

OBSEA: An Acoustic-enabled Observatory for Underwater Noise Monitoring, Sound Source Localization and Tracking

Enoc Martínez¹, Ivan Masmitjà¹, Albert García-Benadí¹, Daniel M. Toma¹, Spartacus Gomáriz¹, Joaquín del Río¹

¹Universitat Politècnica de Catalunya (UPC), Electronics Department, Spain

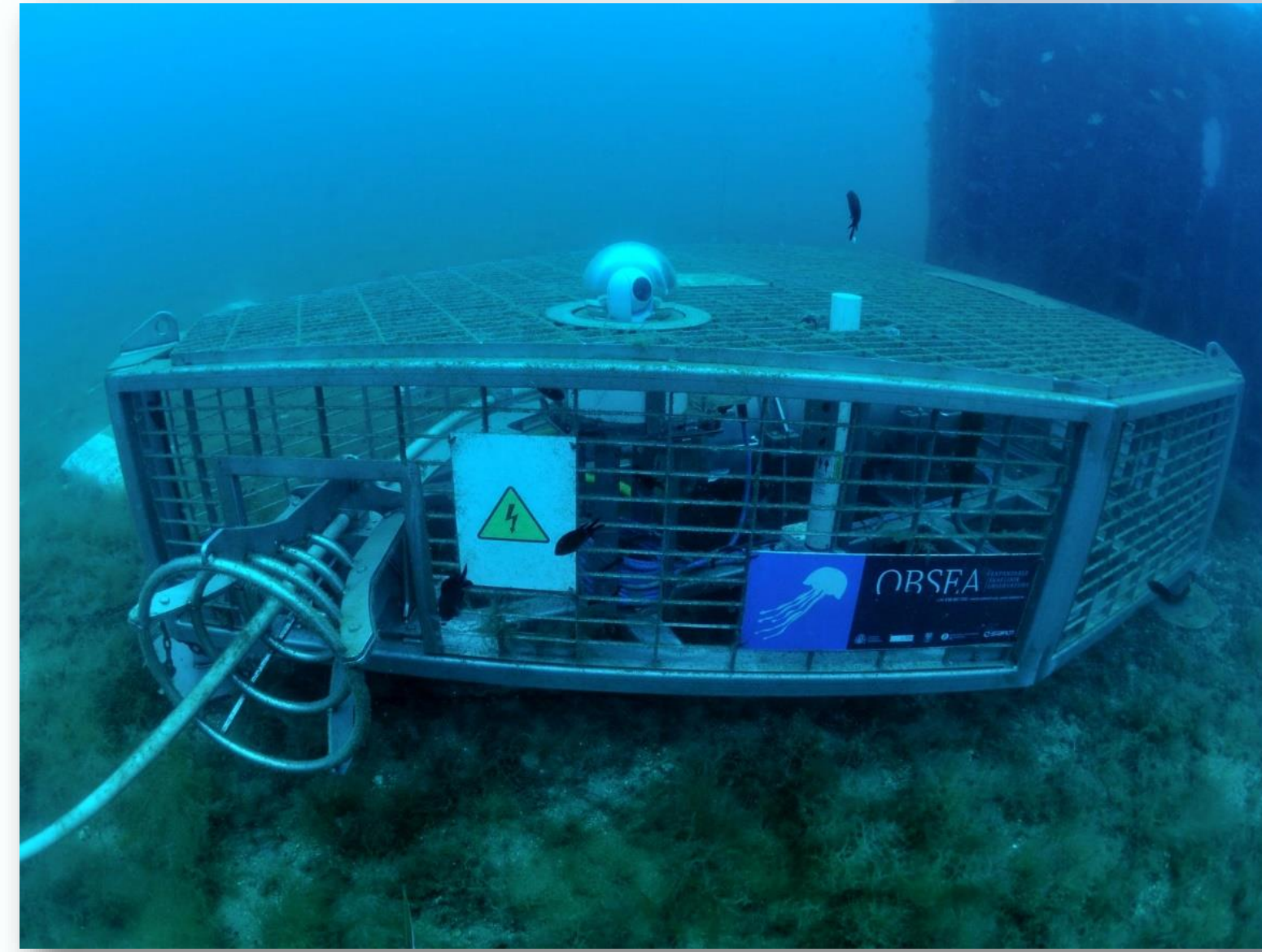
OBSEA Cabled Observatory

Location

- Cabled Observatory
- Deployed at Vilanova i la Geltrú (Spain)
- 4 km offshore
- 20 m depth

