FACULTY OF ENGINEERING AND ARCHITECTURE

Application of open boundaries within a two-way coupled DualSPHysics-OceanWave3D model

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INTRODUCTION

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Floating Wave Energy Converter Farm

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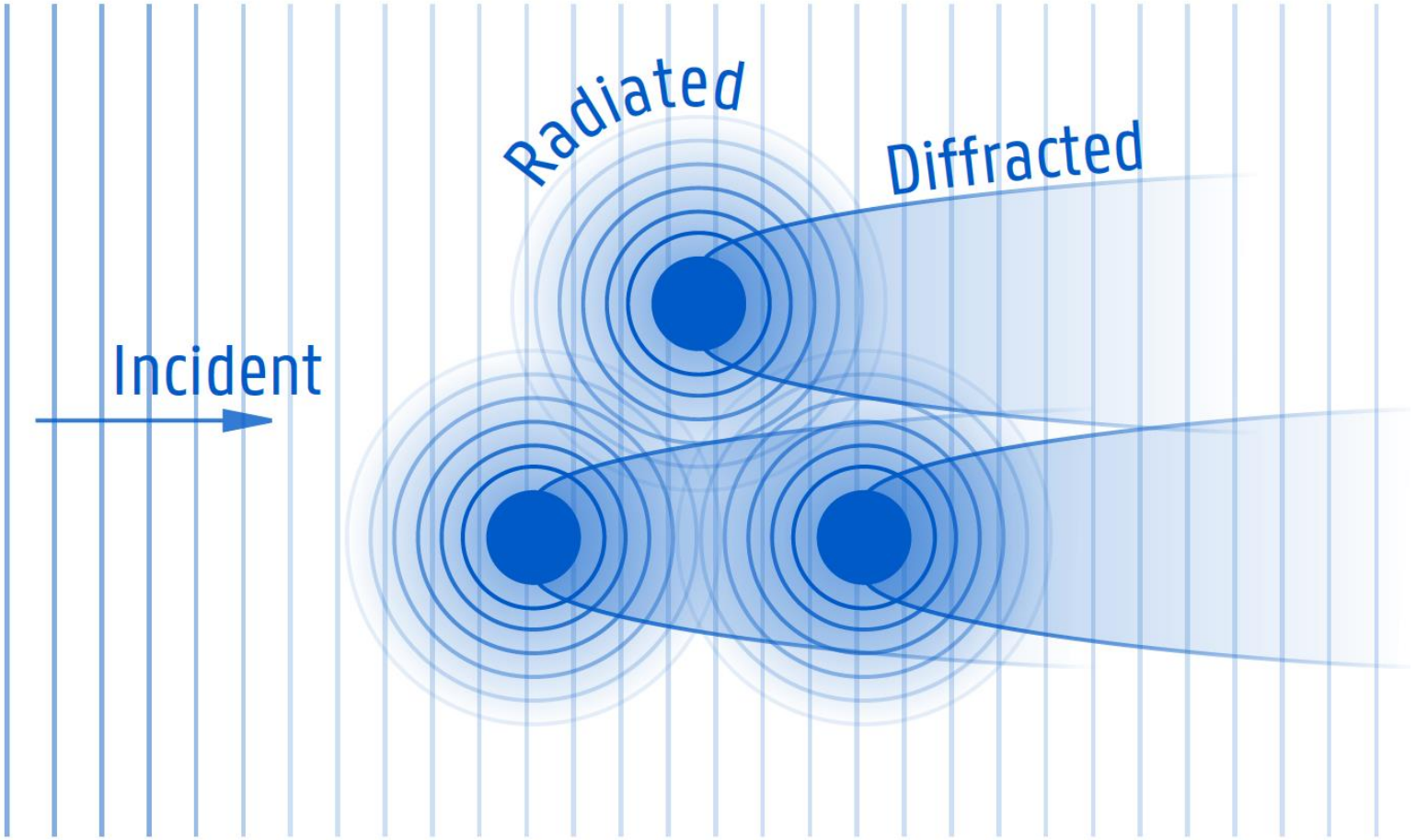
Floating Wave Energy Converter Farm



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CURRENT COUPLING PRINCIPLE

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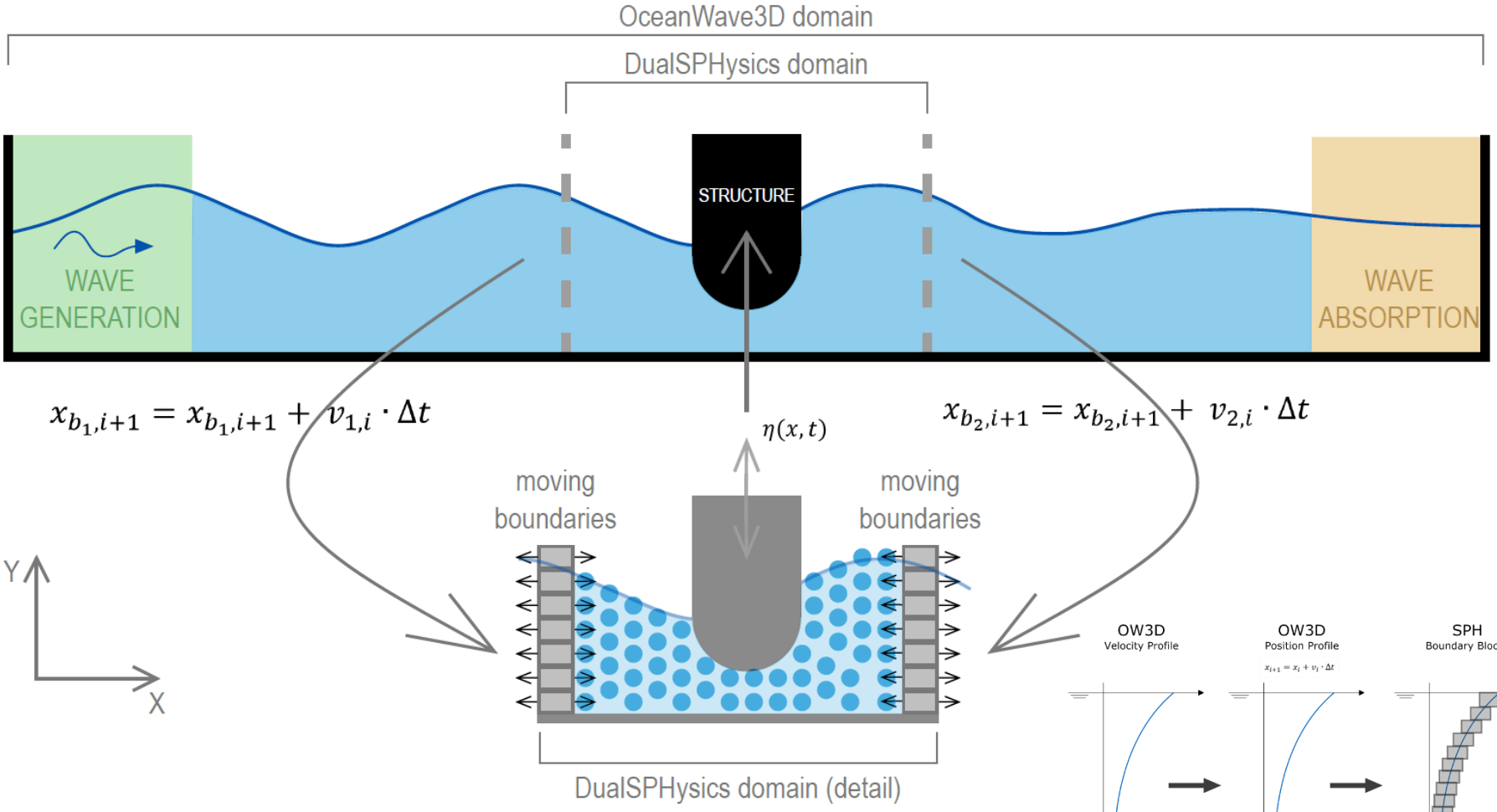
Principle sketch



