



🕒 14h00 à 16h00

📍 Espace Gilbert Simondon, 1B36,  
ENS Paris-Saclay

THÈSES ET HDR

# Daniel S. PELAEZ ZAPATA : Soutenance de thèse

**Title: Beyond the Sea Surface: Exploring Ocean Wave Measurements From Multiple Perspectives**

**Supervision: F. Dias, V. Pakrashi**

**Soutenance le 06/02/2024 à 14h00 en 1B36**

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**Daniel S. PELAEZ ZAPATA**

**Beyond the Sea Surface: Exploring Ocean Wave Measurements From Multiple Perspectives**

**Abstract:**

This thesis explores ocean wave measurements from multiple perspectives, extending the analysis beyond their visual manifestation on the sea surface. Existing limitations in measurement technologies hinder a full understanding of aspects such as directional wave spectrum, wave breaking processes, and wave-induced bubble plumes. This study integrates data from various platforms, including bottom-mounted sensors, surface buoys, and satellites, addressing spatial and temporal coverage limitations. A novel wavelet-based technique for directional wave spectrum estimation is presented, showing consistent performance and advantages over conventional methods. Analysis of directional wave spreading reveals narrow distributions at the spectral peak and asymmetric broadening at lower and higher frequencies. The thesis also compares GPS buoy data with satellite-based observations from the CFOSAT/SWIM mission. The acoustic properties of ocean waves are examined through measurements of bubble plumes, revealing a relationship between wind speed, bubble plume depth, and whitecapping coverage. The role of Langmuir circulation in transporting bubble plumes is highlighted. Underwater noise and its correlation with environmental variables are investigated using a bottom-mounted hydrophone. Overall, the thesis provides a comprehensive description of ocean waves, offering valuable insights into complex air-sea interactions.

## Jury:

- Øyvind Breivik (Geophysical Institute, University of Bergen)
- Leonel Romero (Department of Marine Sciences, University of Connecticut)
- Kevin Nolan (School of Mechanical and Materials Engineering, University College Dublin)
- Nicolas Vayatis (Centre Borelli, ENS Paris-Saclay)

## Supervisors:

- Frédéric Dias (Centre Borelli, ENS Paris-Saclay & School of Mathematics and Statistics  
(<https://www.ucd.ie/mathstat/>), University College Dublin) (<https://www.ucd.ie/>)
- Vikram Pakrashi (<https://people.ucd.ie/vikram.pakrashi>) (School of Mechanical and Materials  
Engineering (<https://www.ucd.ie/mecheng/>), University College Dublin)