Specifications

- Power availability: 600 W
- Gigabit Ethernet communications
- Synchronization capabilities (IEEE 1588)
- Ethernet / Serial ports

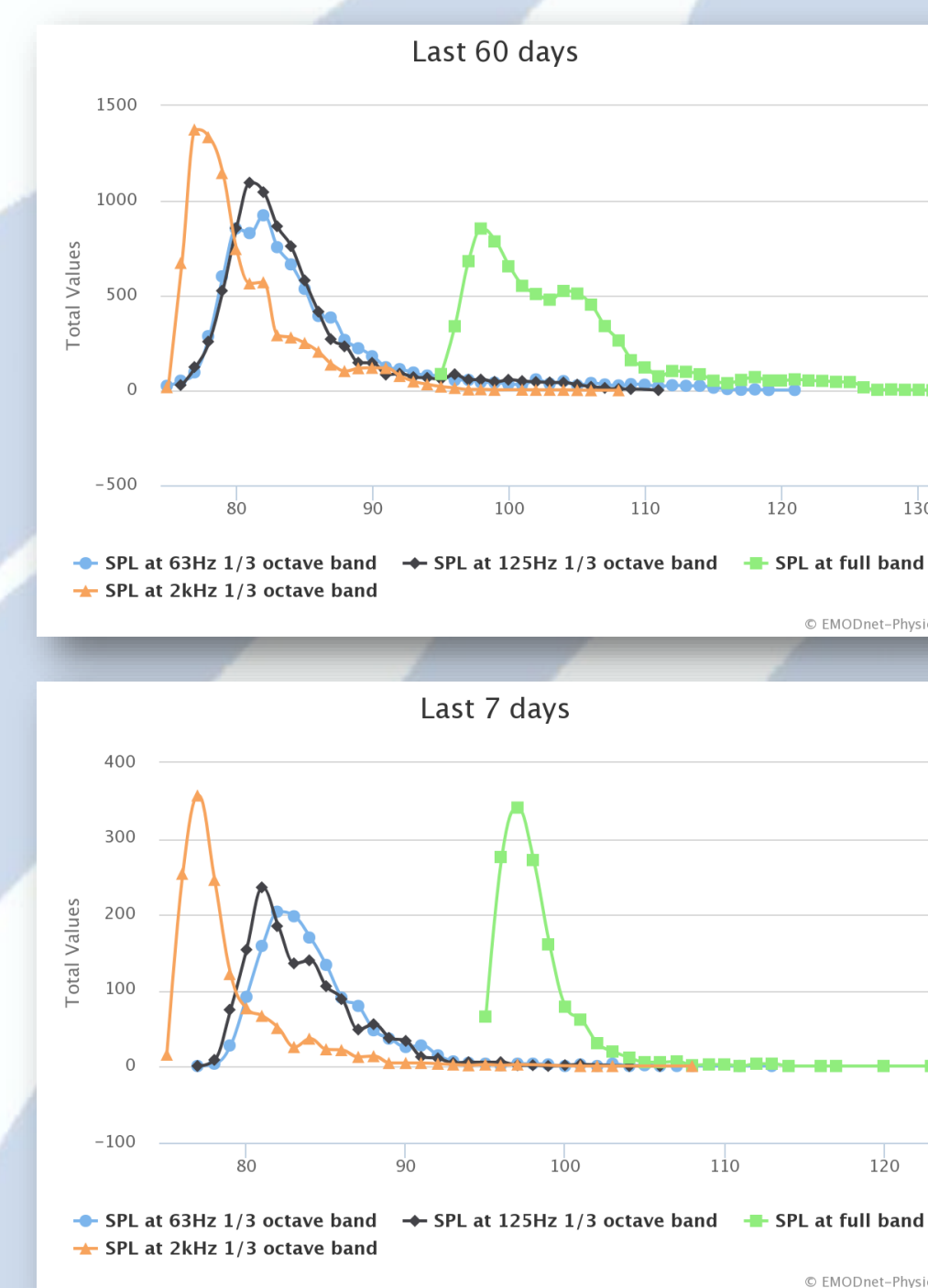
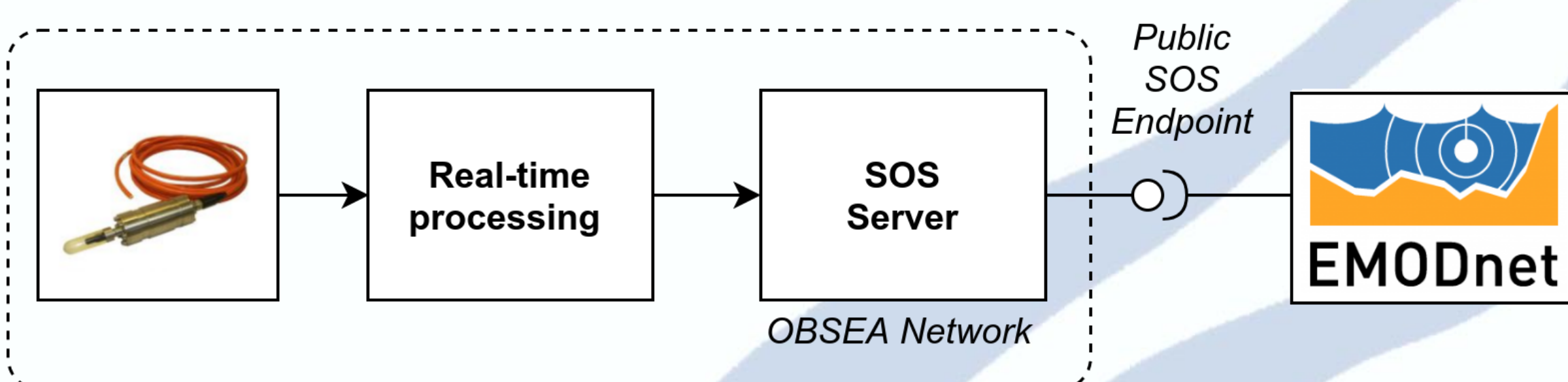