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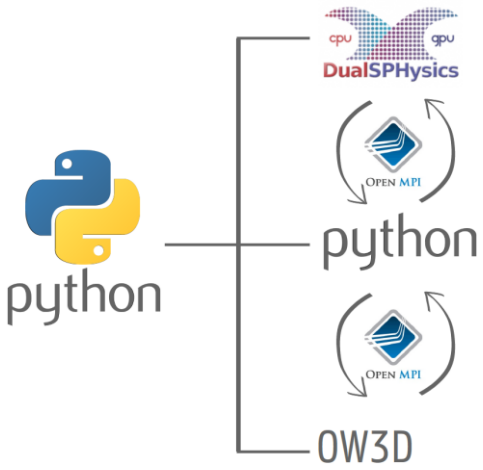
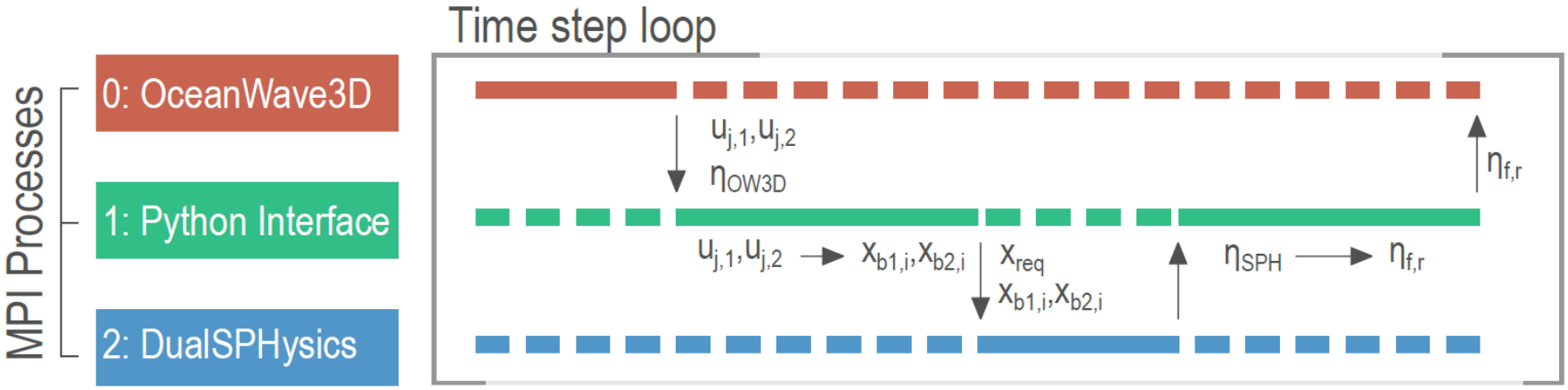
Coupling algorithm





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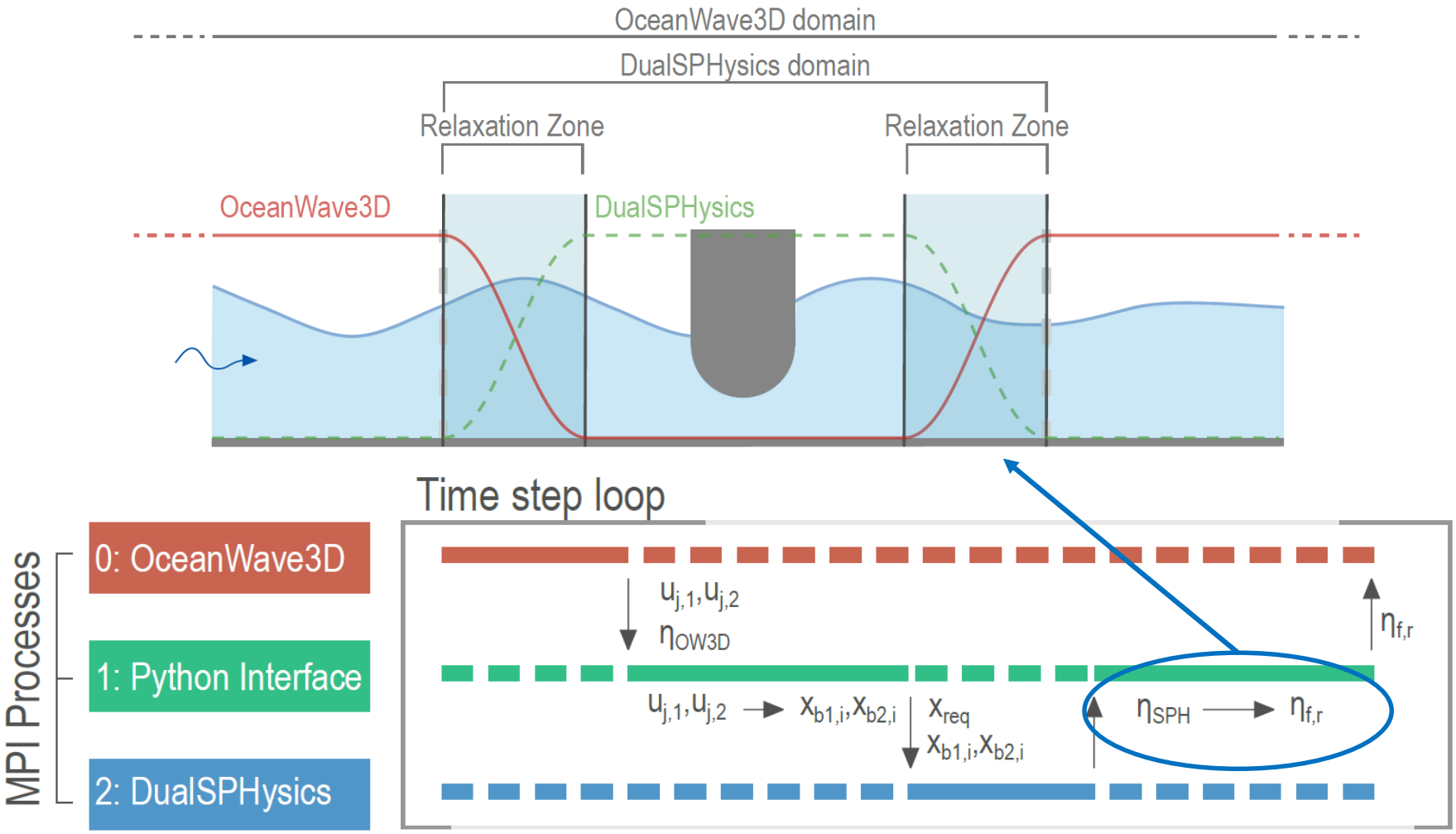

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VALIDATION

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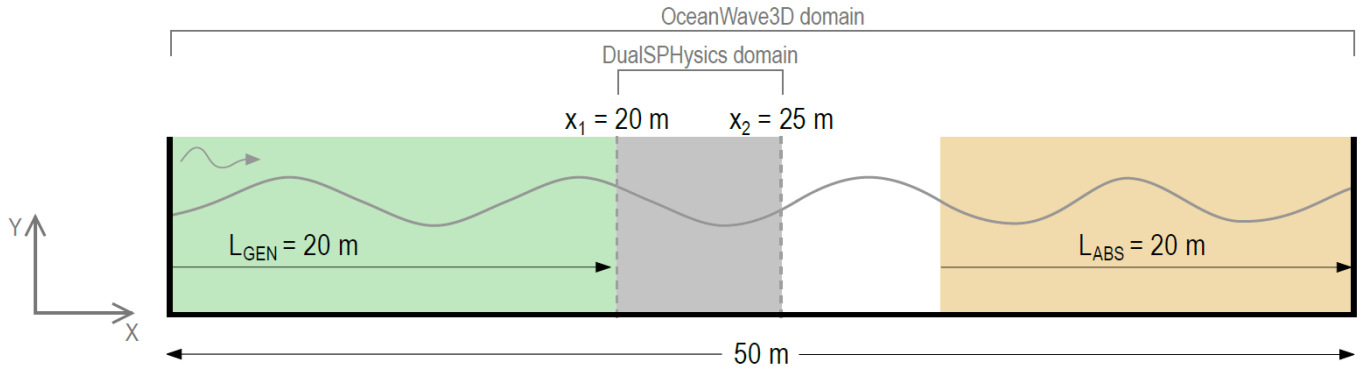
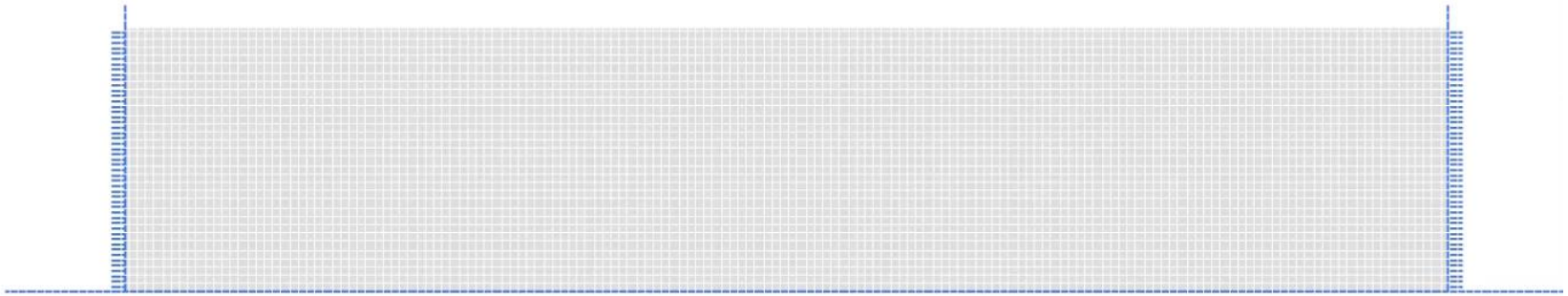
Two-way wave propagation





