SYMPOSIUM OP'24 ADVANCING OCEAN PREDICTION SCIENCE FOR SOCIETAL BENEFITS

Theme 5.6 Digital Twins

Coastal seabed quantification based on digital scenarios using hydroacoustic data

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Introduction

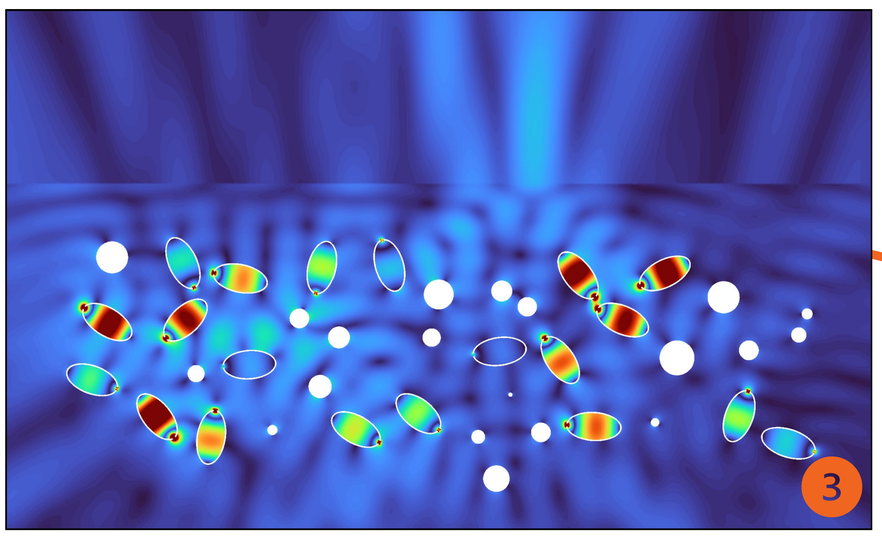
Underwater hydroacoustic measurements are widely used in sonar applications not only for detecting target objects (such as vessels or fisheries) but also to characterize the **nature of the seabed** and quantify the presence of algae (1) or bivalves (2)

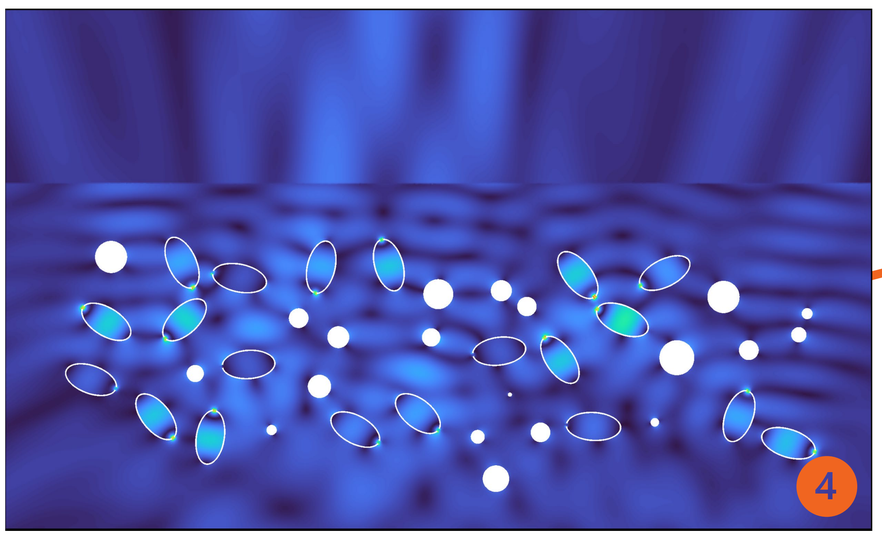
Modelling and simulation

Hydroacoustic models for **Lagrangian displacement** for fluid and porous media are solved at time-frequency regime using:

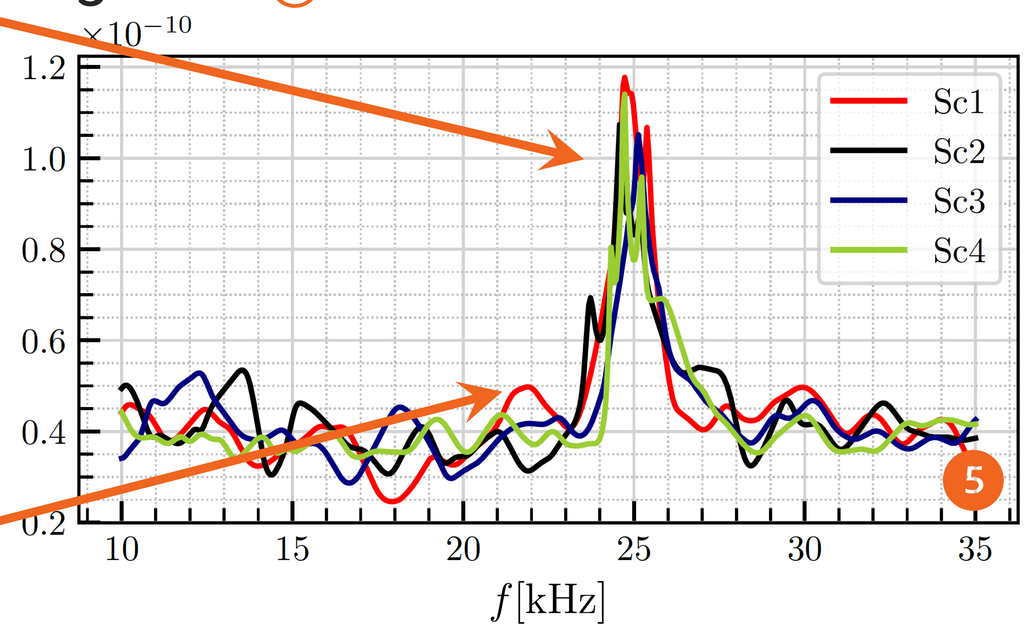
- Darcy and Biot-Stoll **porous models**
- Perfectly Matched Layers
- Finite element method

Numerical results





Every random seabed scenario is simulated at different frequencies (3 and 4) to quantify the biological presence of bivalves, sand and rocky bottoms or algae, and hence characterized by its **frequency-dependent signature** (5)



High reflected energy at some specific frequencies corresponds to **resonance phenomena** (3) of the heterogeneities buried in the upper layer of the seabed

Conclusions

- Multiple seabed environments are simulated by generating digitally random underwater scenarios
- Simulated hydroacoustic data is used to quantify their frequency-dependent signature

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