WESE

WAVE ENERGY IN SOUTHERN EUROPE

# Environmental Monitoring of underwater noise around wave devices in the framework of the WESE project

Juan Bald (AZTI)[2], Teresa Simas (WAVEC)[2], Iván Felis (CTN)[1] and, Erica Cruz (Wavec)

[1]Corresponding author: ivanfelis@ctnaval.com
[2]Presenting author: jbald@azti.es; tsimas@wavec.org

OES-Environmental & ORJIP International Forum #3:

Updates on Monitoring and Research Around Wave Devices

April 23, 2020

This project has been funded by the European Union

# Contents

- WESE project description
- Environmental Monitoring
- Conclusions and lessons learned

This project has been funded by the European Union

# WESE Project

WESE
WAVE ENERGY
IN SOUTHERN EUROPE

WESE project is funded by the European Maritime and Fisheries Fund (EMFF) and launched in November 2018 and will run until 2021.

Aims to **increase** the current **knowledge on environmental impacts** of Wave Energy (WE projects) to **better inform decision-makers and managers** on environmental real risks and **reduce uncertainty in the environmental consenting processes** and a do **better maritime spatial planning (MSP)** in Spain and Portugal.

*This project has been funded by the European Union*

# WESE Project

## Scientific partners

AZTI
MEMBER OF
BASQUE RESEARCH
& TECHNOLOGY ALLIANCE

WavEC
Offshore Renewables

HIDROMOD
modelação em engenharia

CTN

## Industrial partners

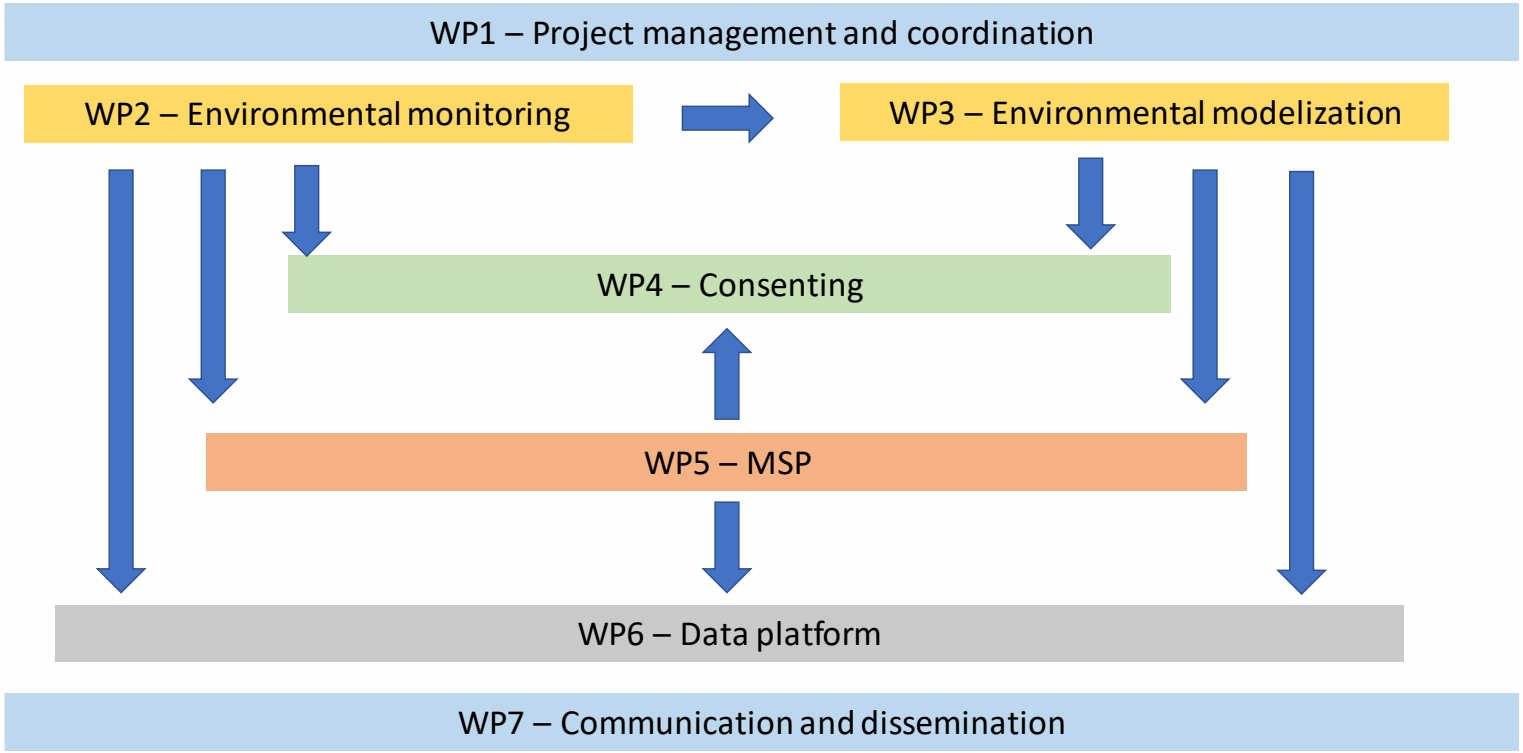