Acoustic Sensors at OBSEA

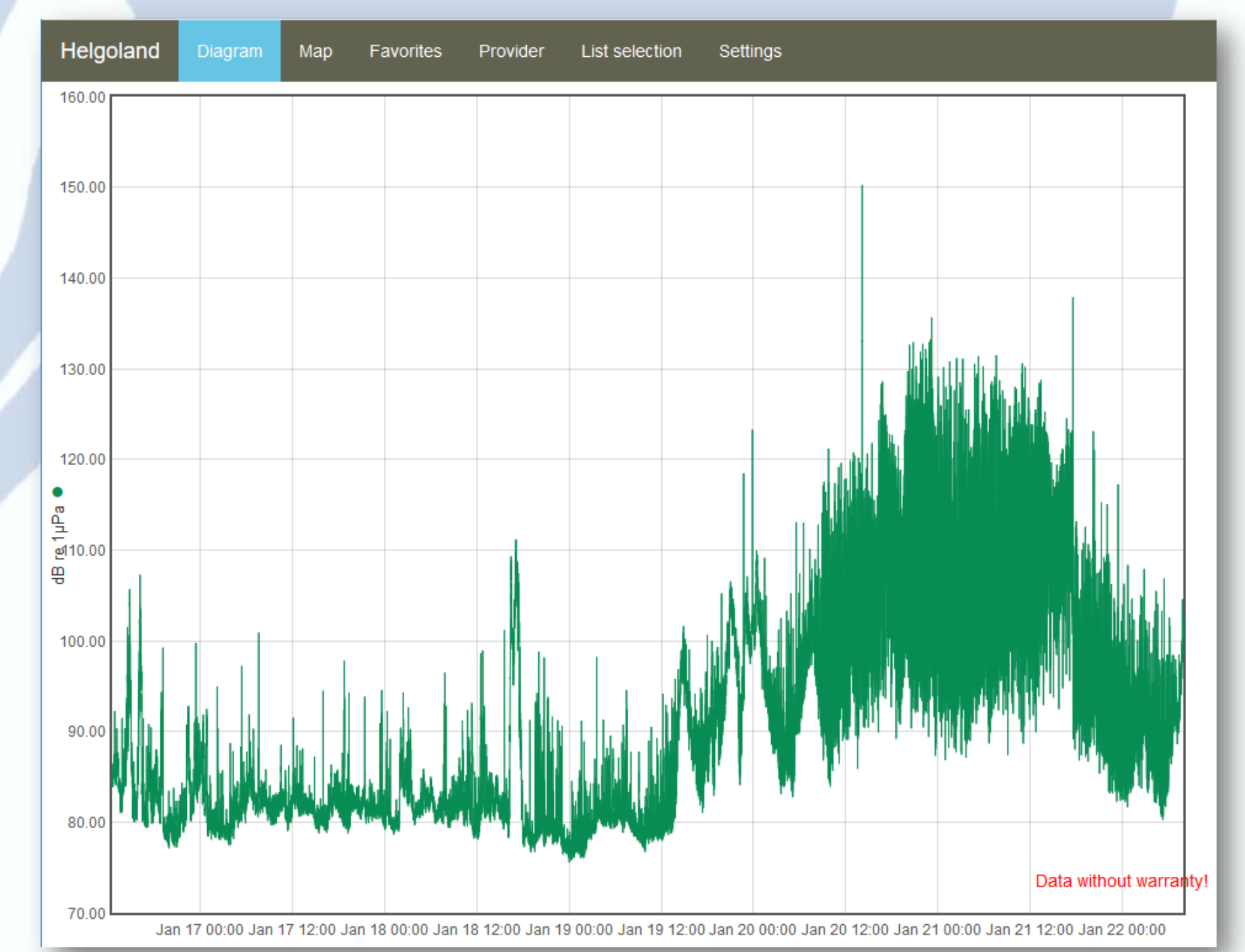
Name	Manufacturer	Sensor Type	Applications
Ethernet 02345	Bjerge-Naxys	Hydrophone	Passive acoustic monitoring
NeXOS A1	Sitep	Hydrophone	Passive acoustic monitoring
NeXOS A2	Sitep	Hydrophone Array	Sound source localization
VR2C	Vemco	Tag receiver	Tag detection
S2C-18/34	EvoLogics	modem	Communications
S2C-18/34	EvoLogics	modem/USBL	Communications, tag localization