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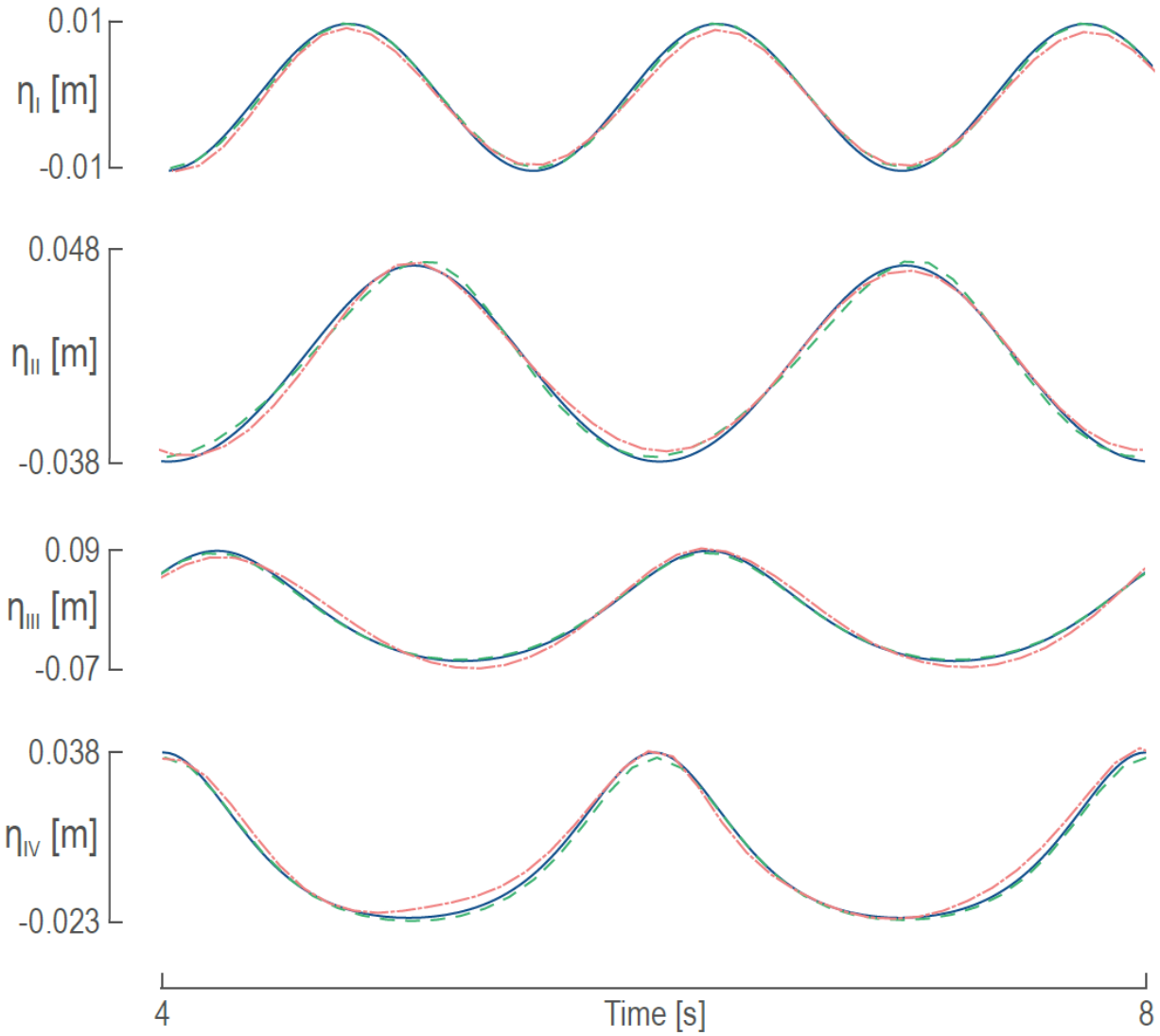
Two-way wave propagation



LINEAR

STOKES II

STOKES III

STREAM

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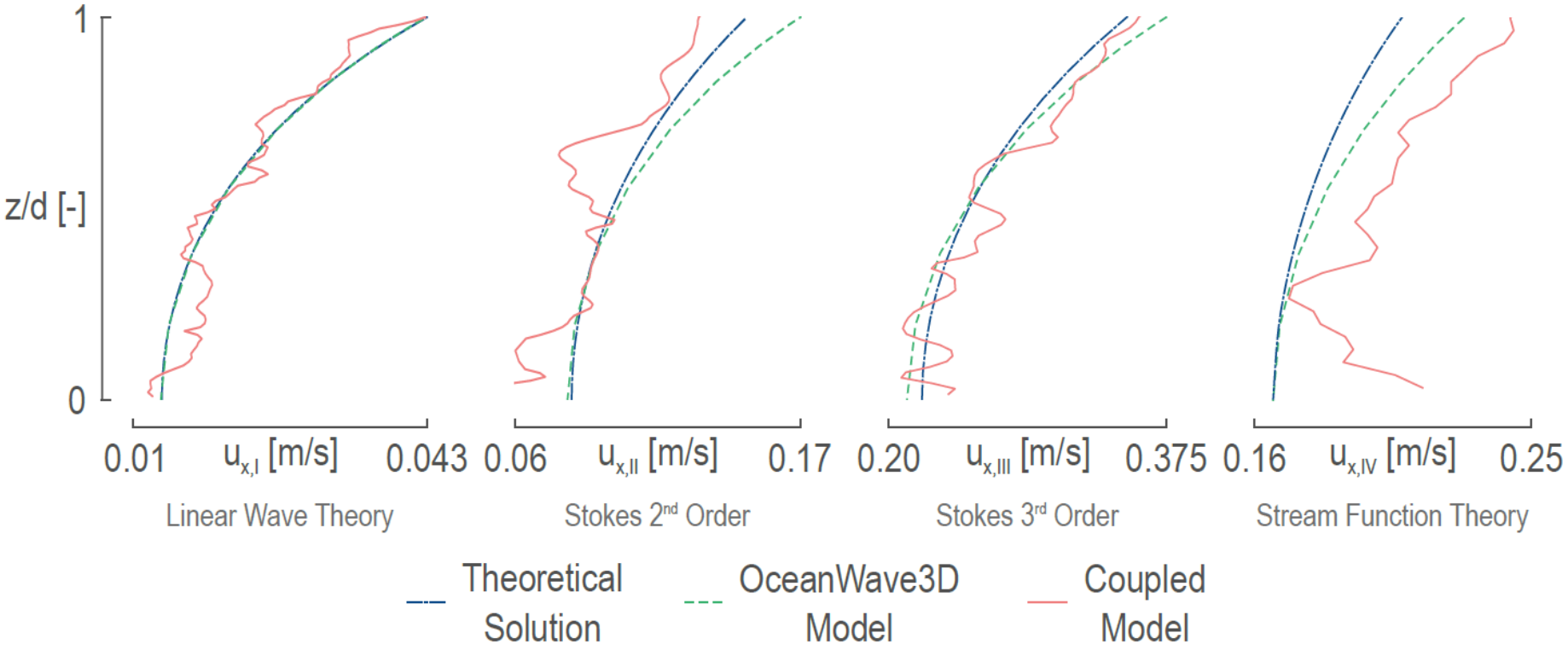
Two-way wave propagation