bimep

IDOM
OCEANTEC

WAVEROLLER®
by AW-Energy

This project has been funded by the European Union

# WESE Project




This project has been funded by the European Union

# Monitoring

The aim of the monitoring works is to collect process, analyse and share environmental data collected around devices operating in real conditions, representing different types of technology locations and, therefore, types of marine environment (onshore, nearshore and offshore):

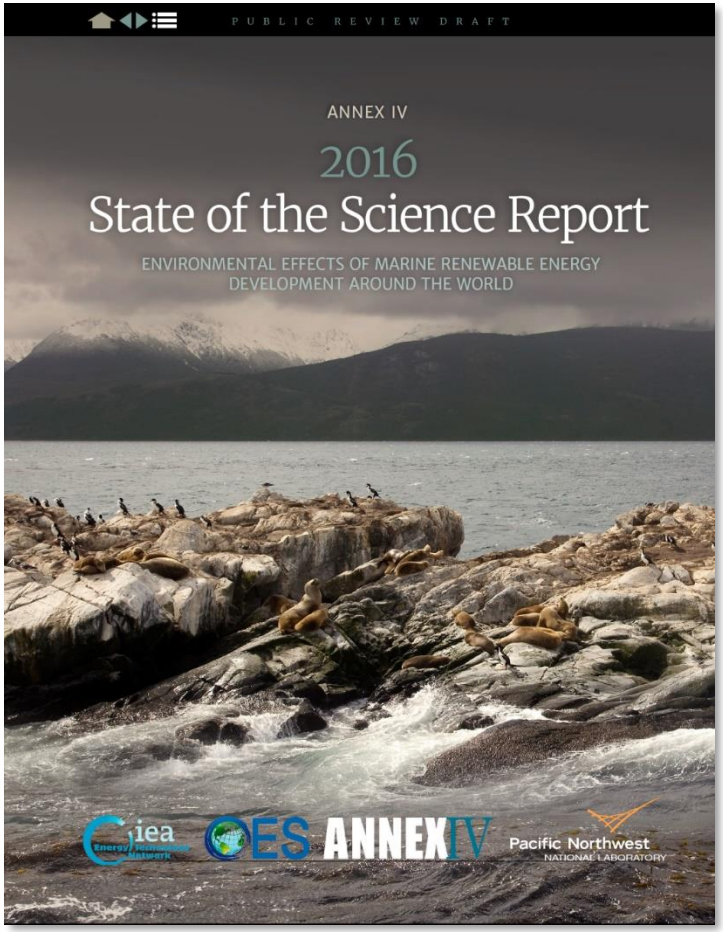
(i) IDOM MARMOK-A-5 installed in Biscay Marine Energy Platform (BIMEP) in Spain;


(ii) Wave Roller (AW Energy) installed in Peniche (Portugal)

(iii) Mutriku Wave Power Plant in operation in Spain.

oject has been funded
European Union

# Monitoring




Data will be collected for **three of the priority areas of research** identified in the *State of Science Report on environmental effects of marine renewable energy development around the world* (Copping et al, 2016):

(i) **Underwater noise emissions**

(ii) Seafloor integrity

(iii) Electromagnetic fields

First data were obtained around MARMOK-A-5 device of IDOM-Oceantec and Mutriku Wave Power Plant in the Basque Country (Northern Spain) between the 6th and 22nd of May 2019

This project has been funded by the European Union

# Underwater noise

## METHODOLOGY

Underwater sound emissions were monitored by means of a combination of static and mobile measurements:

