

Monitoring Offshore Ocean Wave Heights from Land Seismic Networks: Multi-Location ANN Estimations and Insights from Microseism Wavefield Simulations

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Contents of this file

1. Figures S1 to S10

A Supplementary Materials

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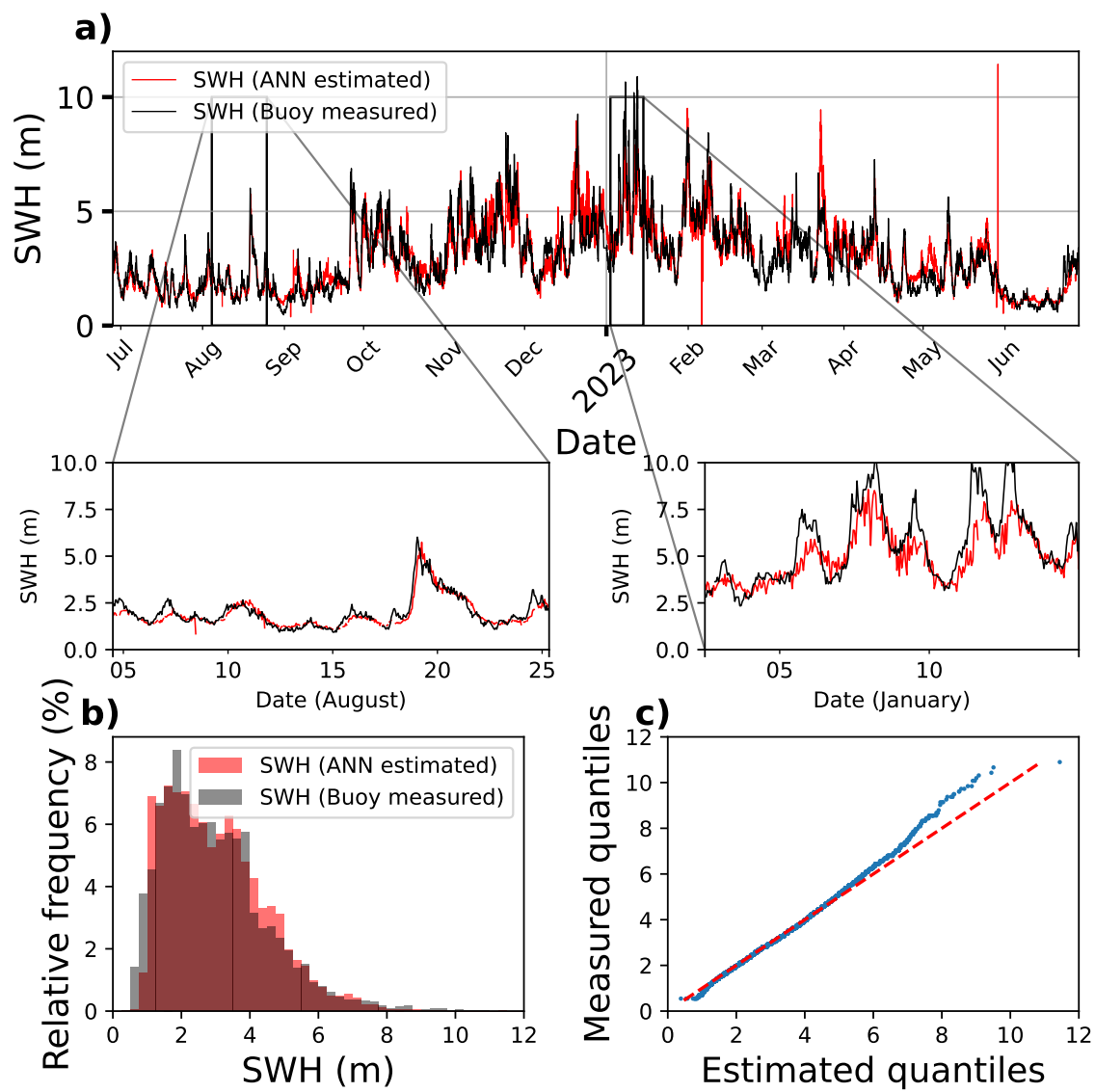


Figure S1 Examples of ANN results for M4 location. Each panel shows (a) time series of ANN-estimated and buoy measured SWH, (b) corresponding histograms, and (c) Q–Q comparison between predicted and measured values.