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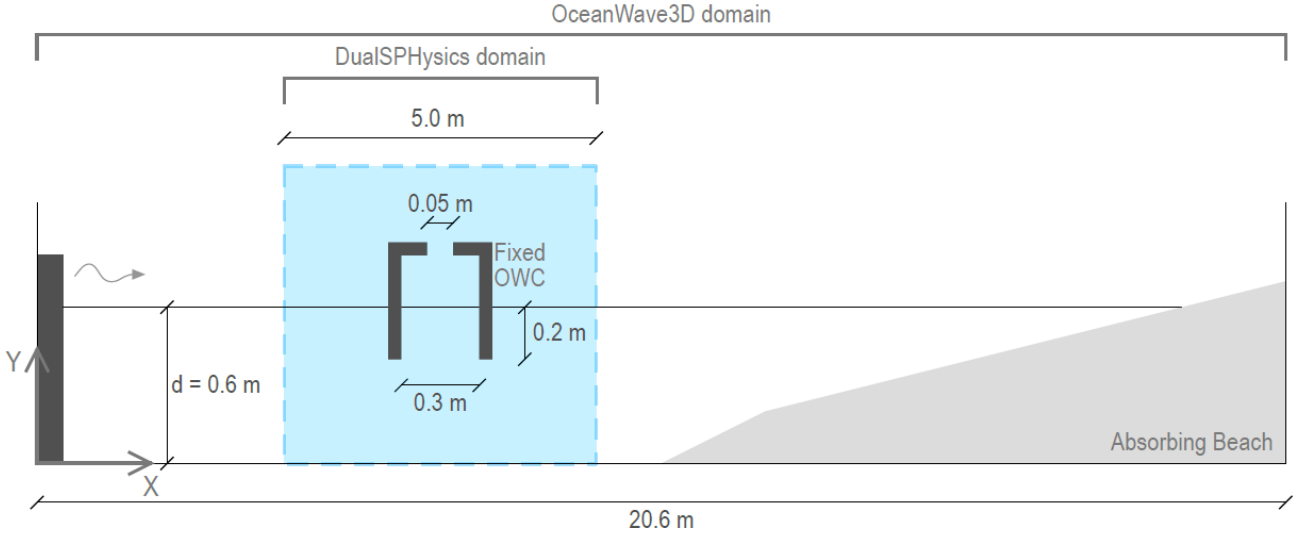
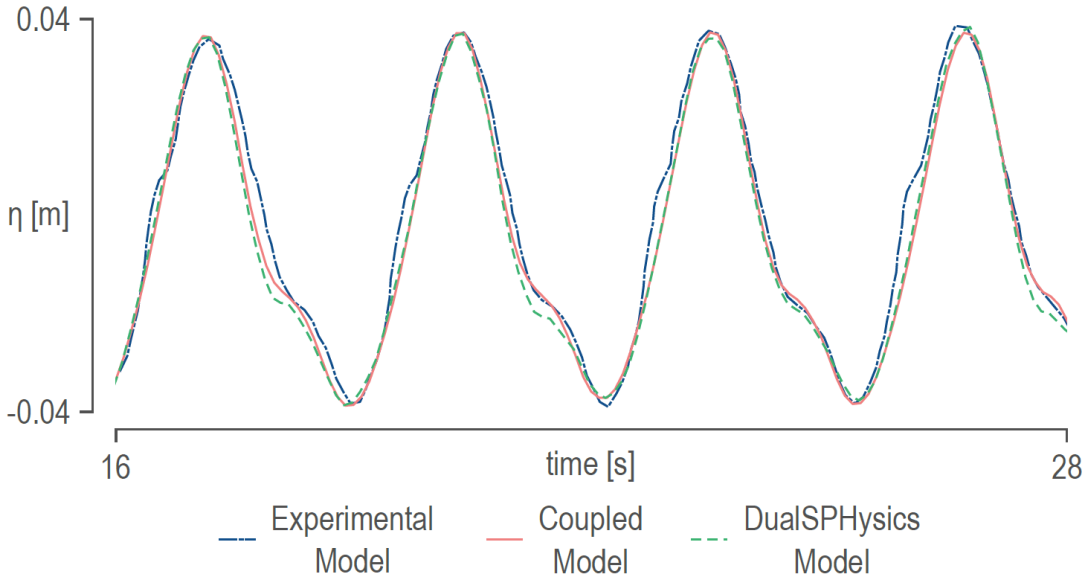
Fixed OWC





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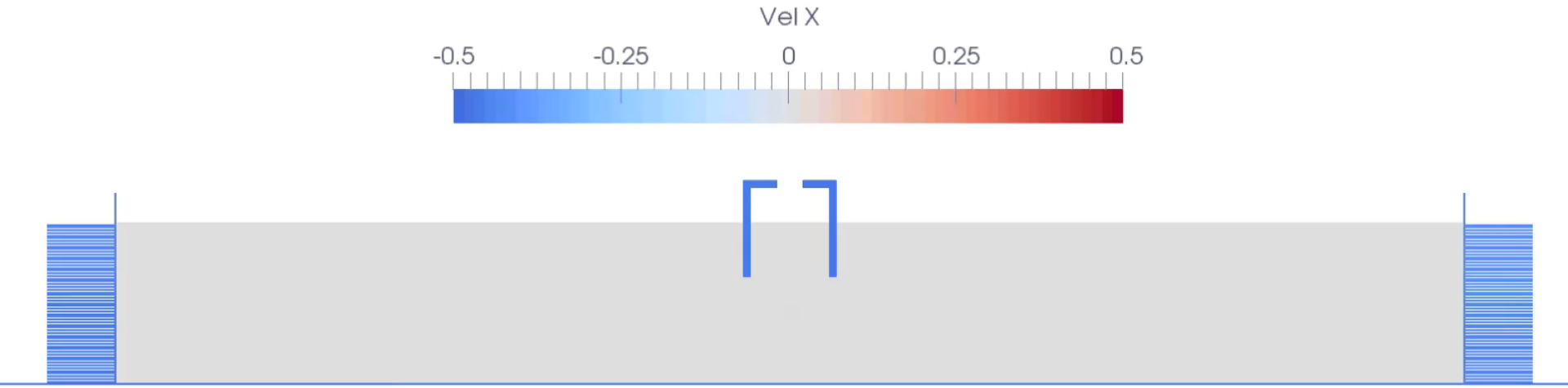

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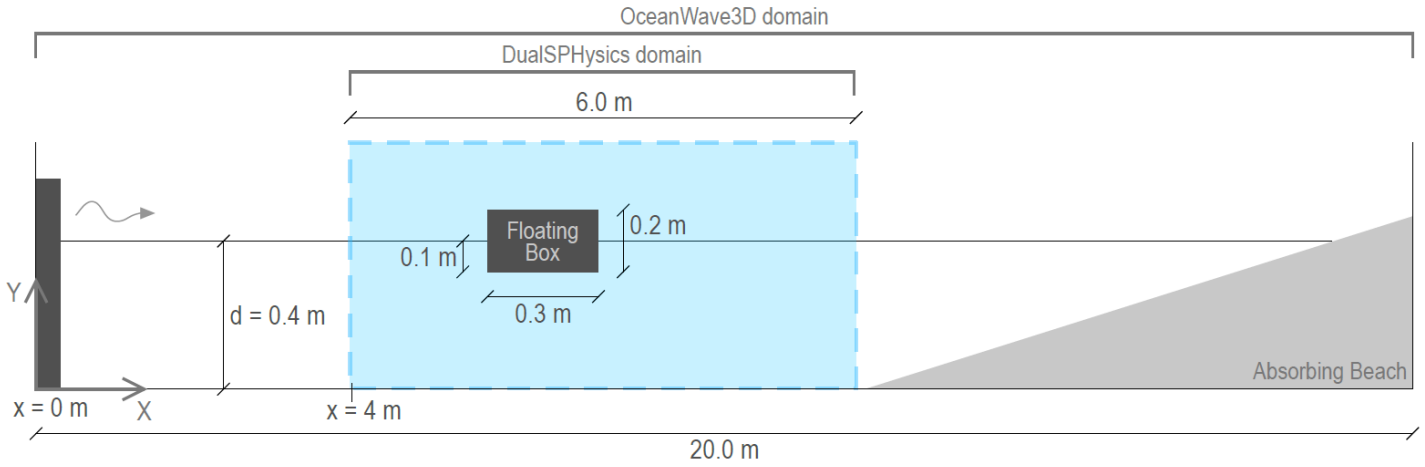
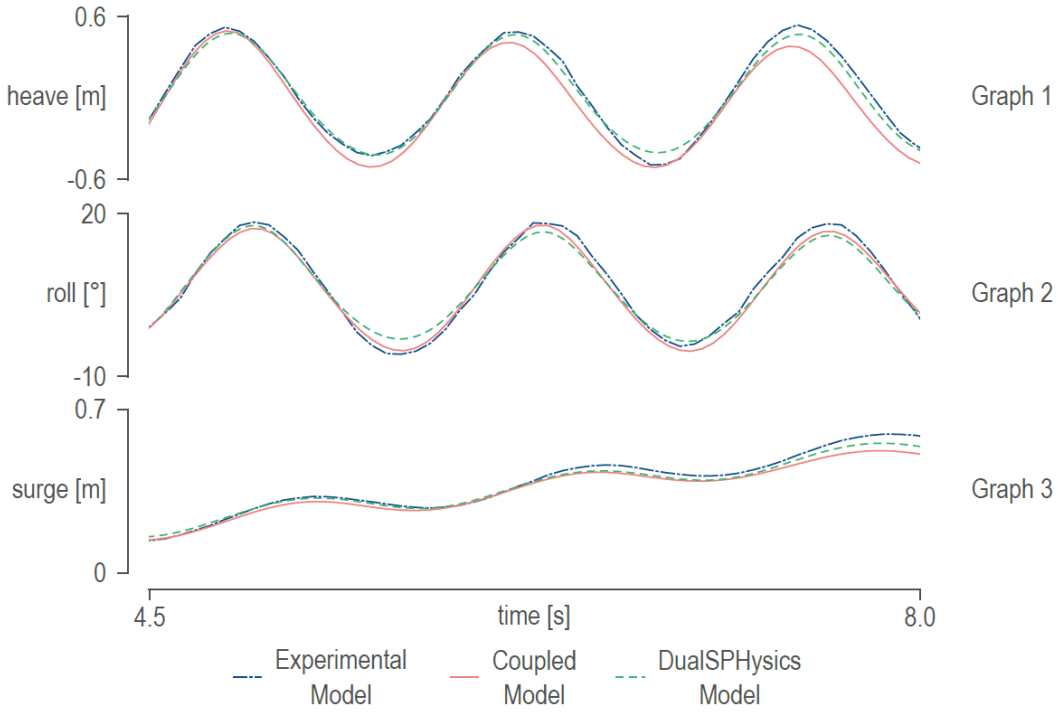
Floating Box