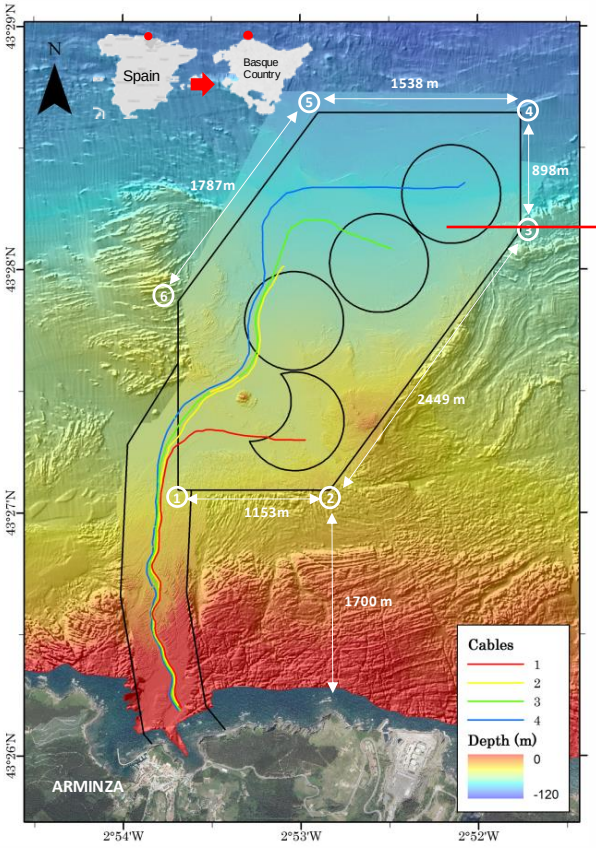
- **Static measurements:** deployment of a passive acoustic sensor moored in a specific location and for a long period of time. In this case, a SoundTrap ST300 HF of Ocean Instruments belonging to WavEC was moored in BiMEP and Mutriku test sites for a period of 45 days.

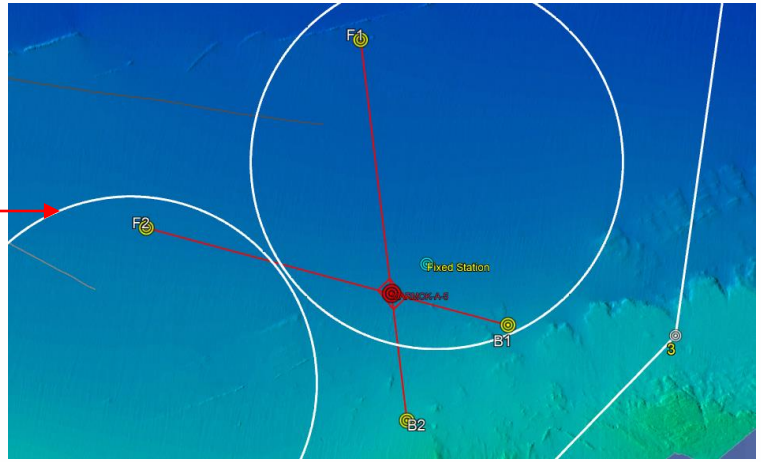
This project has been funded by the European Union