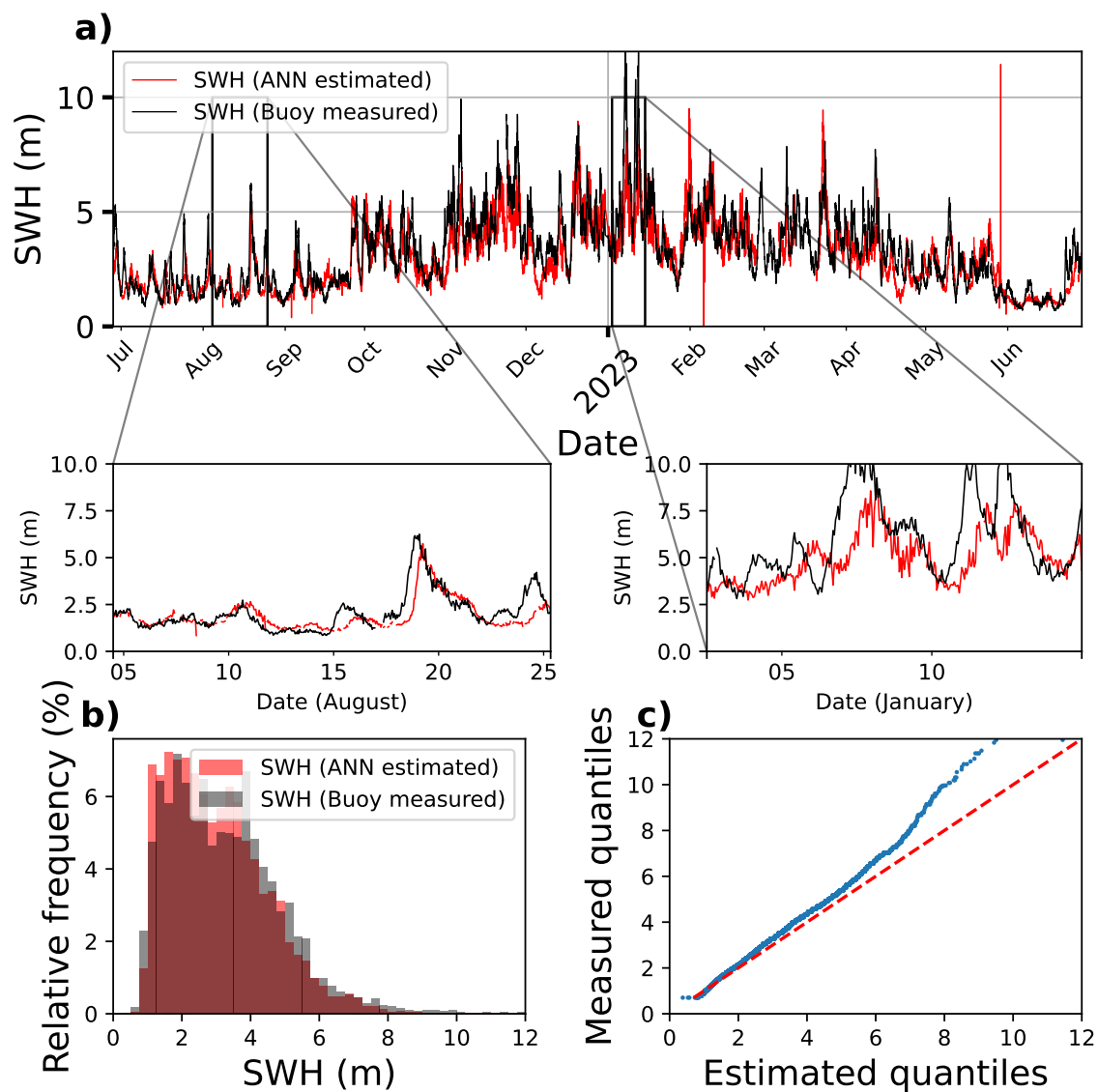


Figure S2 Examples of ANN results for M6 location. Each panel shows (a) time series of ANN-estimated and buoy measured SWH, (b) corresponding histograms, and (c) Q–Q comparison between predicted and measured values.