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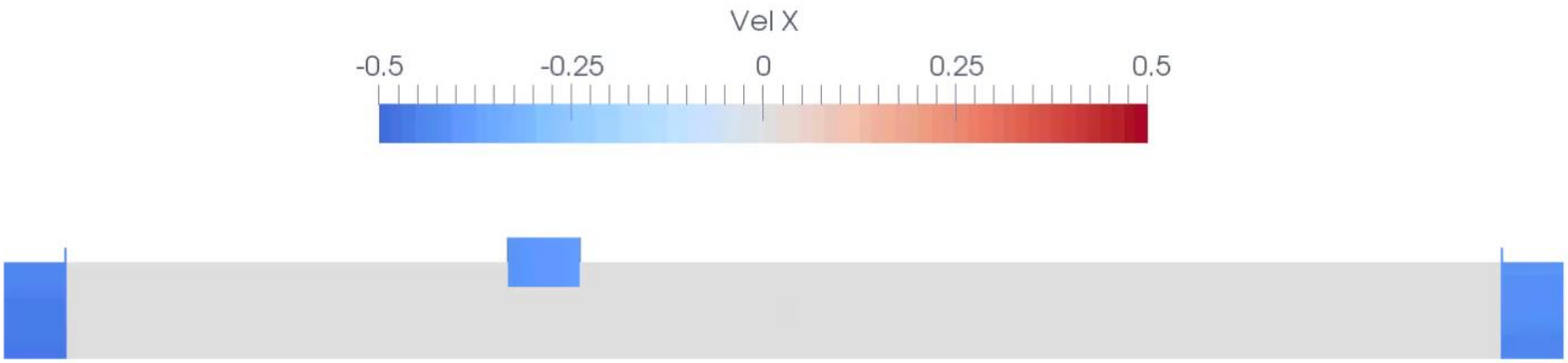
Floating Box



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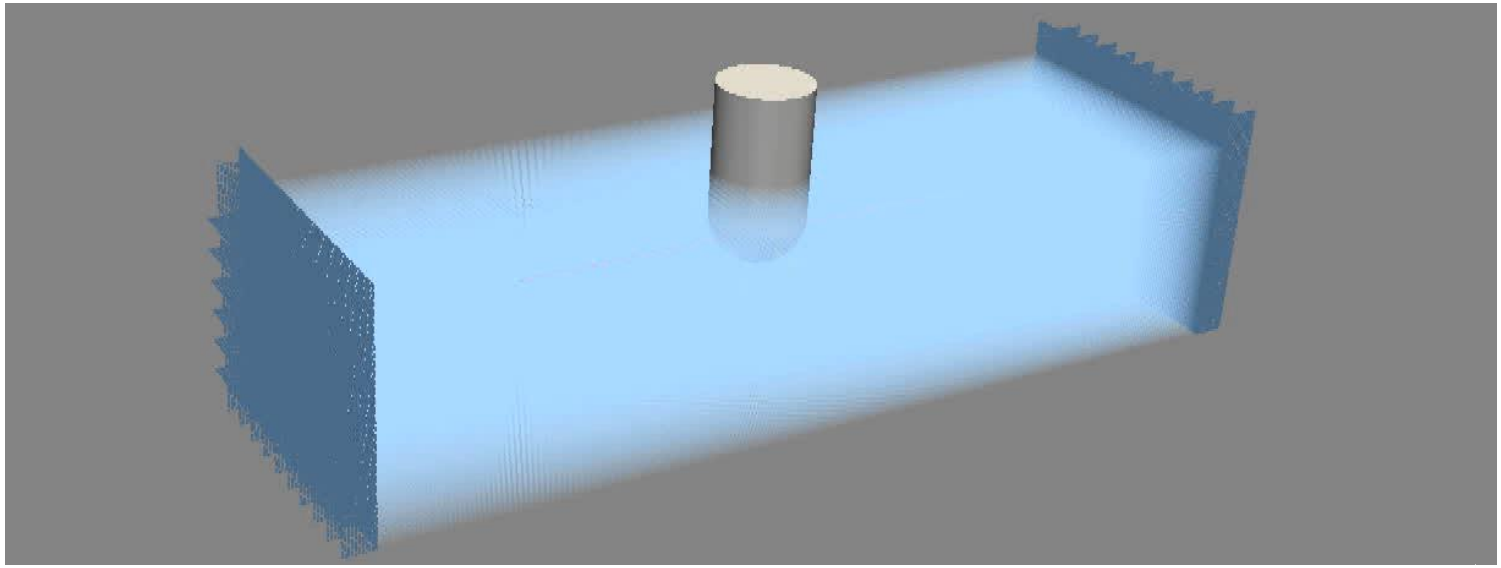
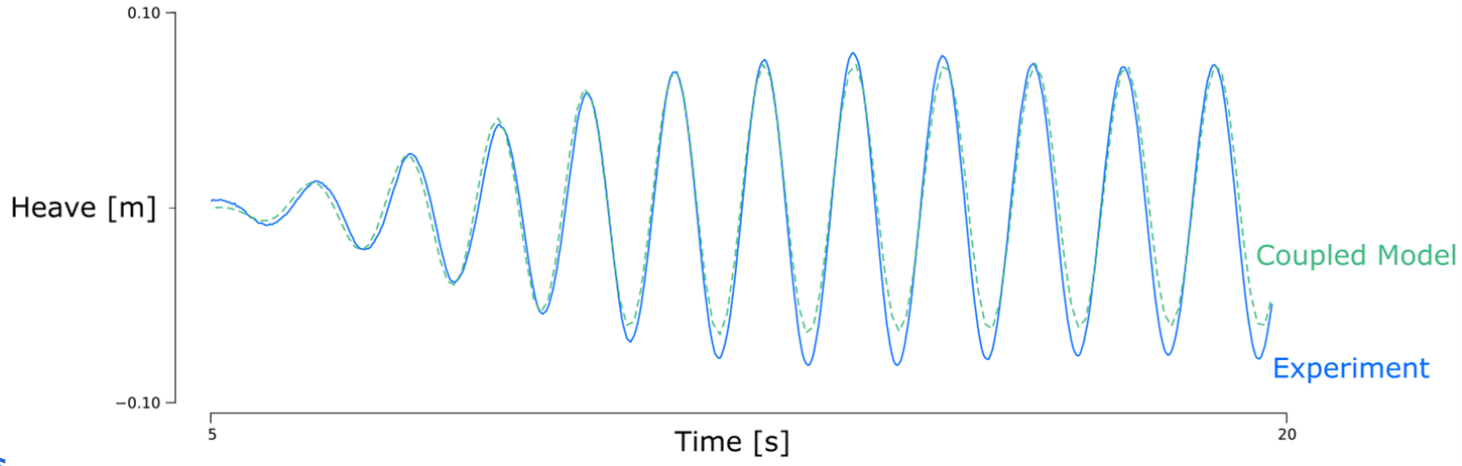
3D WECwakes





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Issues with current coupling principle

- Only horizontal orbital velocities are used as boundary conditions
- Net horizontal drift over time -> limited simulation time
- Limited number of dynamic boundaries

