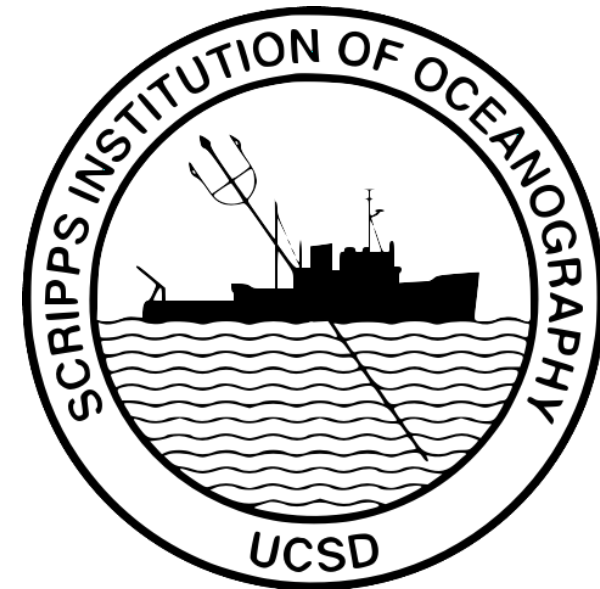


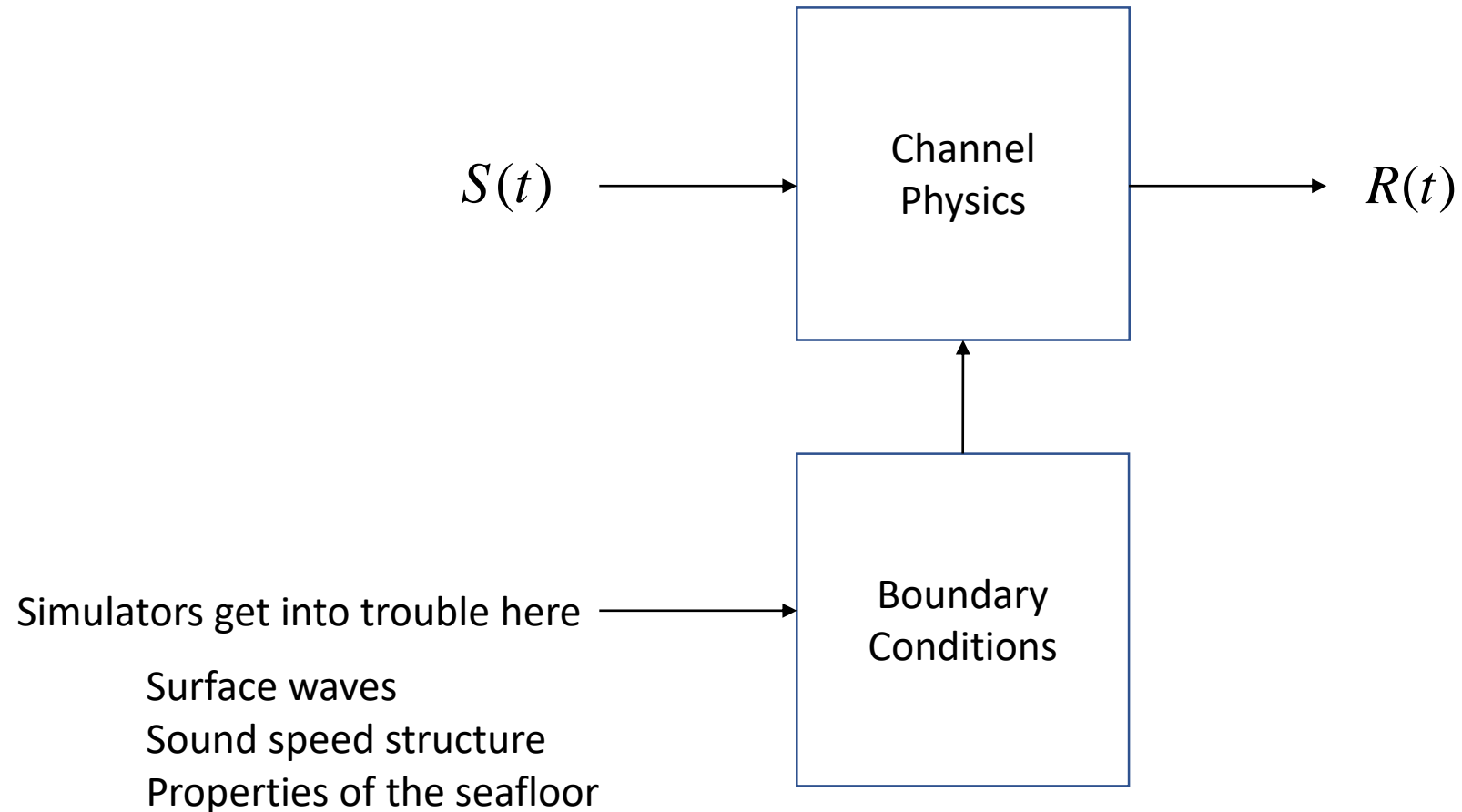
Channel Simulators are critical: why they fail, and what we have to do about it

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The Problem with Channel Simulators



Two Simulation Scenarios

I. Computer simulations of channel regimes for algorithm development and testing.

II. Optimization of model parameters in real-time scenarios.

Both tasks require specific information about channel state.