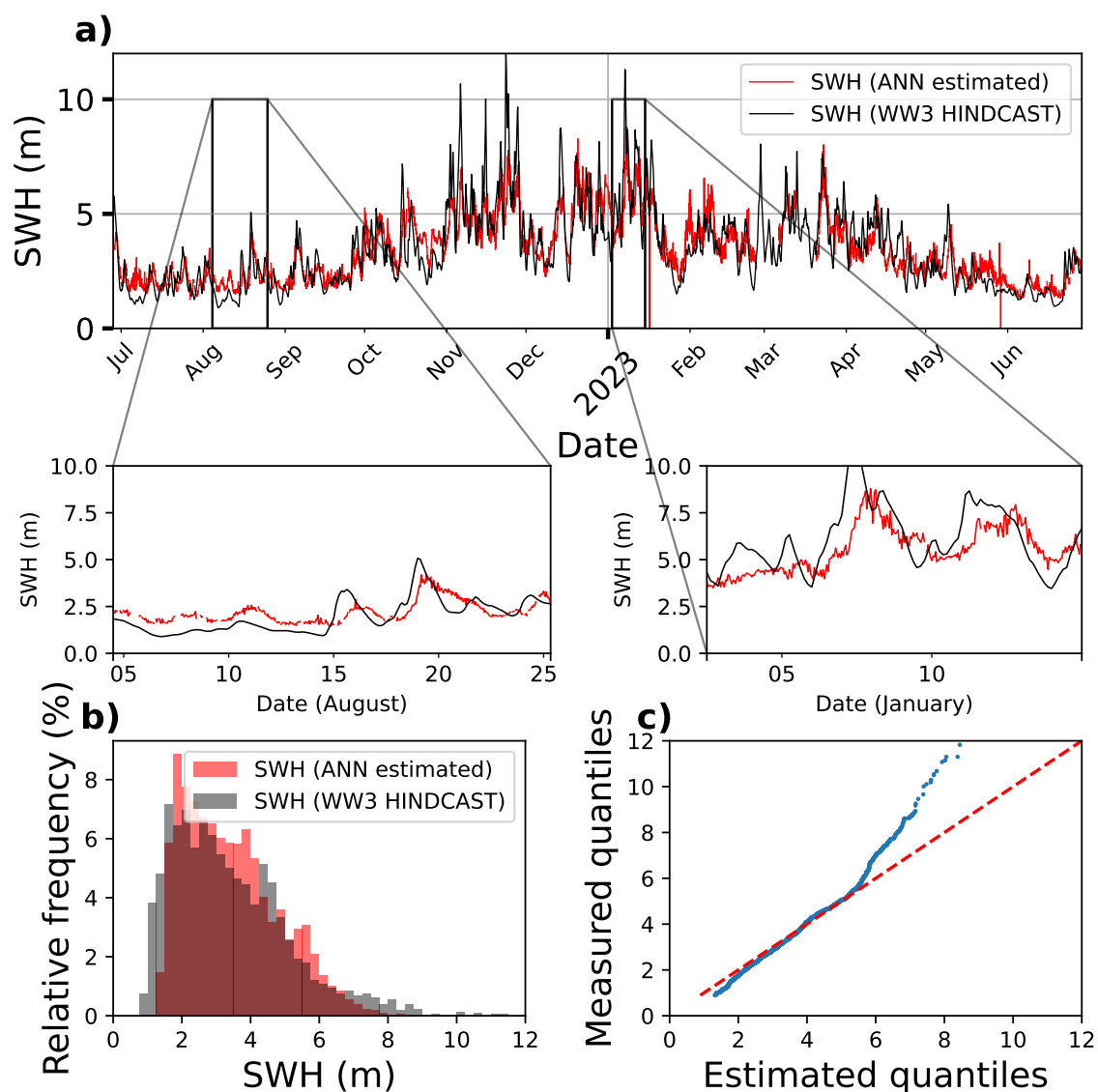


Figure S3 ANN-estimated versus modeled SWH using hindcast numerical data at Virtual Buoy location VB2. Each panel shows (a) time series of ANN-estimated and buoy measured SWH, (b) corresponding histograms, and (c) Q-Q comparison between predicted and hindcast values.

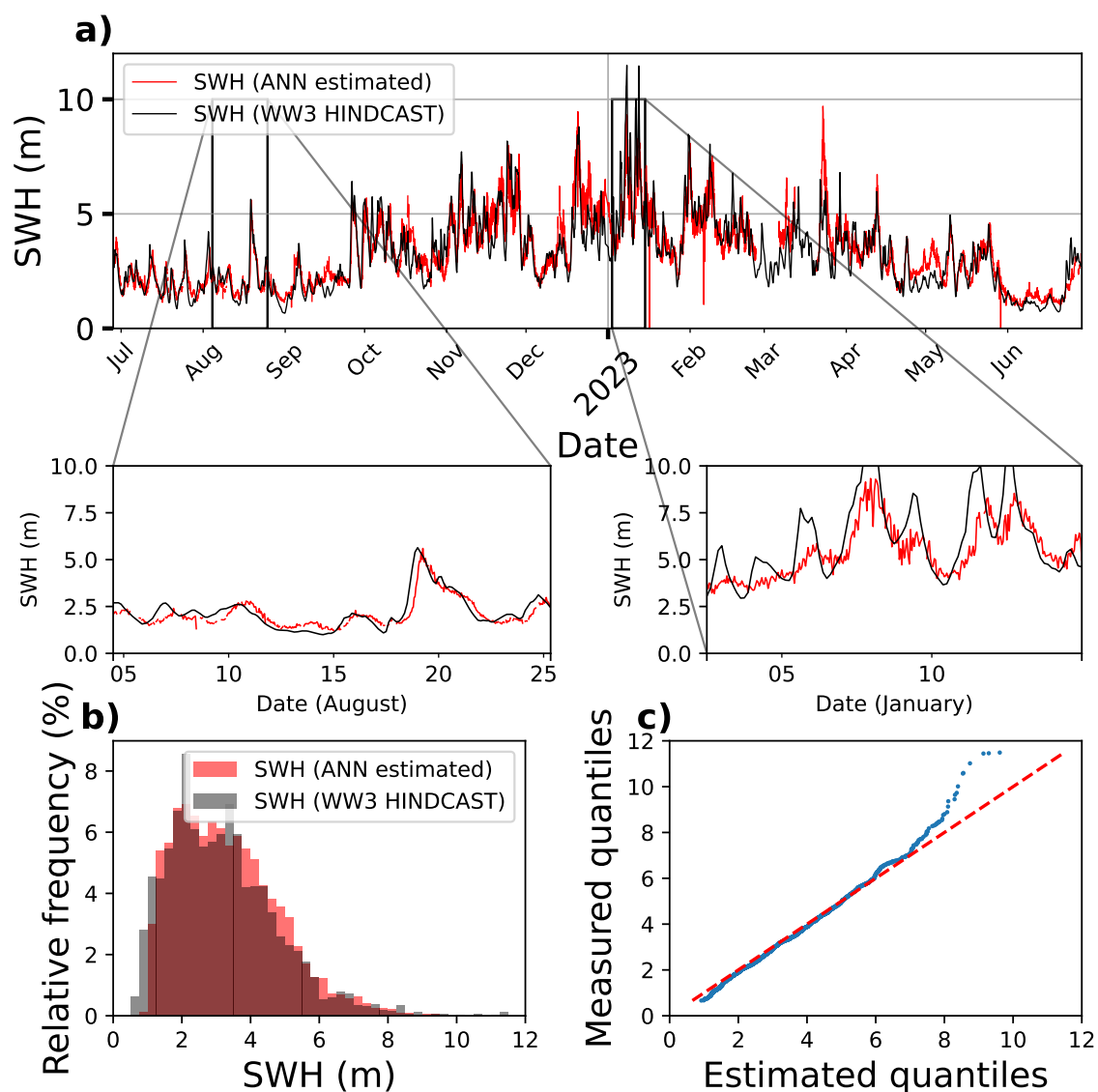


Figure S4 ANN-estimated versus modeled SWH using hindcast numerical data at Virtual Buoy location VB3. Each panel shows (a) time series of ANN-estimated and buoy measured SWH, (b) corresponding histograms, and (c) Q-Q comparison between predicted and hindcast values.

