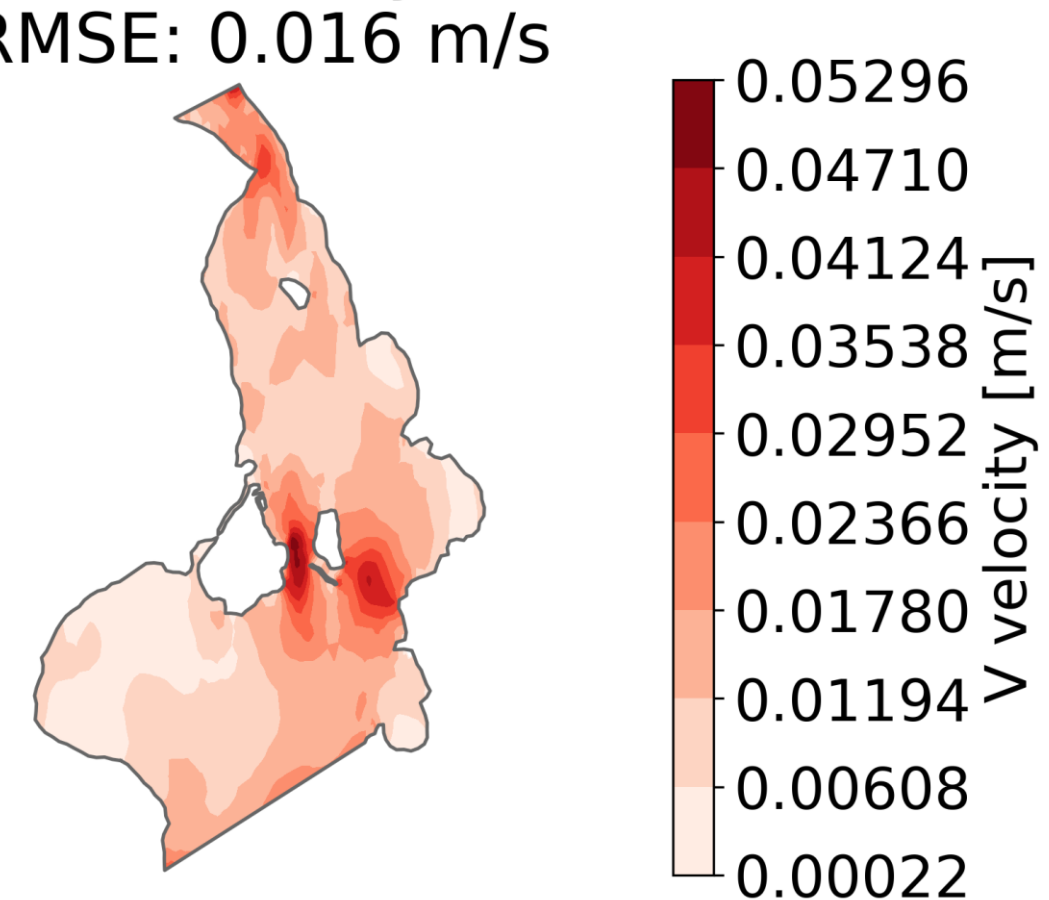
Further results for LKAE TU



Surface elevation
RMSE: 0.016 m



V velocity
RMSE: 0.016 m/s



Contact