Task I

How Much
Boundary
Information is
Required?

Lower bound: 0.01 bytes/s for a stochastic surface wave model.

Upper bound: 1 Gbytes/s for a deterministic surface bounce at 10 kHz.

The answer lies somewhere in these 11 orders of magnitude.

Finding it will take signal processors, acousticians and oceanographers.

Fostering Interdisciplinary Collaborations

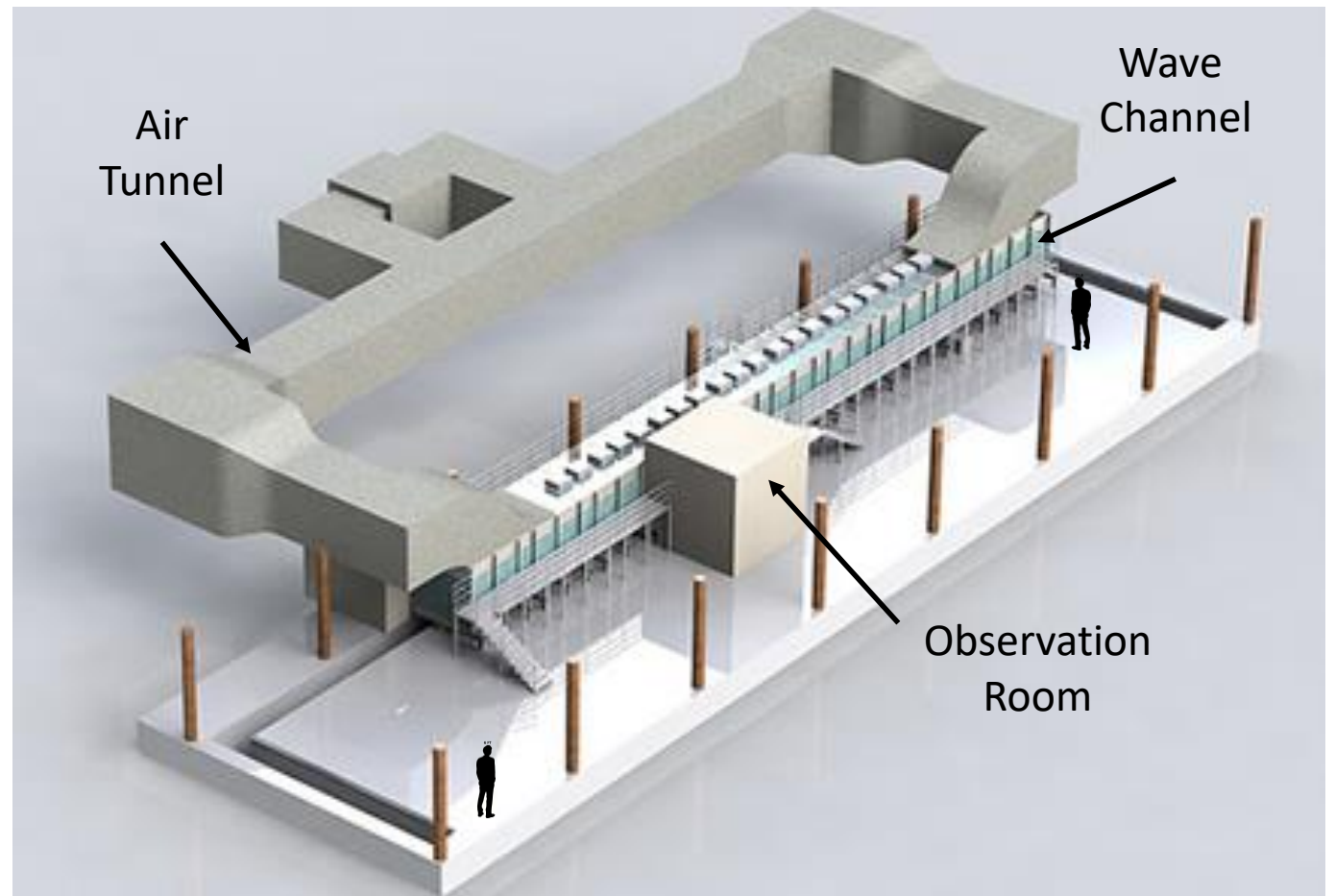
Funded
Programs

Field
Experiments

Infrastructure

Infrastructure

Scripps Ocean-Atmosphere
Research Simulator
SOARS



Specifications

Cost: \$4M (\$2.8M NSF/\$1.2M SIO)

