Towards Deep Learning Models for Global Sea Level Prediction


Martin

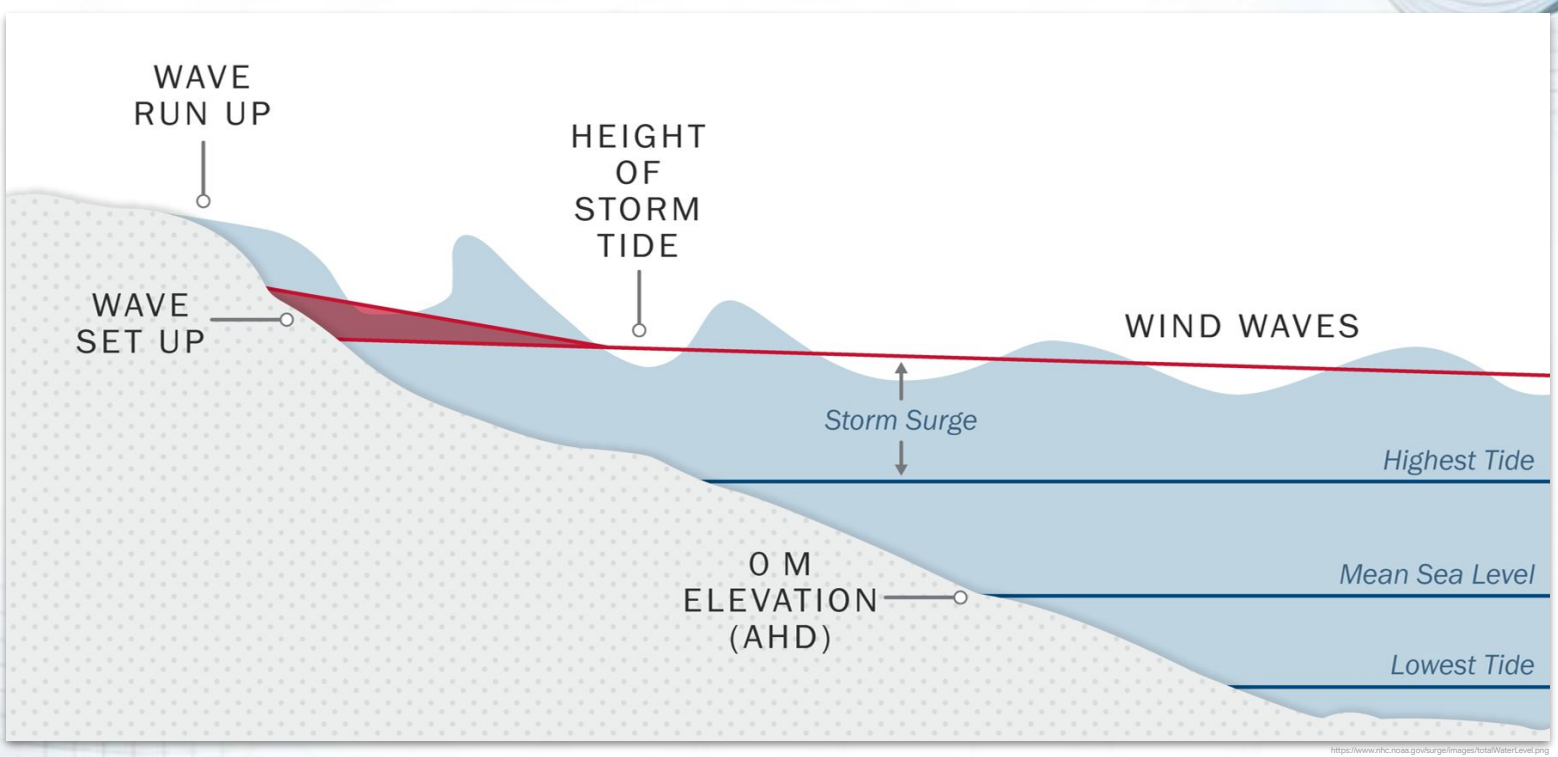

Patrick


Amitay

Google

Introduction

Sea level 101