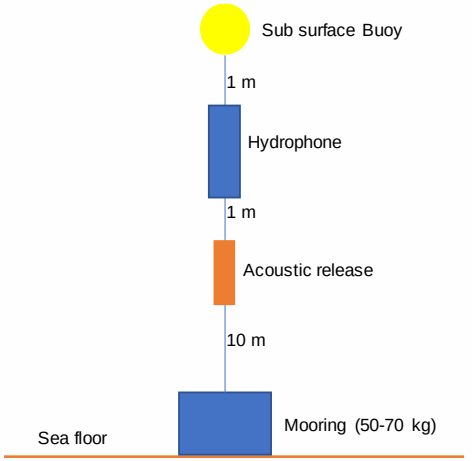
# Underwater Noise

## METHODOLOGY

### Fixed static measurements - BIMEP – Marmok



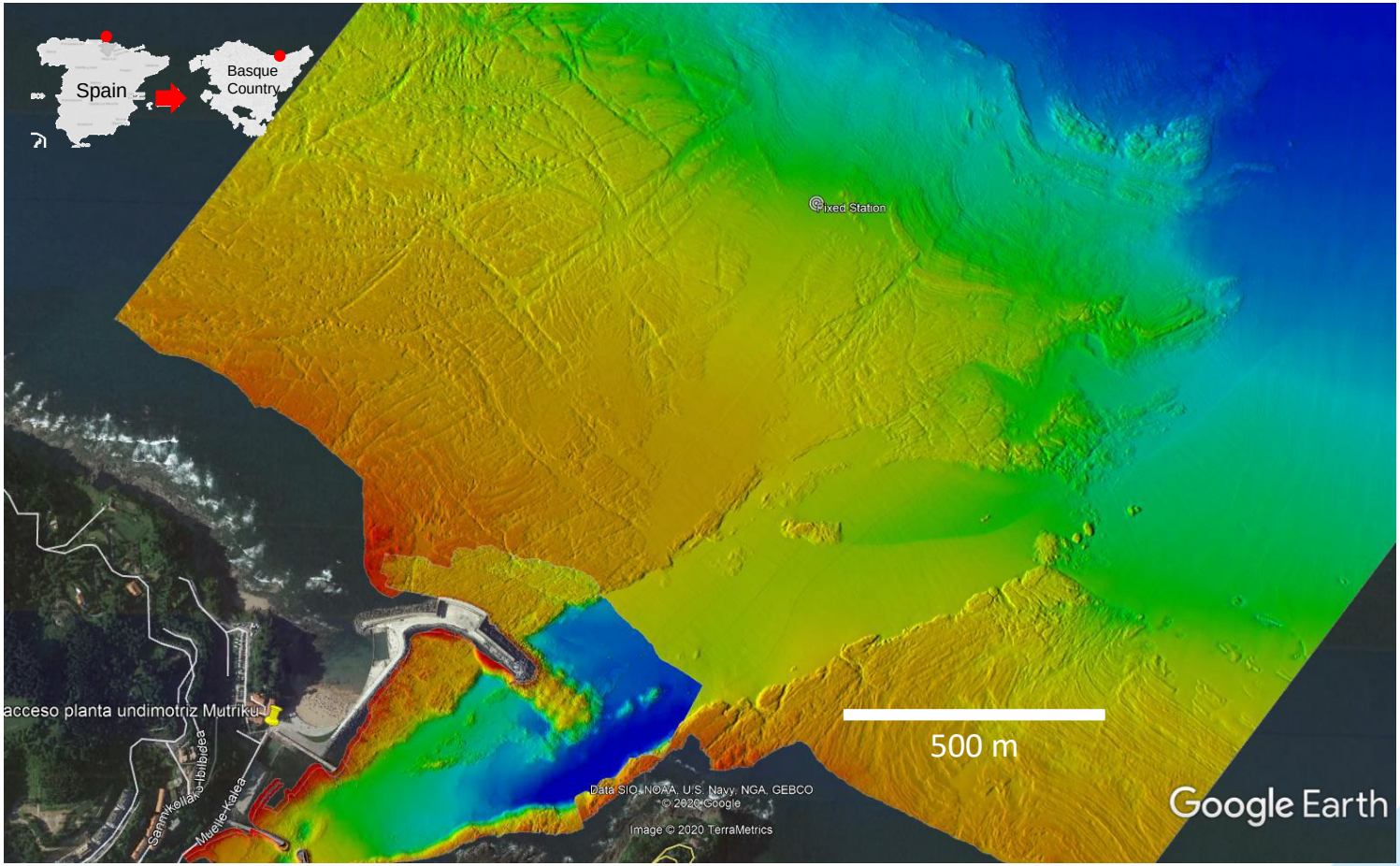




This project has been funded by the European Union

# Underwater Noise

## METHODOLOGY

### Fixed static measurements - Mutriku OWC Plant




This project has been funded by the European Union