On-line: 2021

Location: SIO Hydraulics Laboratory

Dimensions: 36 m x 2.4 m x 2.4 m

Air Temp: -15 to 30 Celsius

Water Temp: 1 – 30 Celsius

Wind speed: 17 m/s

Waves: 1.6 m, 0.3 – 1.5 Hz

Sea spray: sealed headspace with atmospheric controls

Mesocosm: growth lights, non-toxic construction

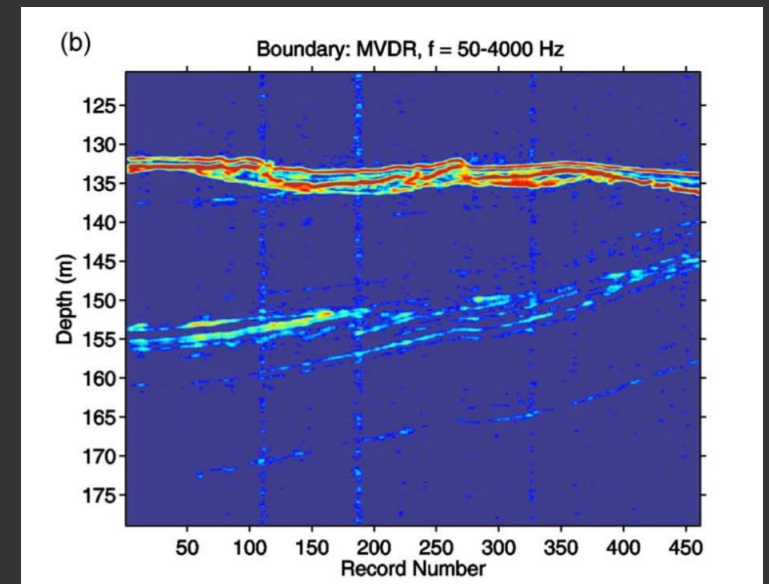
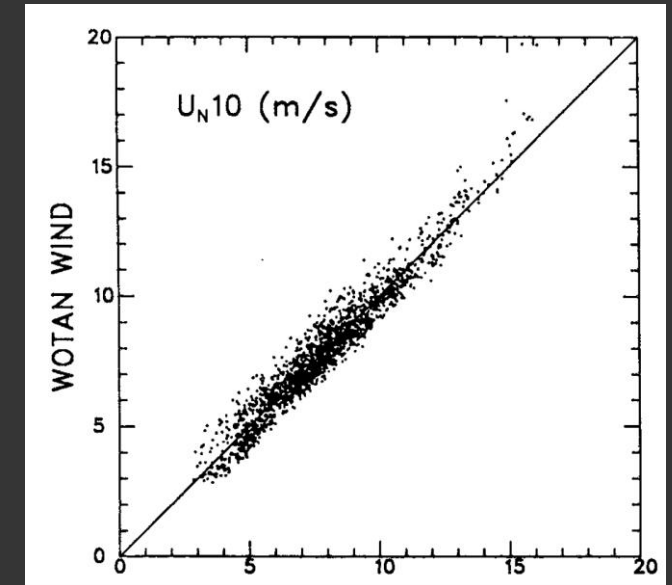
Environmentally controlled observation room

Secondary reaction chamber for sea spray aerosol

Task II

Optimization of model parameters from Ambient Noise

- Wind speed: Weather observations through ambient noise (WOTAN)
 - Vagle et al. 1990, "An evaluation of the WOTAN technique of inferring oceanic winds from underwater ambient sound, J. Atmos. Oceanic Tech. doi:10.1175/1520-0426(1990)007<0576:AEOTWT>2.0.CO;2
- Bottom structure: Sub-bottom profiling using ambient noise.
 - Harrison and Simons 2002, "Geoacoustic inversion of ambient noise: A simple method," J. Acoust. Soc. Am., 112 doi:10.1121/1.1506365
 - Siderius et al. 2010, "Adaptive passive fathometer processing," J. Acoust. Soc. Am., 127 doi:10.1121/1.3303985



Steps To Improve Channel Simulation

- Interdisciplinary channel studies focused on:
 - Improving models of channel variability.
 - Determining critical boundary variables.
- Exploitation of ambient noise to determine boundary variables in real time.