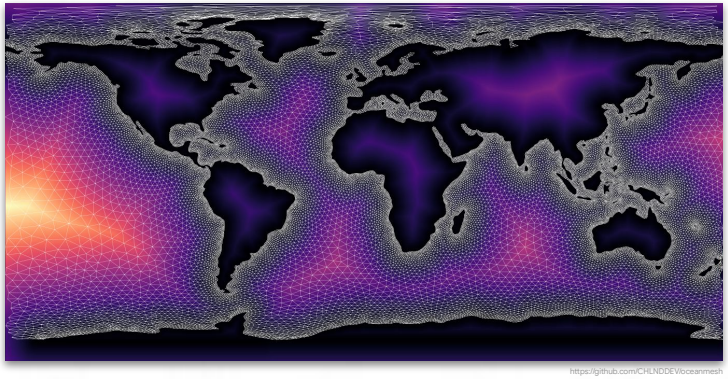
Hydrodynamic modeling

gravitational forces

bathymetry

sea level pressure

wind u/v



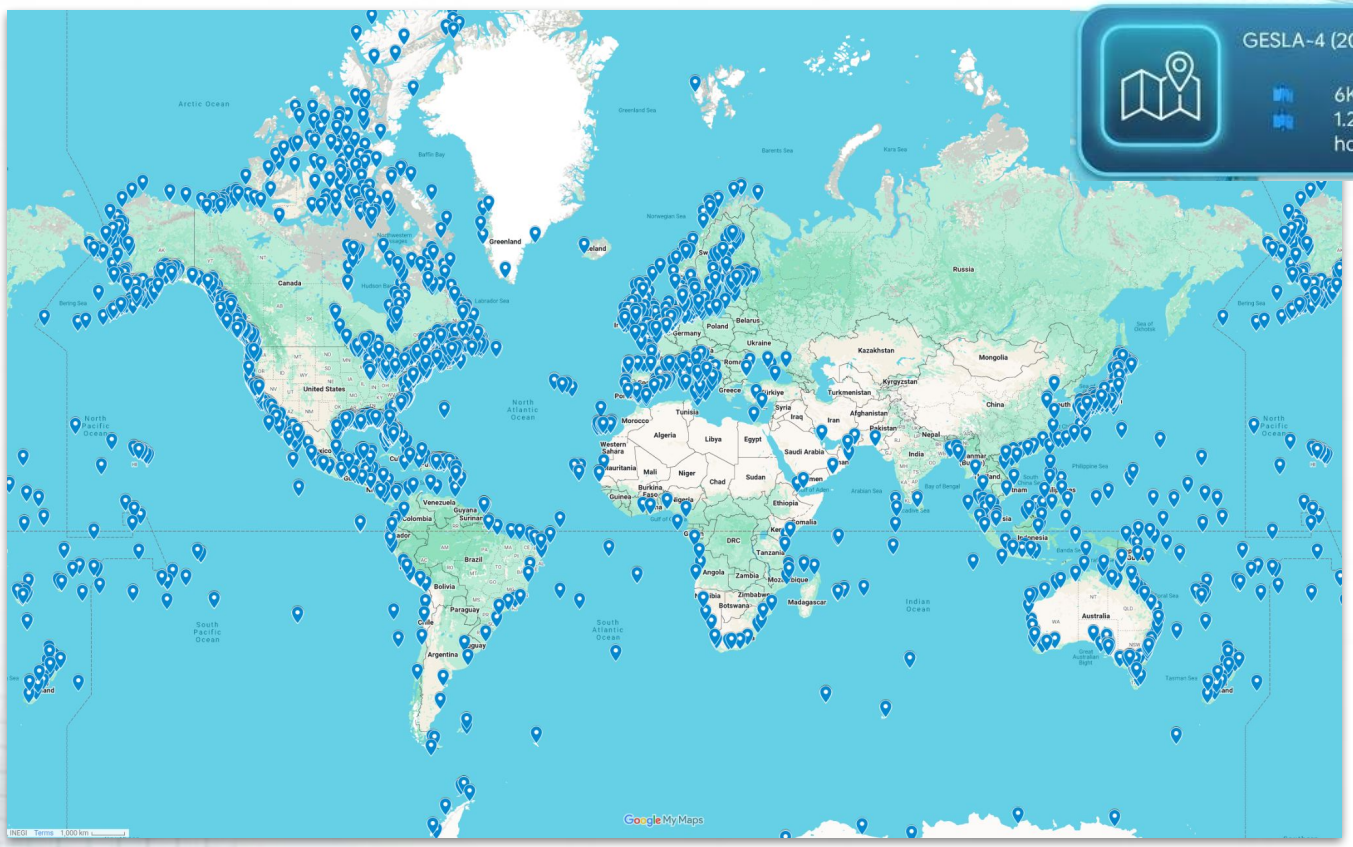
total sea level

tide

surge