PROPOSED COUPLING PRINCIPLE

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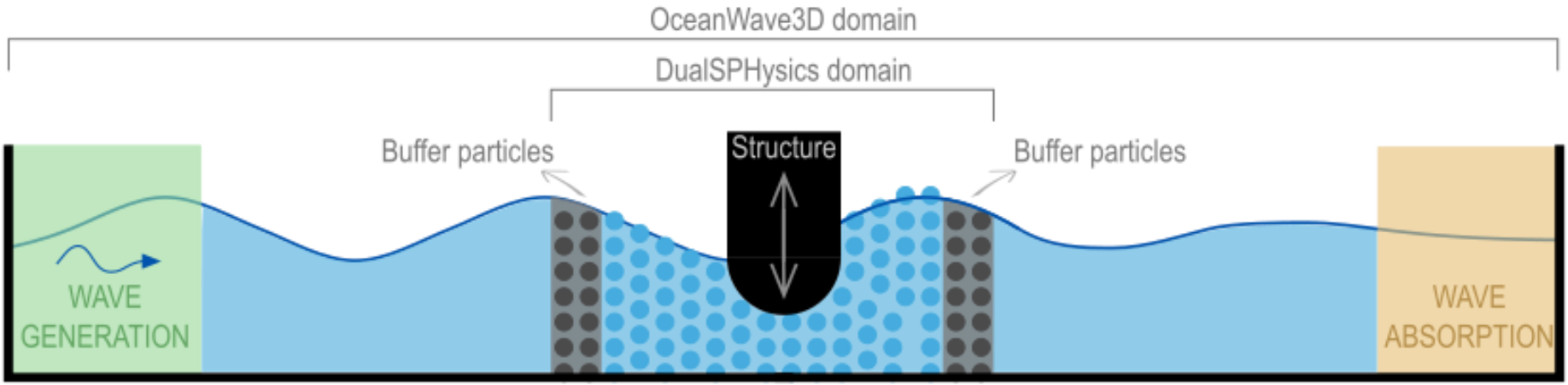
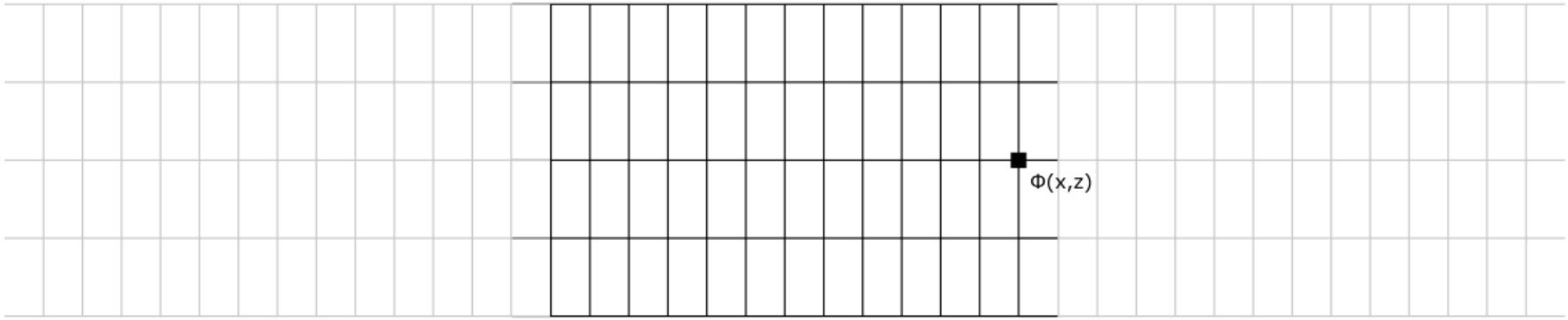
Overview

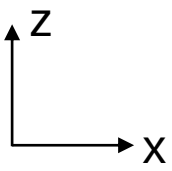
MOVING BOUNDARIES → BUFFER PARTICLES



Principle

OceanWave3D Grid





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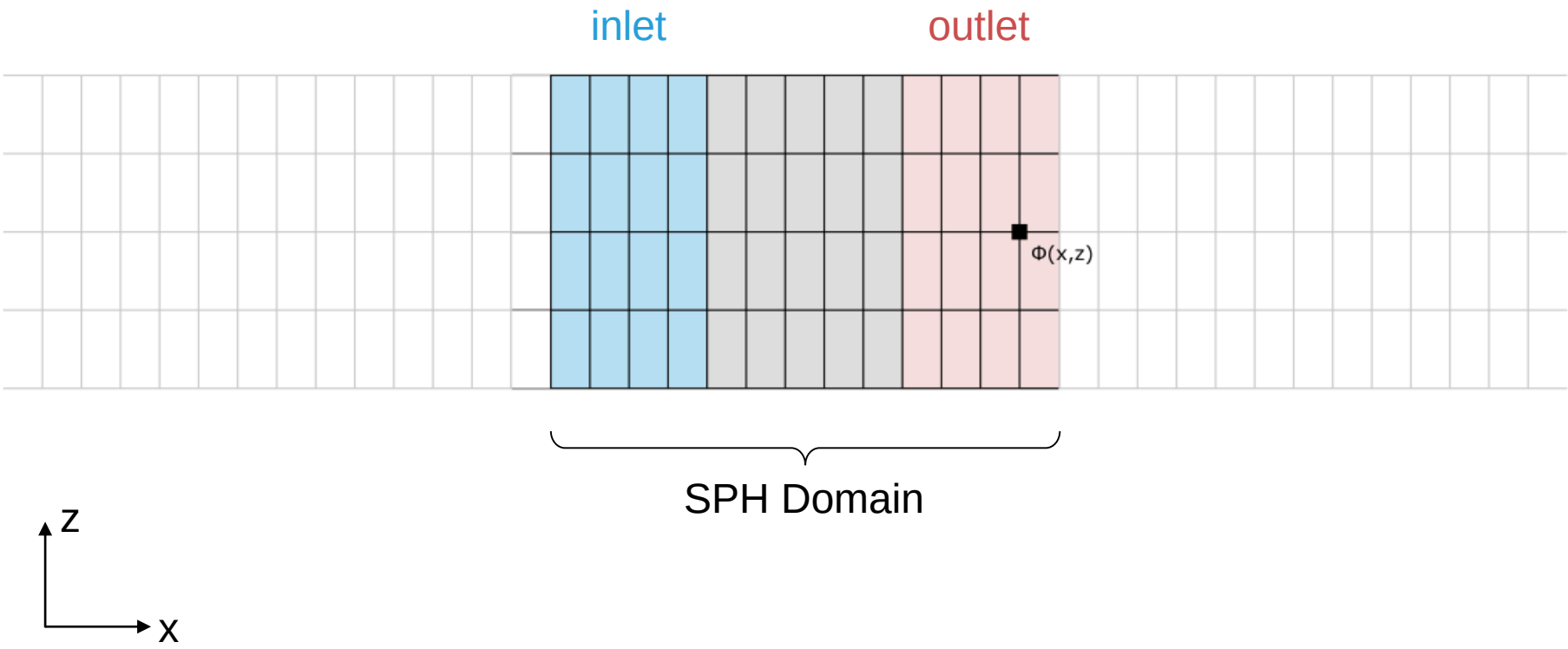

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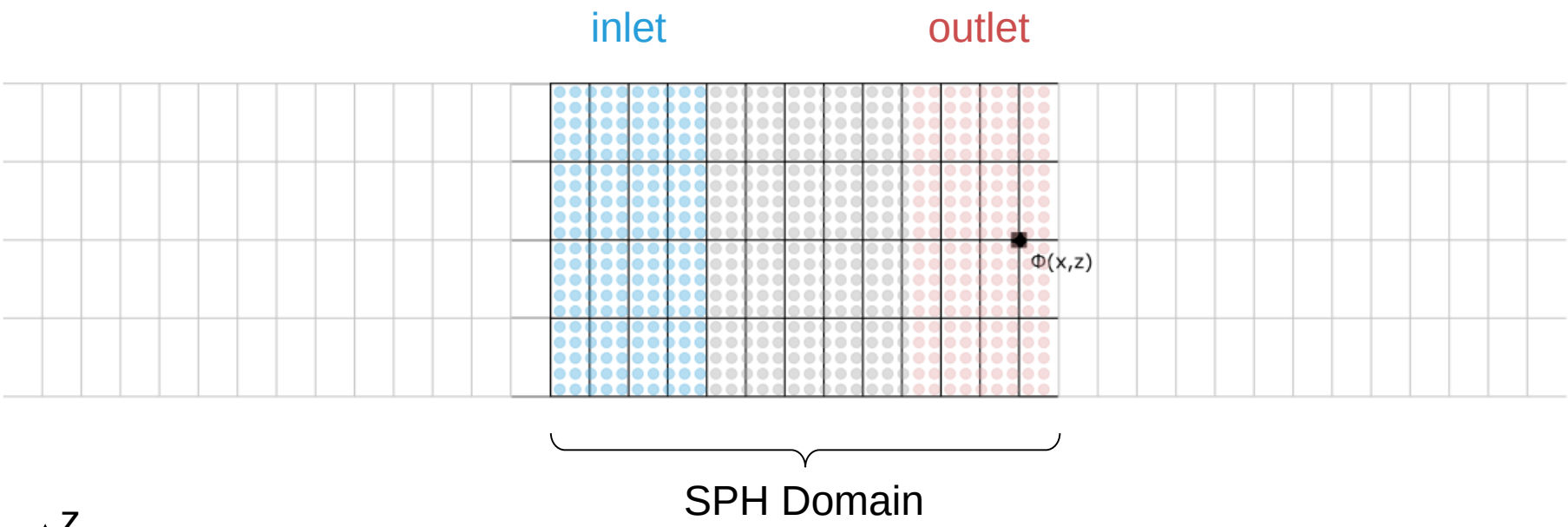
Principle