# Underwater noise

## METHODOLOGY

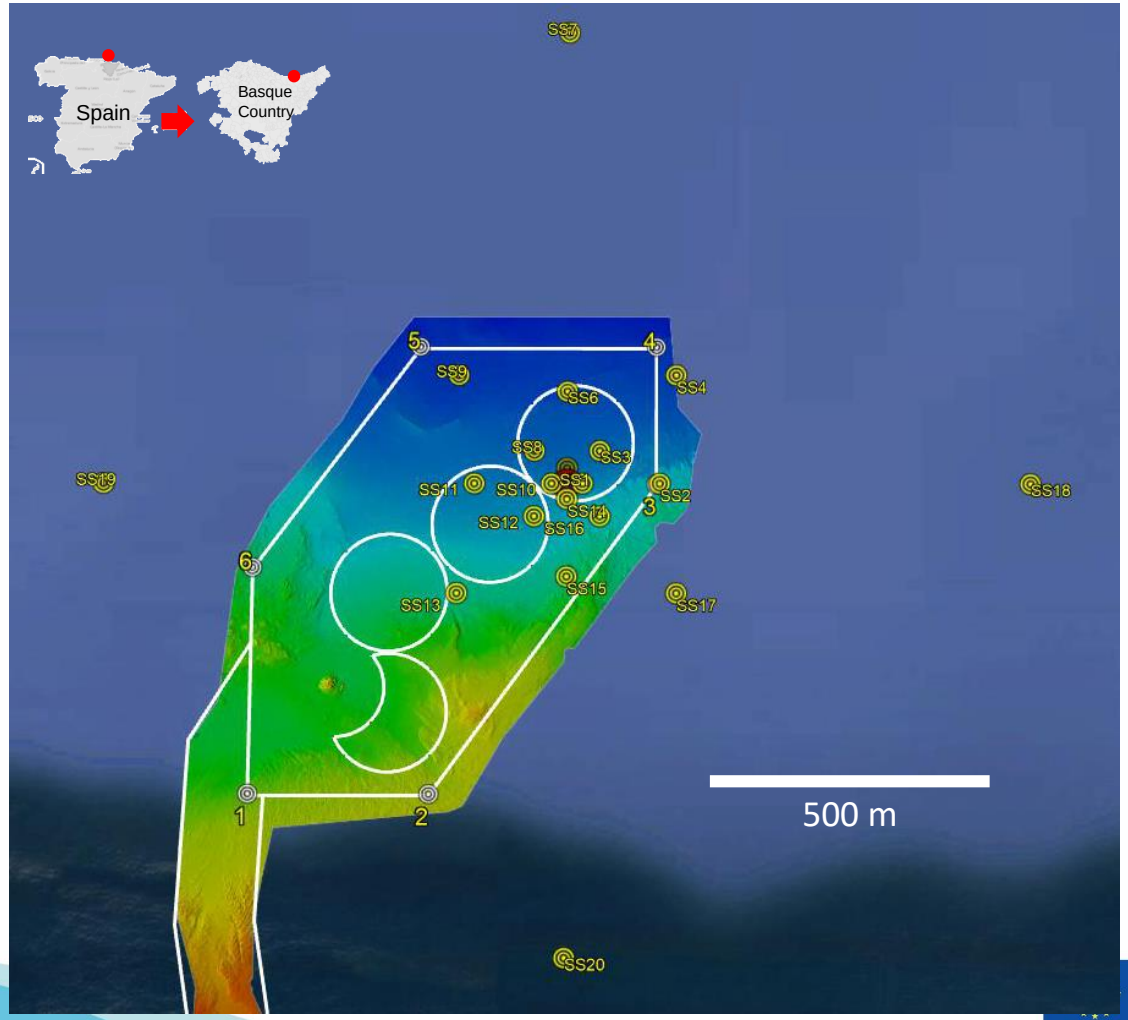
- **Mobile surveys:** passive acoustic measurements in different locations (17 sampling stations in BiMEP and Mutriku around wave energy devices) during a short period of time (5 minutes in each sampling station). The same equipment was used for the static measurements (SoundTrap ST300 HF).