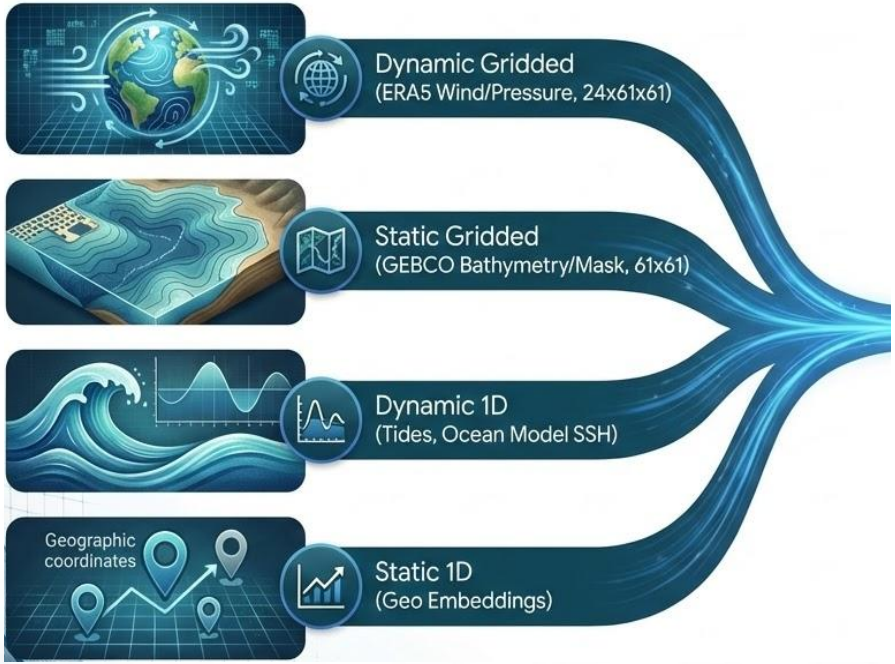
Hydrodynamic modeling → **Deep Learning**

Gauge measurements: GESLA



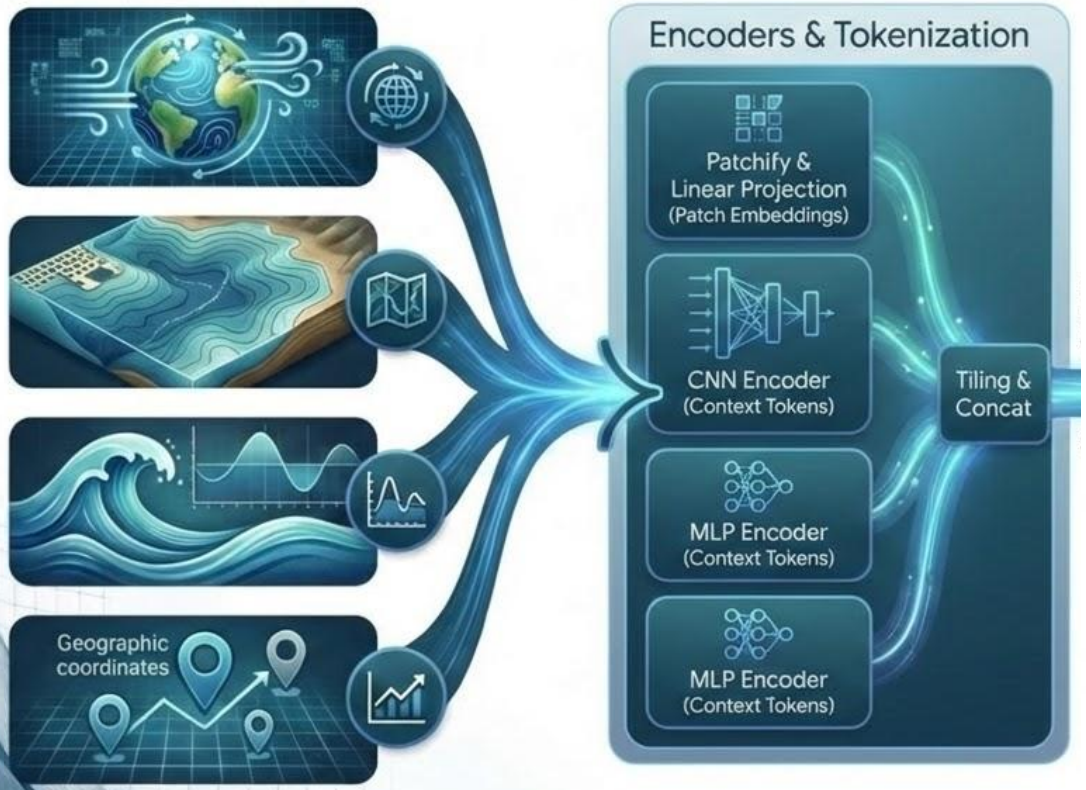
Hydrodynamic Modeling with Deep Learning