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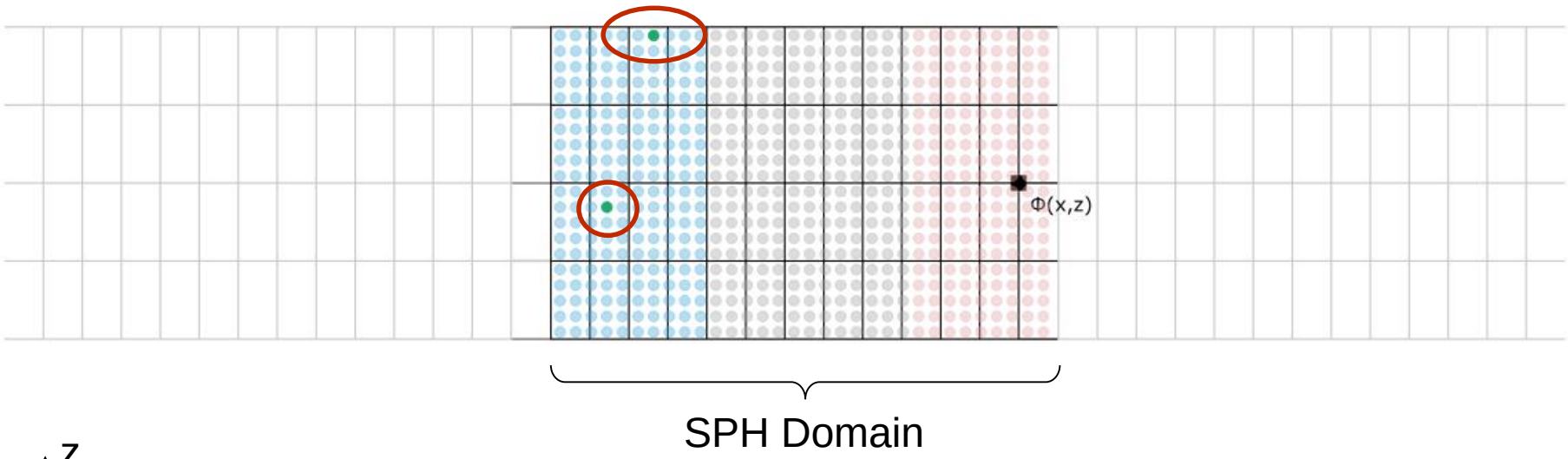

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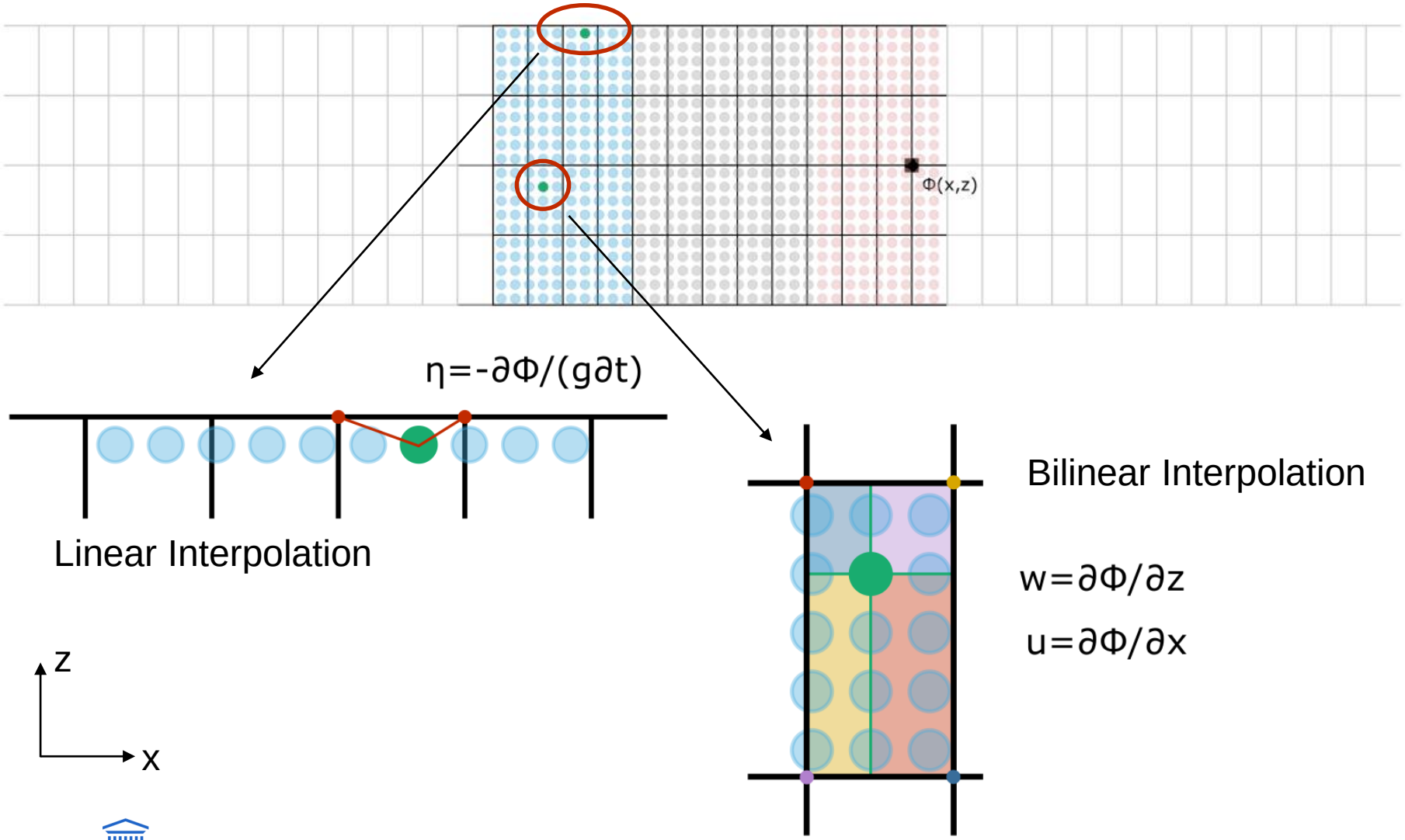

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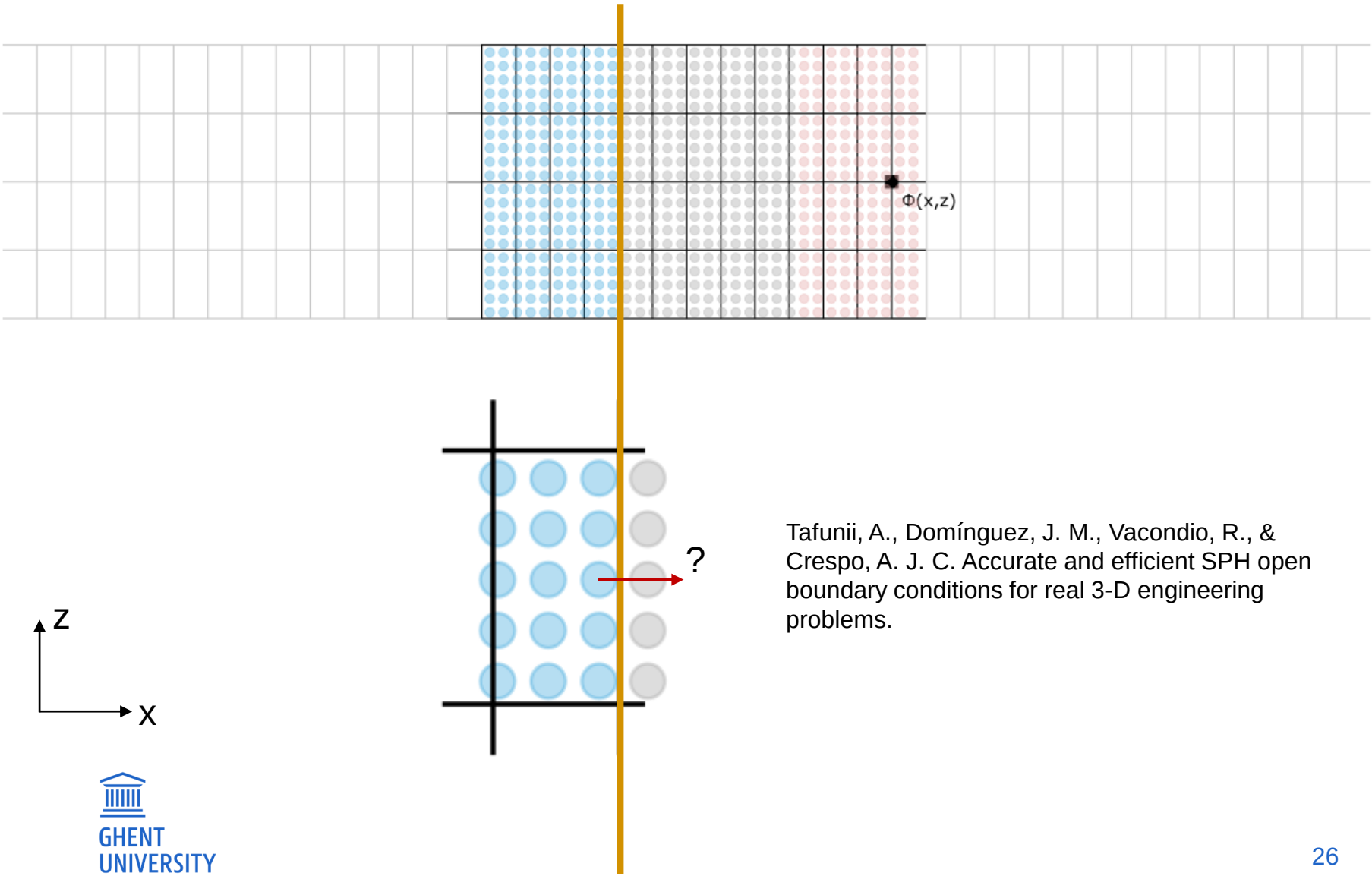