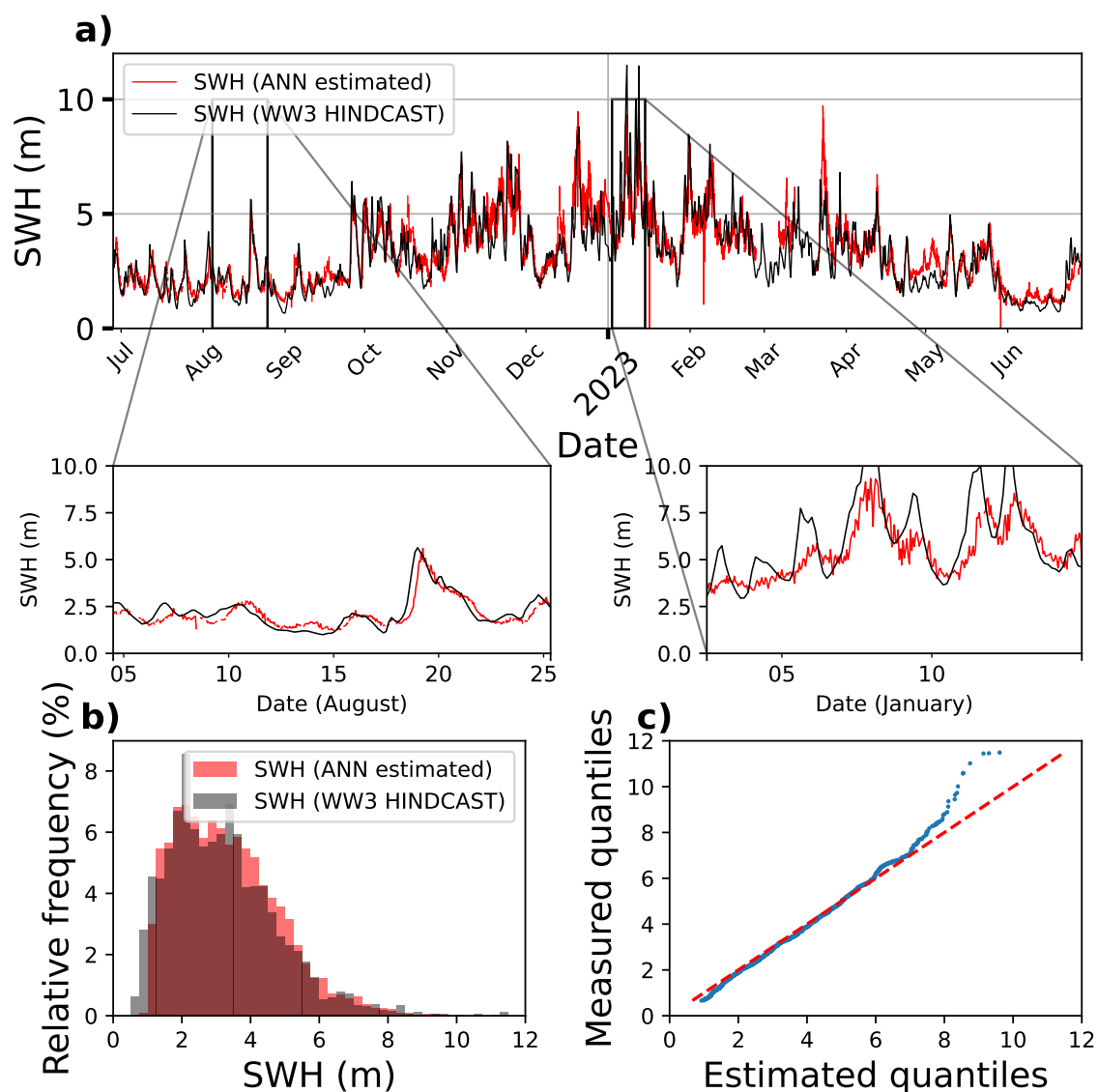


Figure S5 ANN-estimated versus modeled SWH using hindcast numerical data at Virtual Buoy location VB4. Each panel shows (a) time series of ANN-estimated and buoy measured SWH, (b) corresponding histograms, and (c) Q-Q comparison between predicted and hindcast values.