This project has been funded by the European Union

# Underwater noise

## METHODOLOGY

## Mobile Measurements - BiMEP – MARMOK-A-5

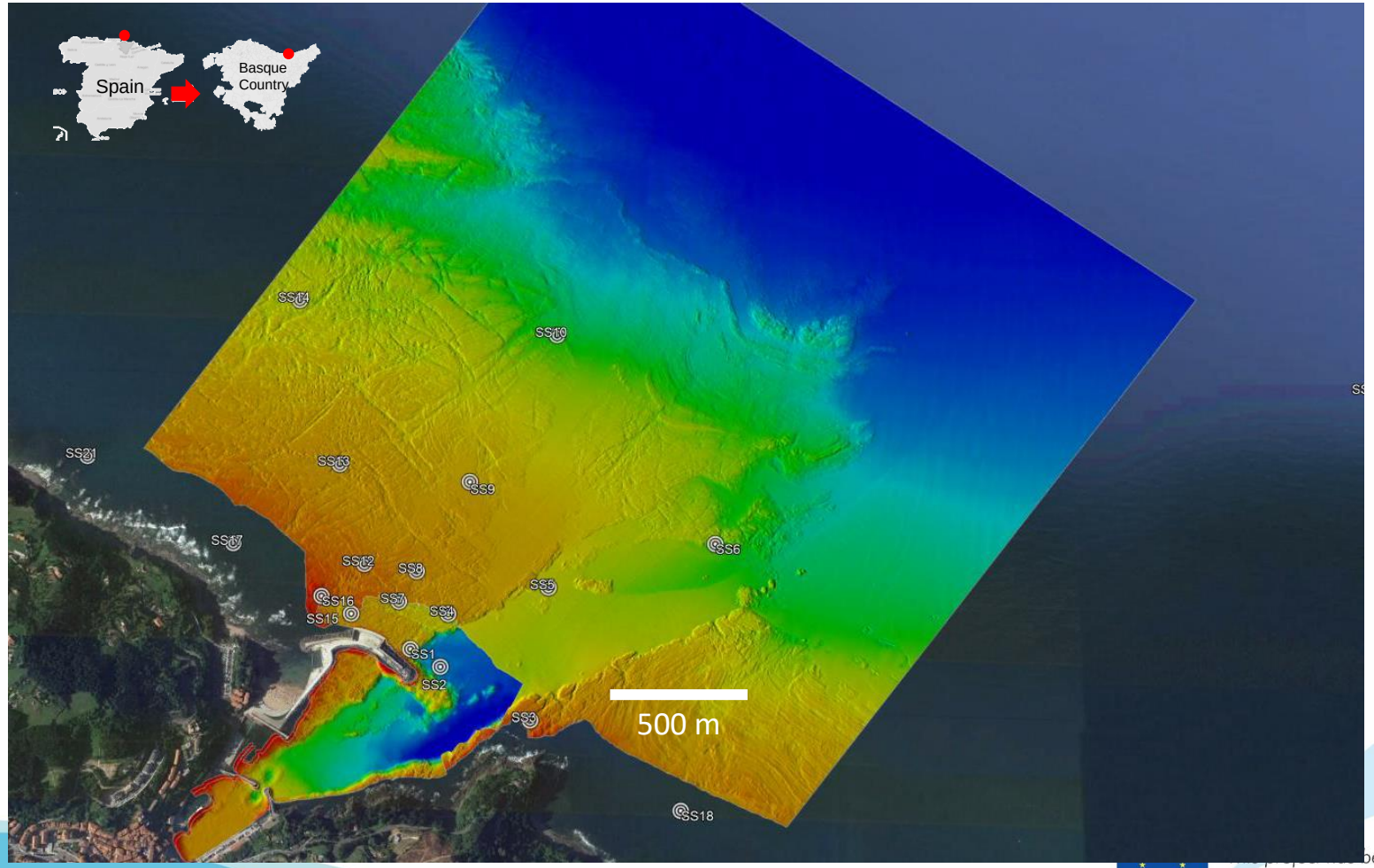



This project has been funded by the European Union

# Underwater noise

## METHODOLOGY

## Mobile Measurements Mutriku OWC Plant

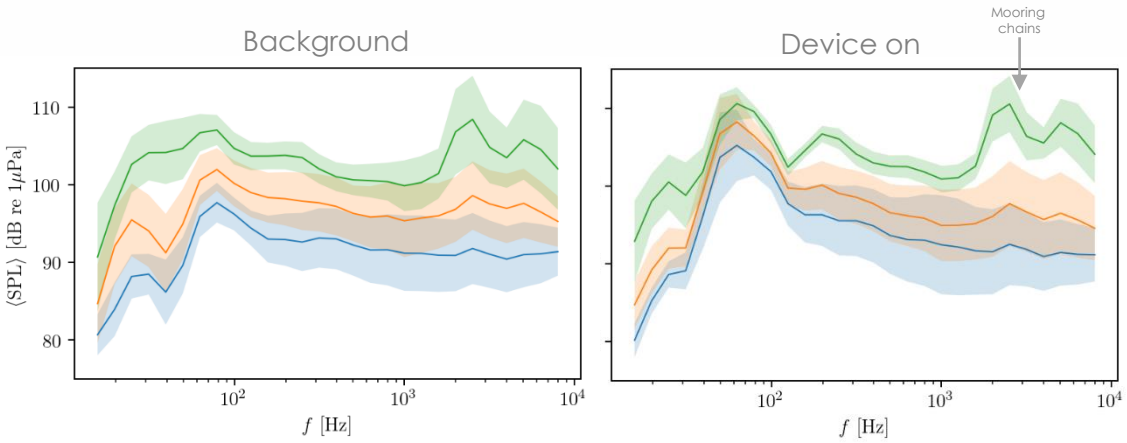


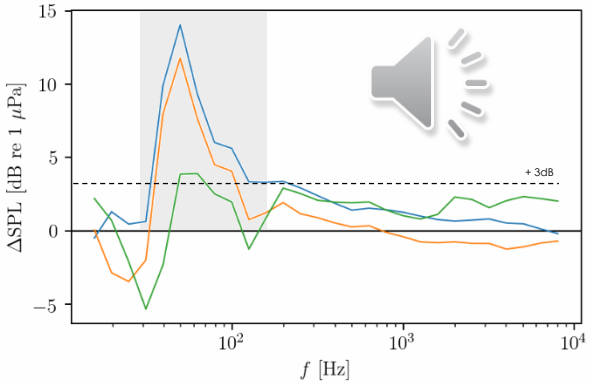