Tafunii, A., Domínguez, J. M., Vacondio, R., & Crespo, A. J. C. Accurate and efficient SPH open boundary conditions for real 3-D engineering problems.

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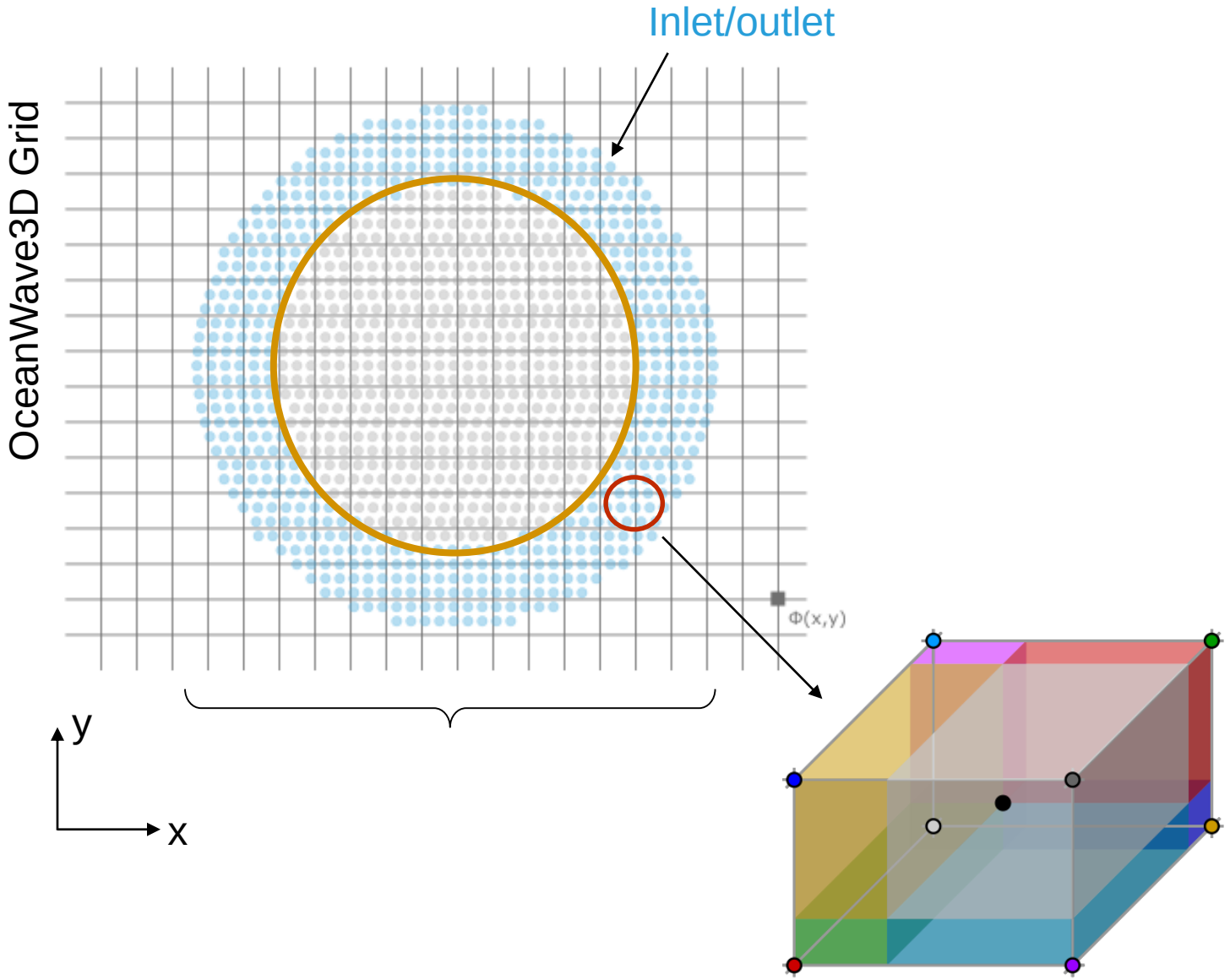
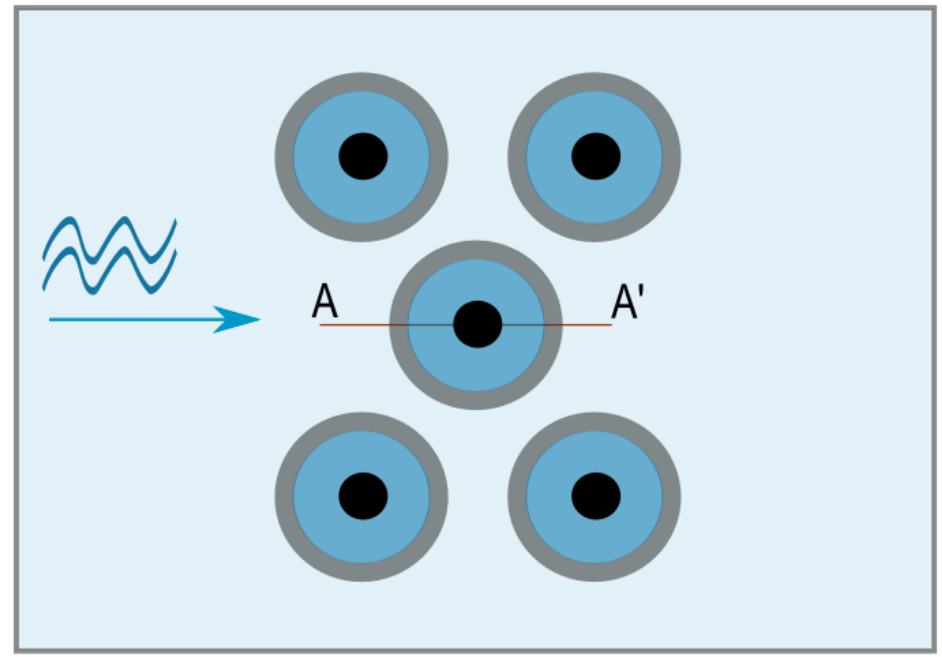
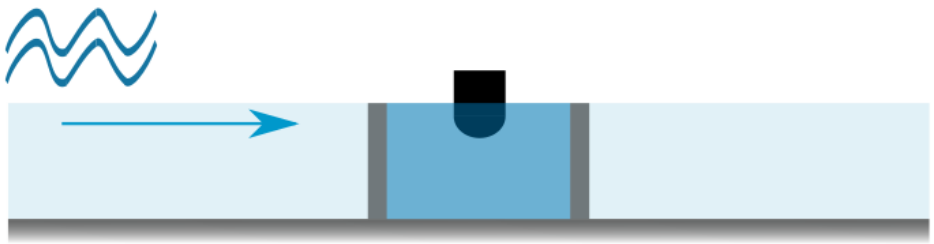
3D Principle



Long-term Objective



section AA'



wave-structure interaction solver domain (DualSPHysics)

structures

wave propagation domain (OceanWave3D)

or

inlet/outlet buffer particles

incident waves

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Thank You!

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