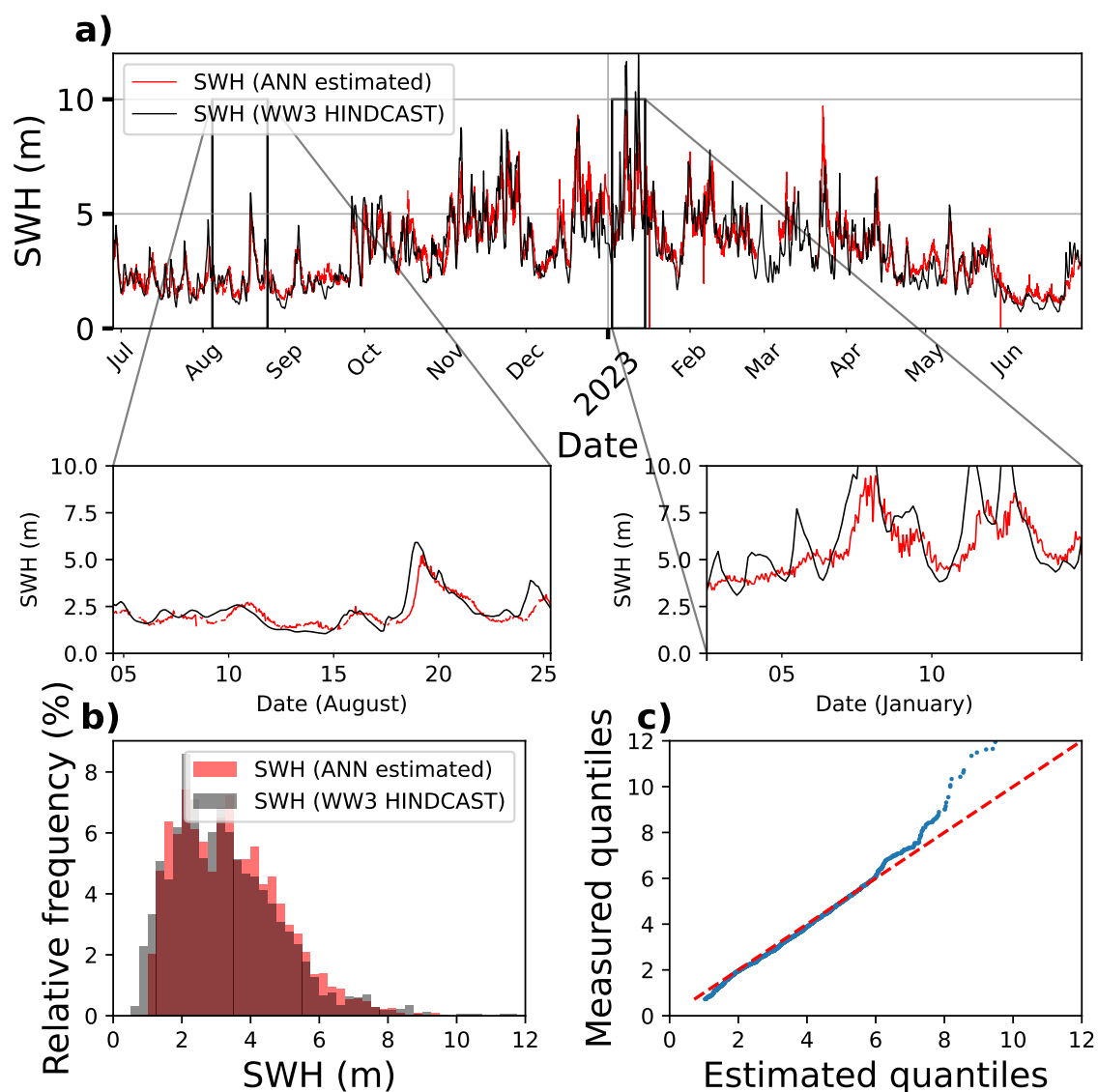


Figure S6 ANN-estimated versus modeled SWH using hindcast numerical data at Virtual Buoy location VB5. Each panel shows (a) time series of ANN-estimated and buoy measured SWH, (b) corresponding histograms, and (c) Q-Q comparison between predicted and hindcast values.