been funded by the European Union

# RESULTS FIXED MONITORING

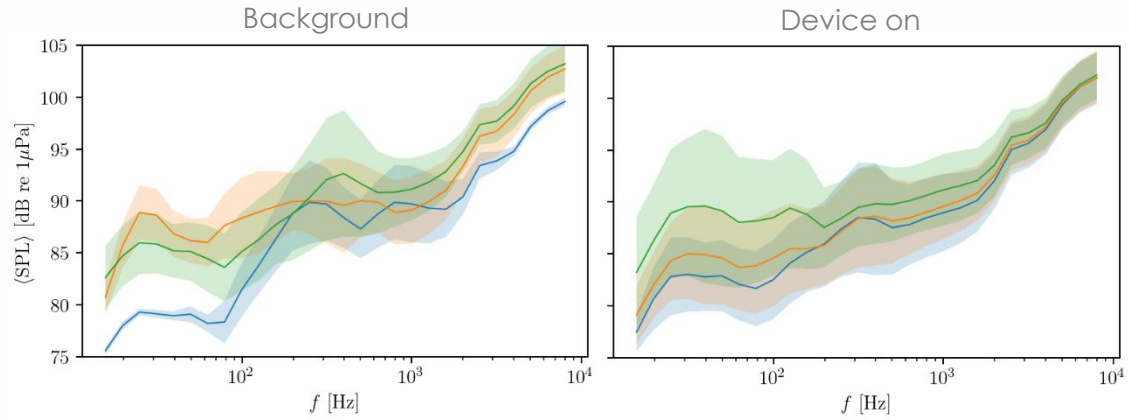
## Underwater noise

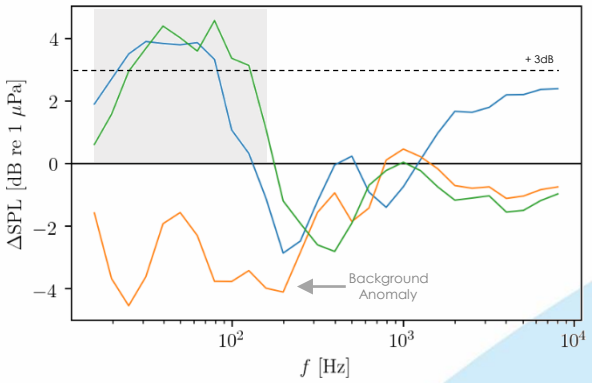
### MARMOK-A-5




### Mutriku




Sea wave hight [m]:

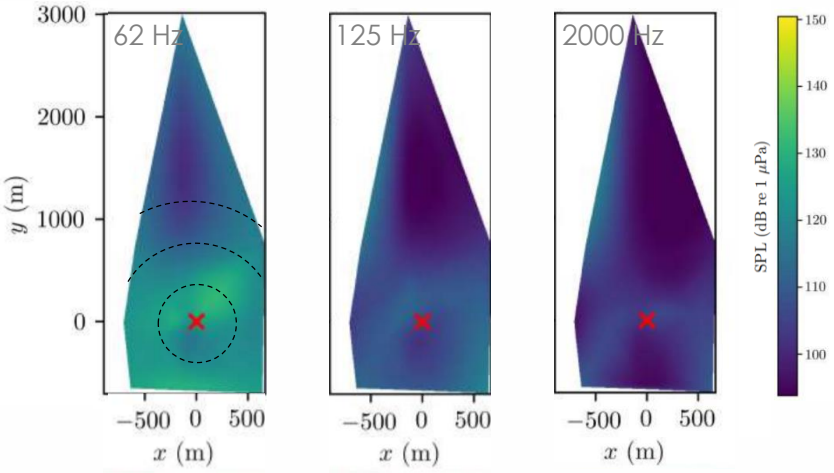
$H_w \in [0, 1)$ $H_w \in [1, 2)$ $H_w \in [2, 5)$

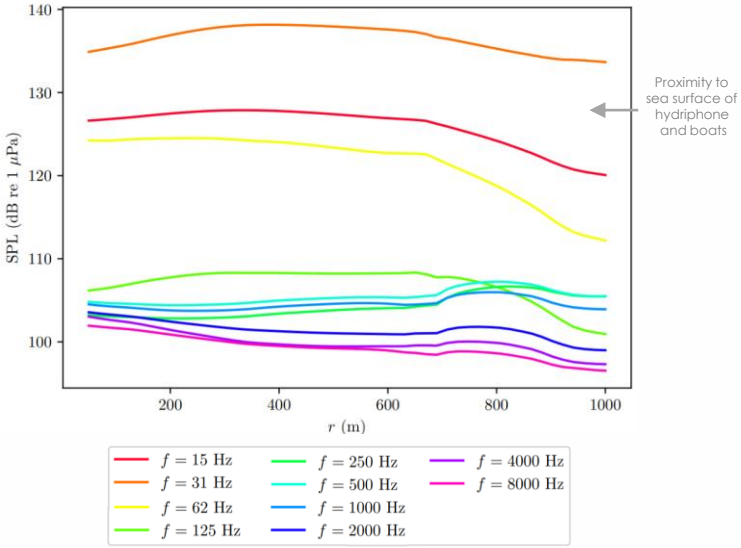
This project has been funded by the European Union