Hydrodynamic modeling with deep learning



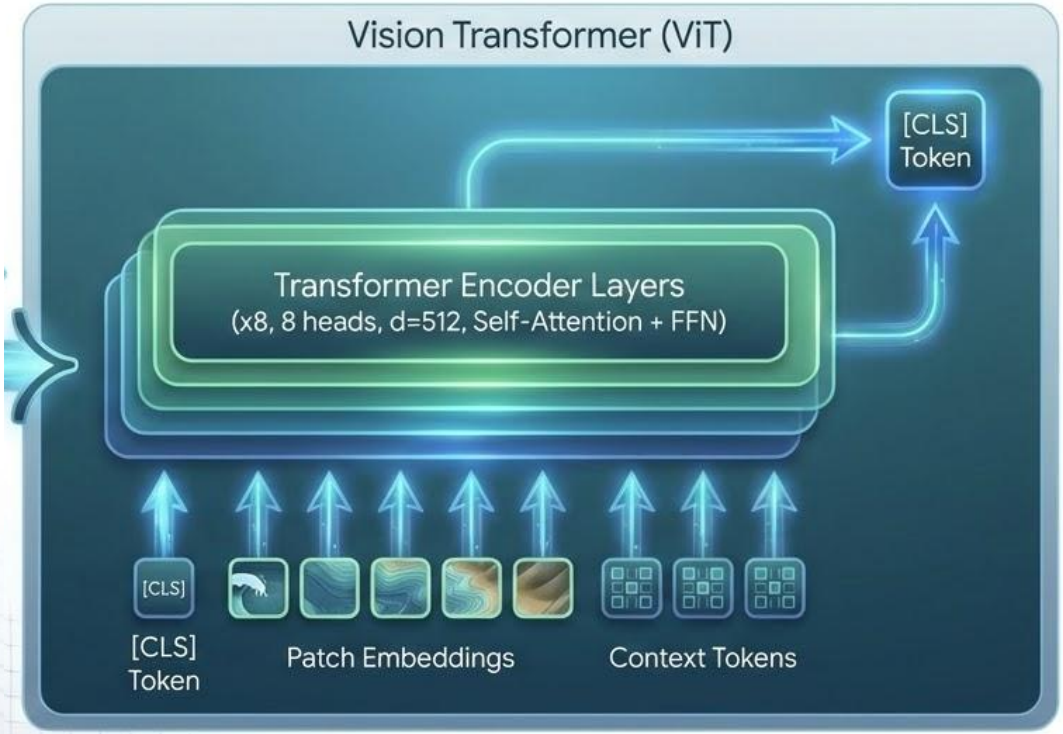
Inputs

Hydrodynamic modeling with deep learning



Encoding

Hydrodynamic modeling with deep learning



Unified Model

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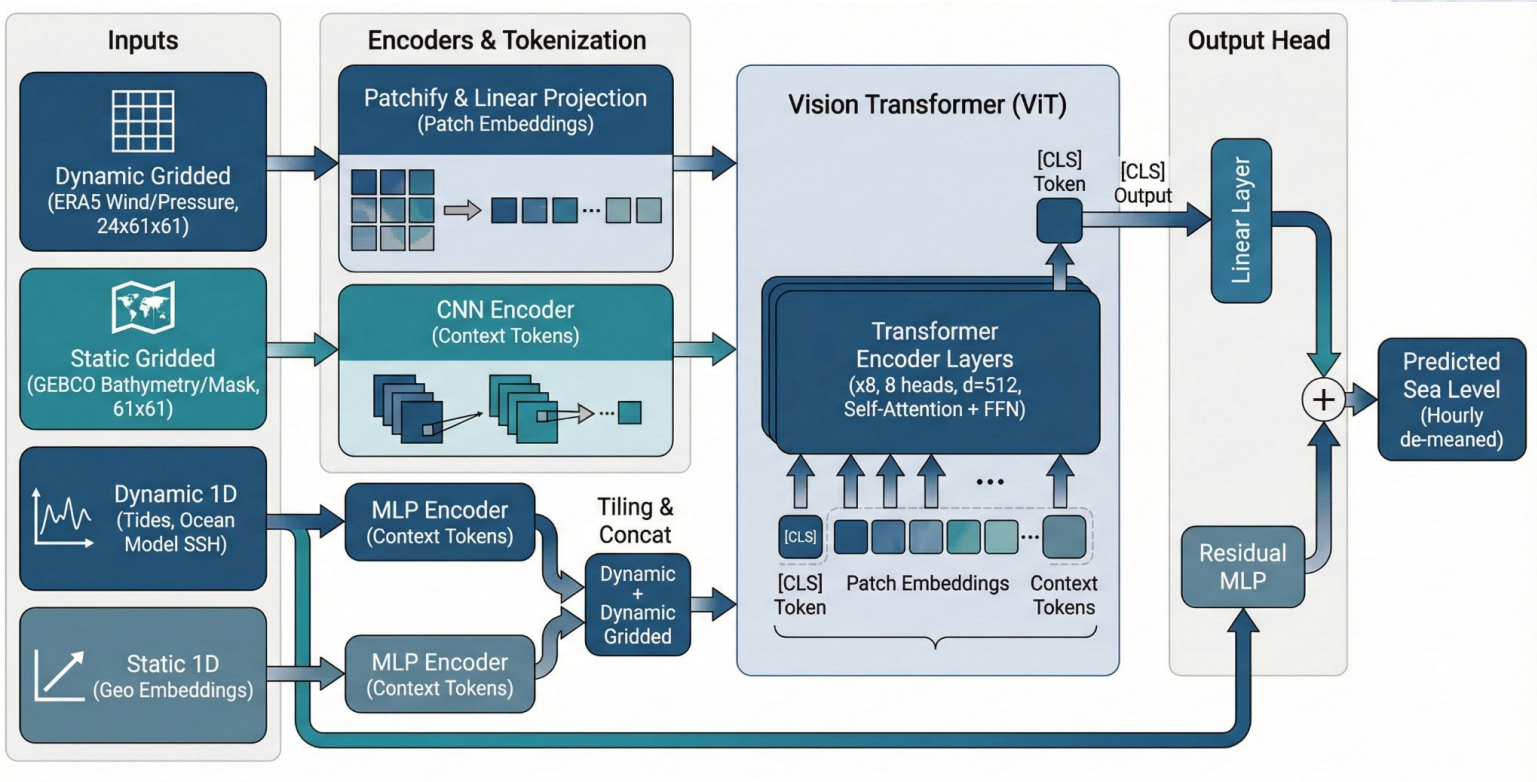
Hydrodynamic modeling with deep learning