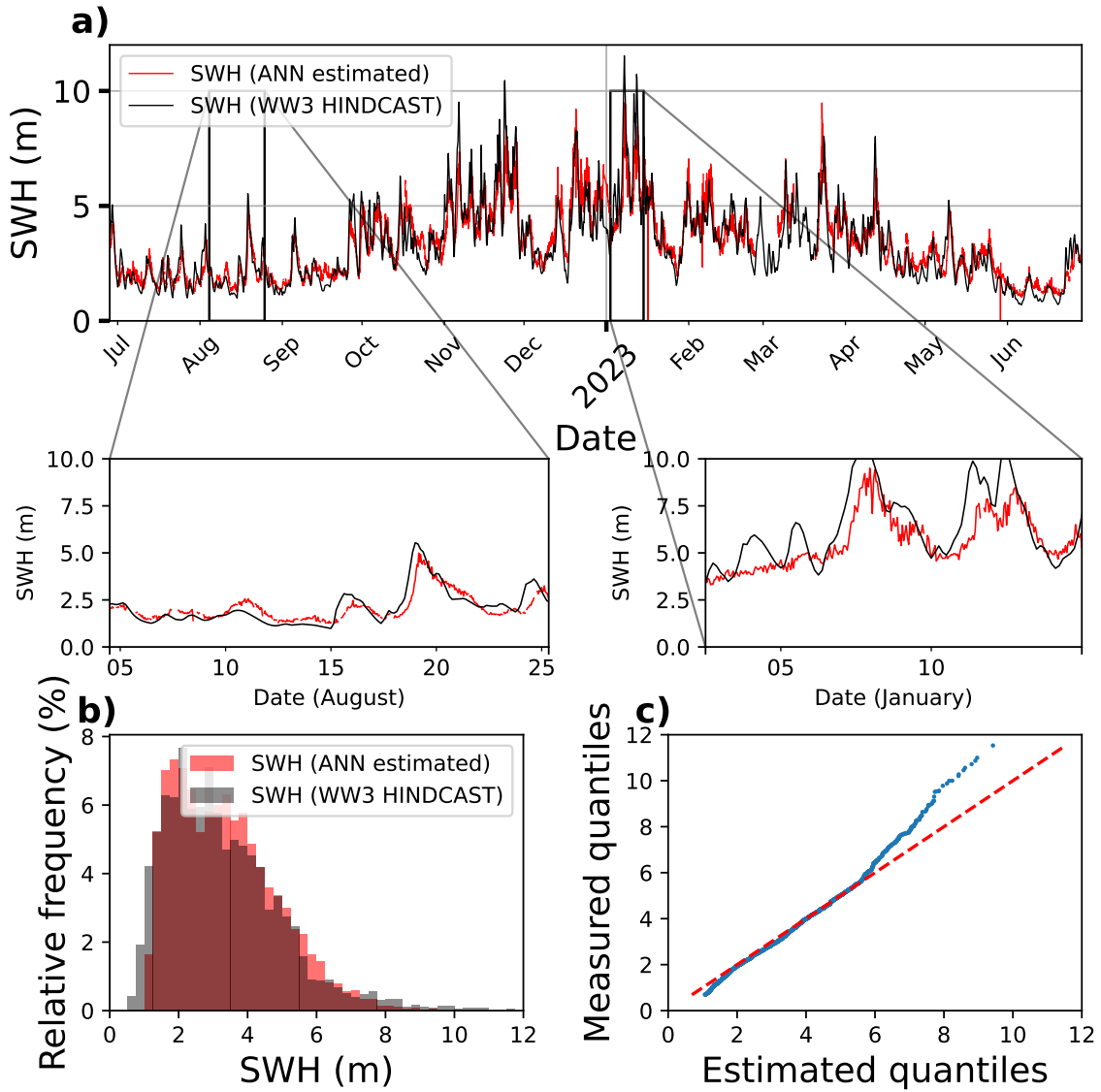


Figure S7 ANN-estimated versus modeled SWH using hindcast numerical data at Virtual Buoy location VB6. Each panel shows (a) time series of ANN-estimated and buoy measured SWH, (b) corresponding histograms, and (c) Q-Q comparison between predicted and hindcast values.