# Underwater noise

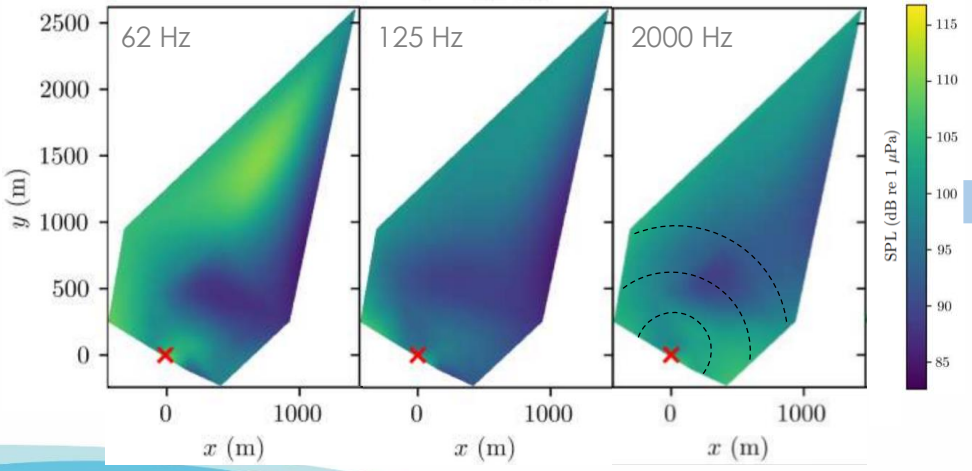
## Spatial monitoring

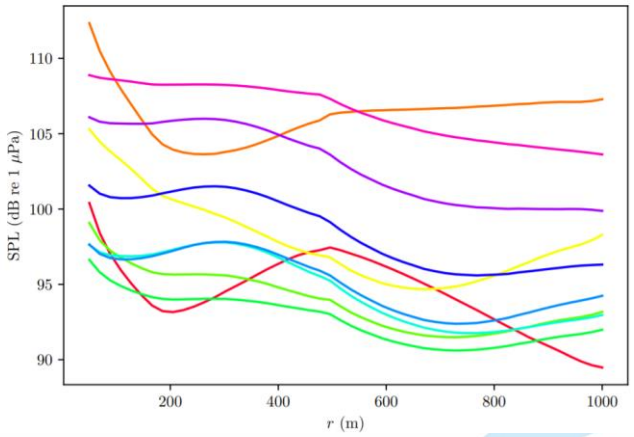
### MARMOK-A-5




### Mutriku




This project has been funded by the European Union

# Conclusions

- **MARMOK-A-5**
  - SPL peaks around 2500 Hz correspond to the noise of the mooring chains.
  - With device off, there is a SPL increase with the background, as expected:

    → total values of 90, 97, 102 dB re 1 µPa for 0m<H<5m.
  - With device on, SPL peaks between 40 and 120 Hz. Increments of:

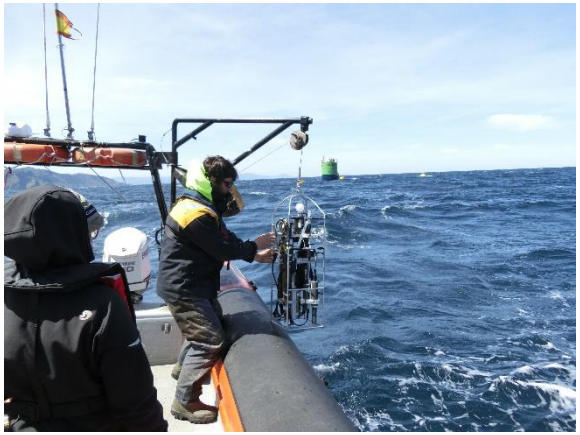
    → +4 dB (H <1m), +11 dB (1m<H<2m) and +13 dB (2m <H <5m).
  - Depending on the range, SPL decrease up to 5 dB in 1000 m.
- **Mutriku**
  - With device off, anomaly SPL increase below 200 Hz for 1m<H<2m.
  - With device on, SPL increase up to 4 dB below 200 Hz.
  - Depending on the range, SPL decrease up to 10 dB in 1000 m.

This project has been funded by the European Union

# Lessons learned

**Better suitability of autonomous and continuous long term monitoring trough fixed stations** instead of punctual mobile monitoring for underwater sound monitoring.

- When sea conditions are rough, the safety during field works could be compromised.



- When conditions are calm and more comfortable for field work, sound emissions coming from device could be not enough to detect any impact

The **methodologies** need to be **designed** in such a way that they could be able to **evaluate the directionality** of sound for ulterior analysis of sound propagation.

This project has been funded by the European Union

WESE

WAVE ENERGY IN SOUTHERN EUROPE

wese-project.eu

# Environmental Monitoring of underwater noise around wave devices in the framework of the WESE project

Juan Bald (AZTI)[2], Teresa Simas (WAVEC)[2], Iván Felis (CTN)[1] and, Erica Cruz (Wavec)

[1]Corresponding author: ivanfelis@ctnaval.com
[2]Presenting author: jbald@azti.es; tsimas@wavec.org

OES-Environmental & ORJIP International Forum #3:

Updates on Monitoring and Research Around Wave Devices

April 23, 2020

This project has been funded by the European Union