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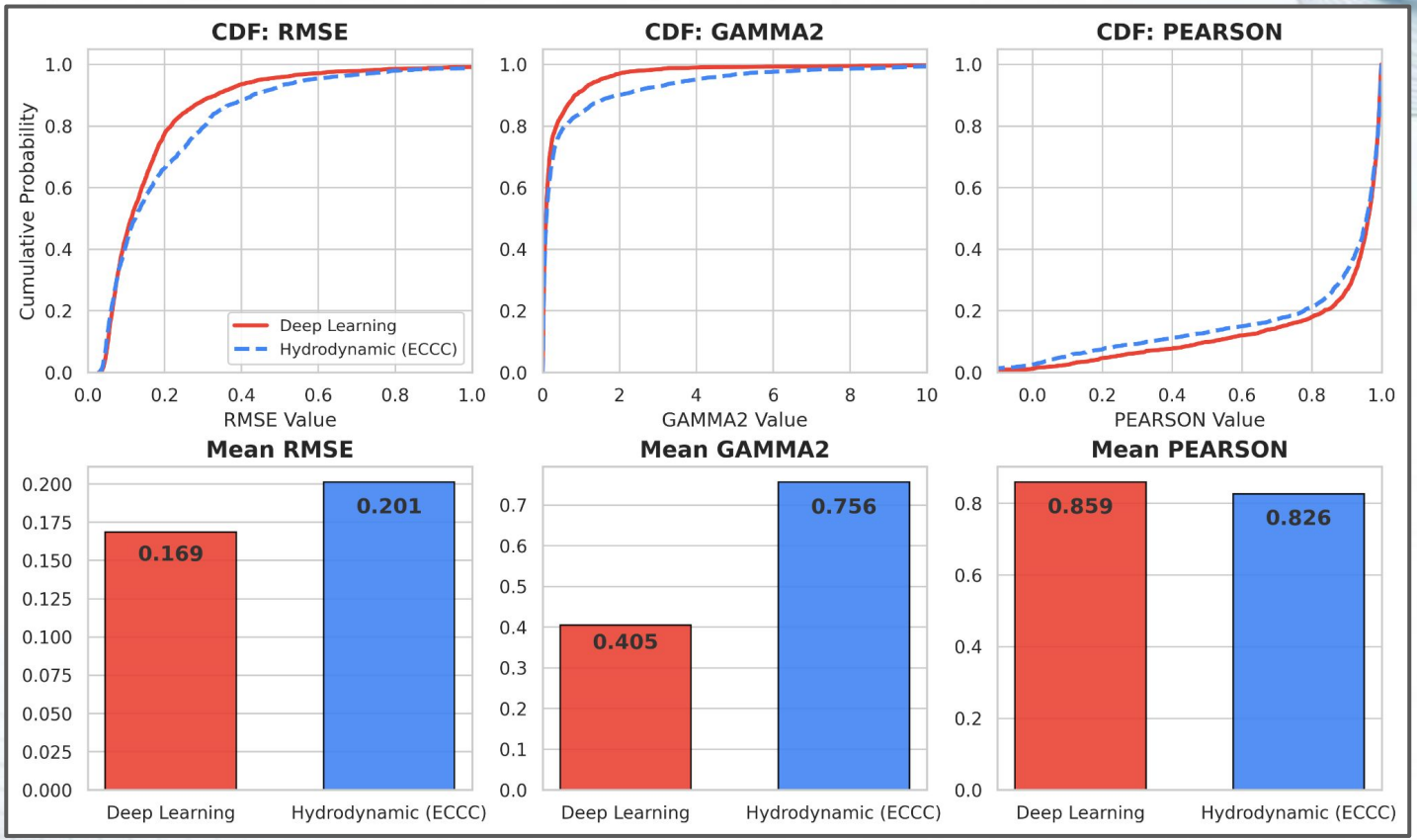
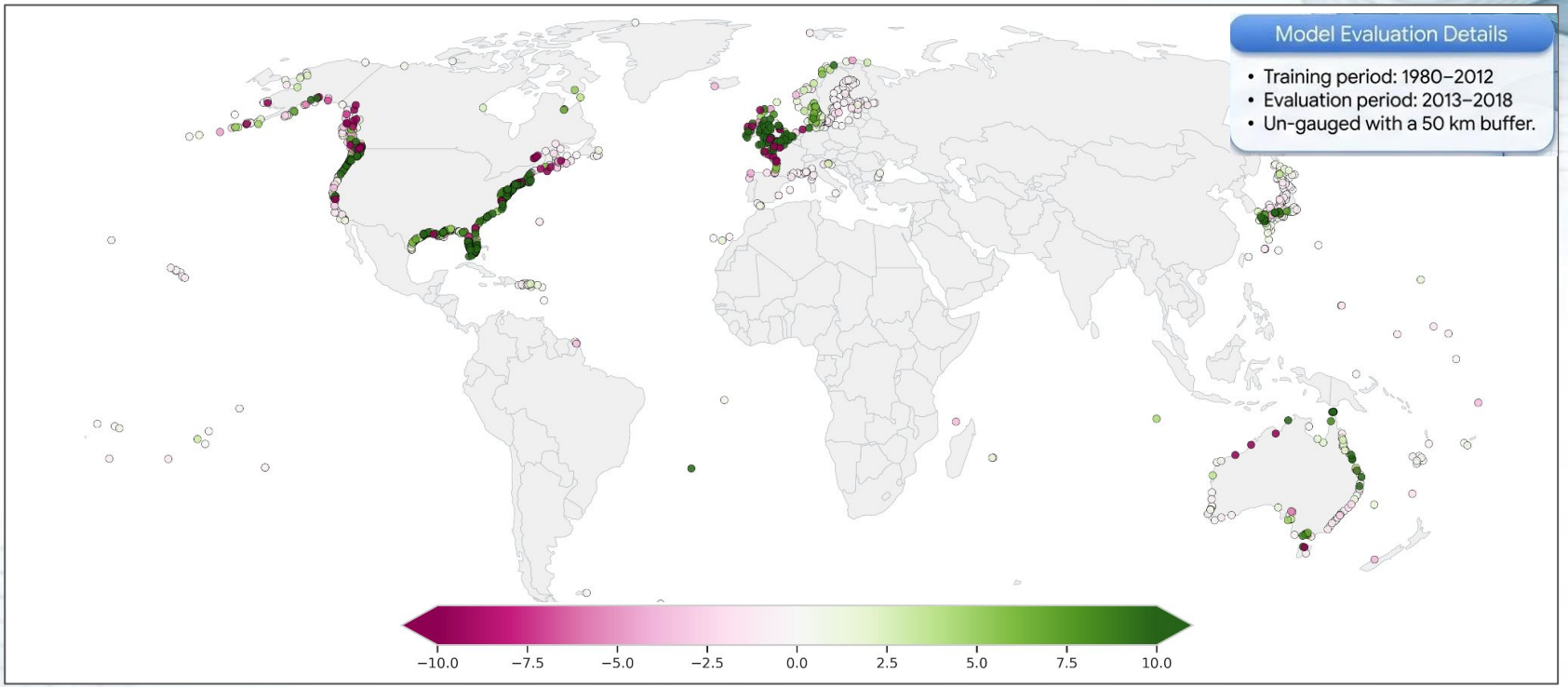
Results