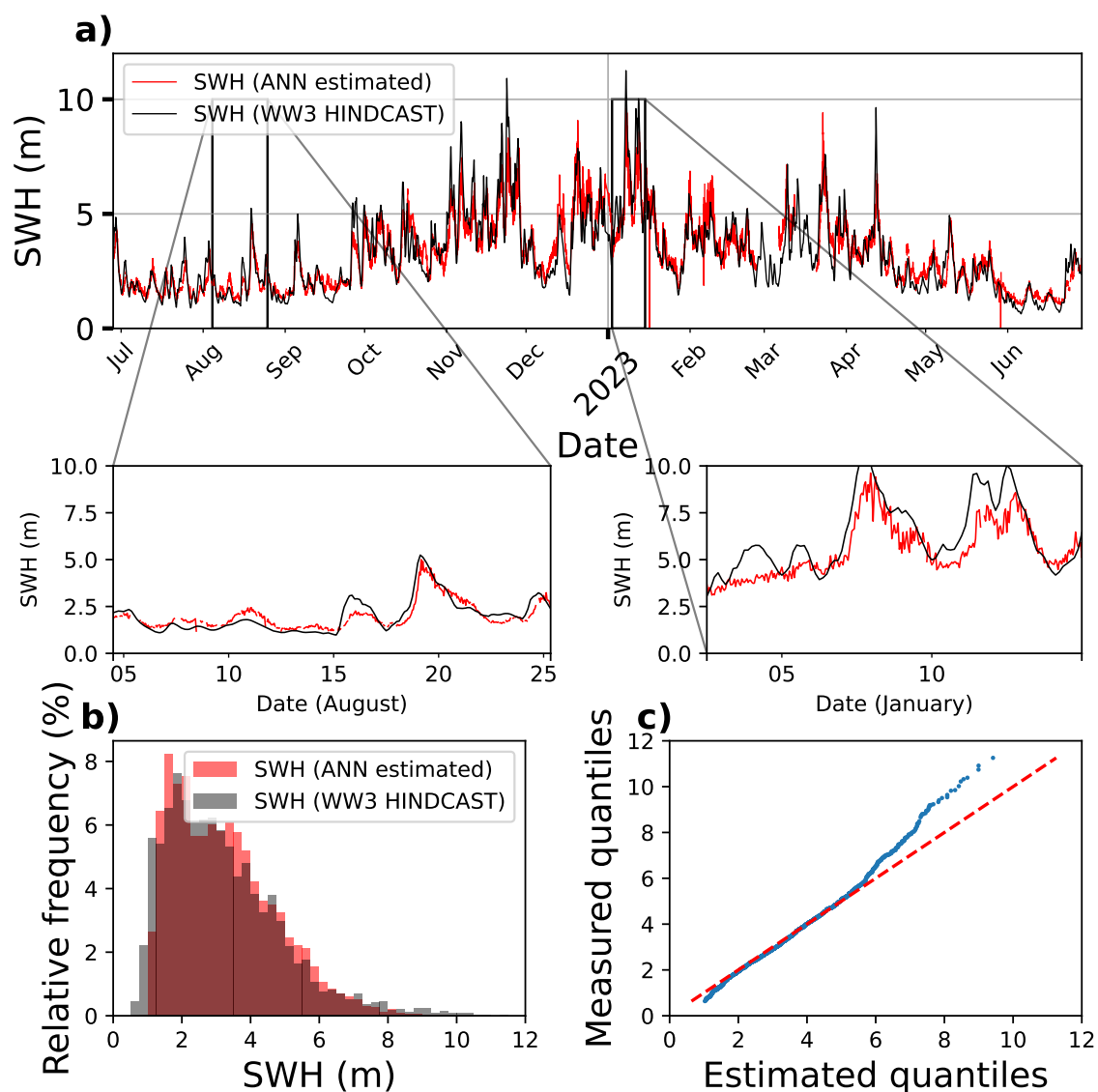


Figure S8 ANN-estimated versus modeled SWH using hindcast numerical data at Virtual Buoy location VB7. Each panel shows (a) time series of ANN-estimated and buoy measured SWH, (b) corresponding histograms, and (c) Q-Q comparison between predicted and hindcast values.

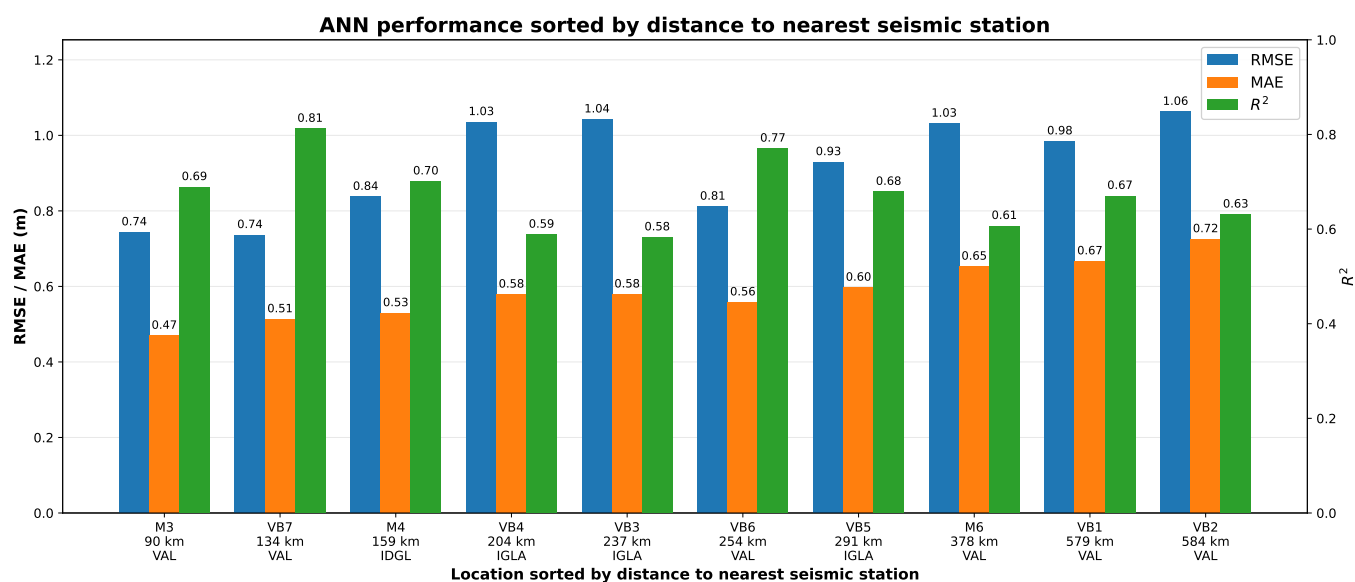
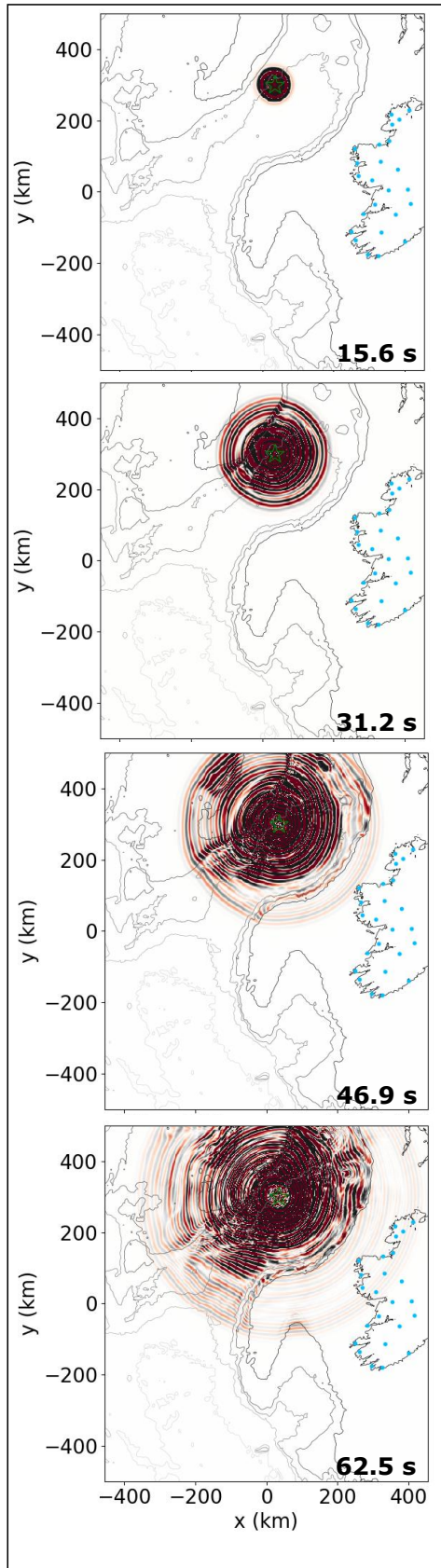


Figure S9 Summary of ANN performance metrics (RMSE, MAE, and R^2) across all physical and virtual buoy locations sorted by the relative distance between the location and nearest seismic station. Each set of three bars corresponds to one location.

a) Northern Source



b) Southern Source

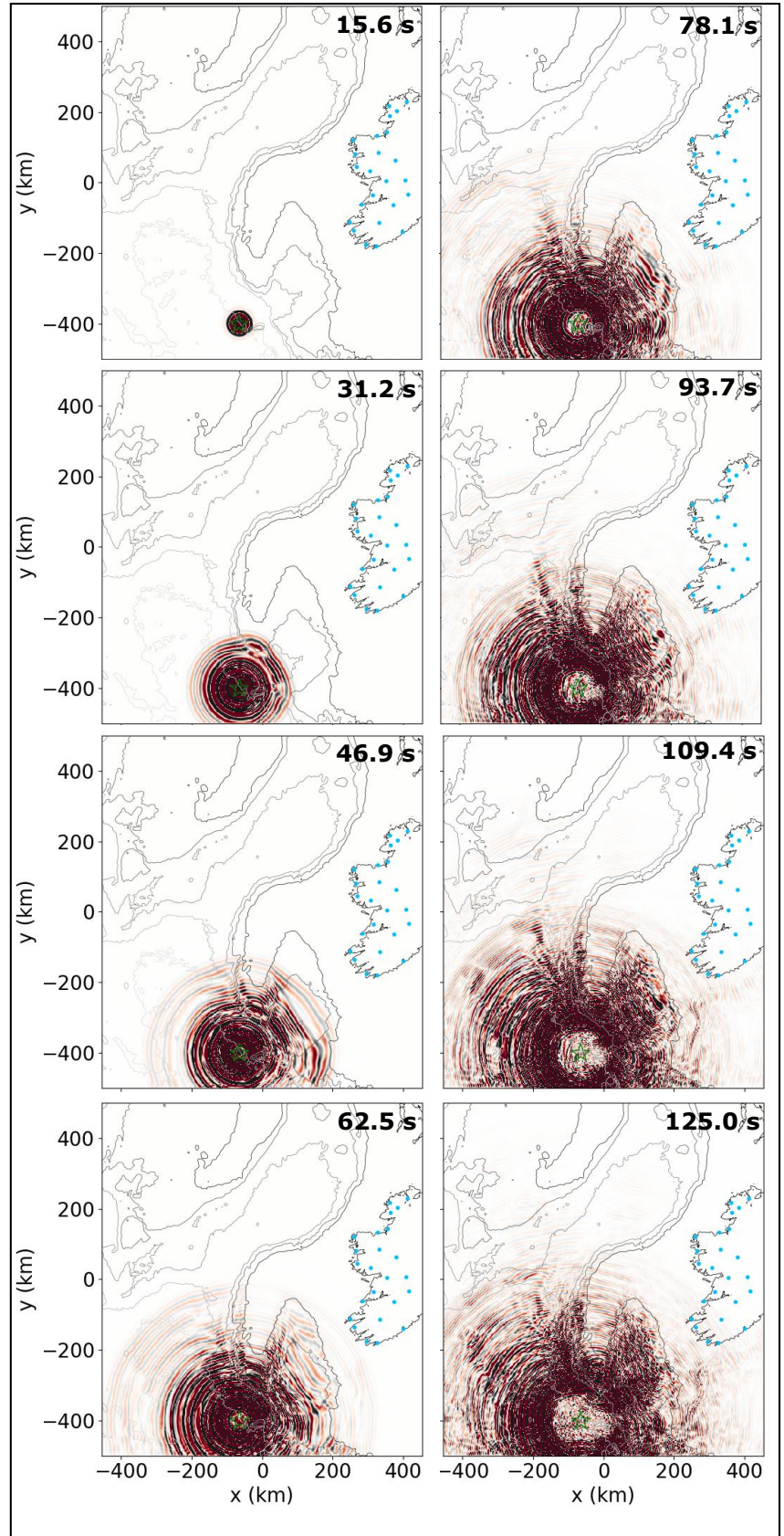


Figure S10 Additional snapshots of simulated secondary microseism wavefields. (a) Northern source simulation showing high energy lobes directed toward northwest Ireland; (b) Southern source simulation showing stronger wavefield distortion due to trapped waves in the porcupine basin and interactions with the continental shelf. The light blue dots represent seismic receiver locations included in the numerical simulation to record the simulated wavefield.