CDF: RMSE
CDF: GAMMA2
CDF: PEARSON
Cumulative Probability
Deep Learning
Hydrodynamic (ECCC)
RMSE Value
GAMMA2 Value
PEARSON Value
Mean RMSE
Mean GAMMA2
Mean PEARSON
0.169
0.201
0.405
0.756
0.859
0.826
Deep Learning
Hydrodynamic (ECCC)

Δ RMSE (ECCC - Deep learning)



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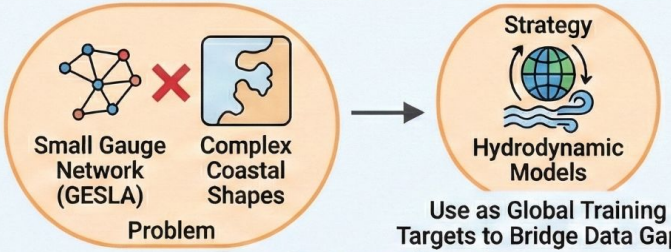
Open Question / Challenges

Open Question / Challenges

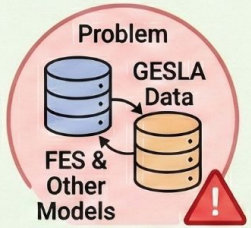
1. Data Scarcity & Overfitting



Use as Global Training Targets to Bridge Data Gaps.

Generalization is difficult.

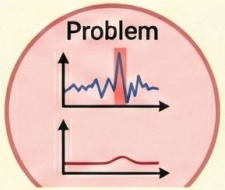
2. "Ungauged" Generalization & Data Contamination



Models already assimilate GESLA data.

Evaluate to Ensure Real-World Generalization.

3. Extreme Event Evaluation



Problem
Standard Metrics (e.g., MSE) Fail to Capture Peak Timing.

Strategy
Leverage for More Robust Extreme-Case Validation.

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Thank You!

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