Underwater Noise Monitoring

- Real-time sound Pressure Levels (SPLs)
- Compliant with MSFD directive (63 and 125 Hz)
- SWE compatible endpoint (Sensor Observation Service)
- Published in real-time at EMODnet-Physics



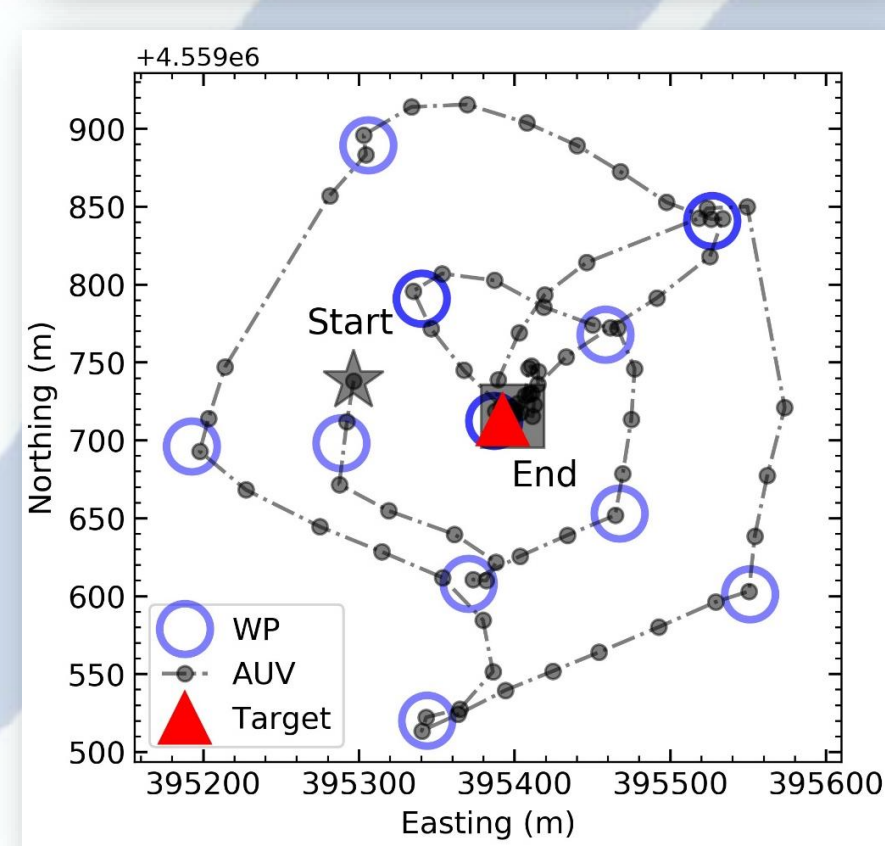
EMODnet-Physics histograms of SPLs at 63, 125 and 2000 Hz (accessed 05/02/2020)



SPL at 125 Hz 1/3 octave band from 17/01/2020 to 22/01/2020
Helgoland SWE Viewer

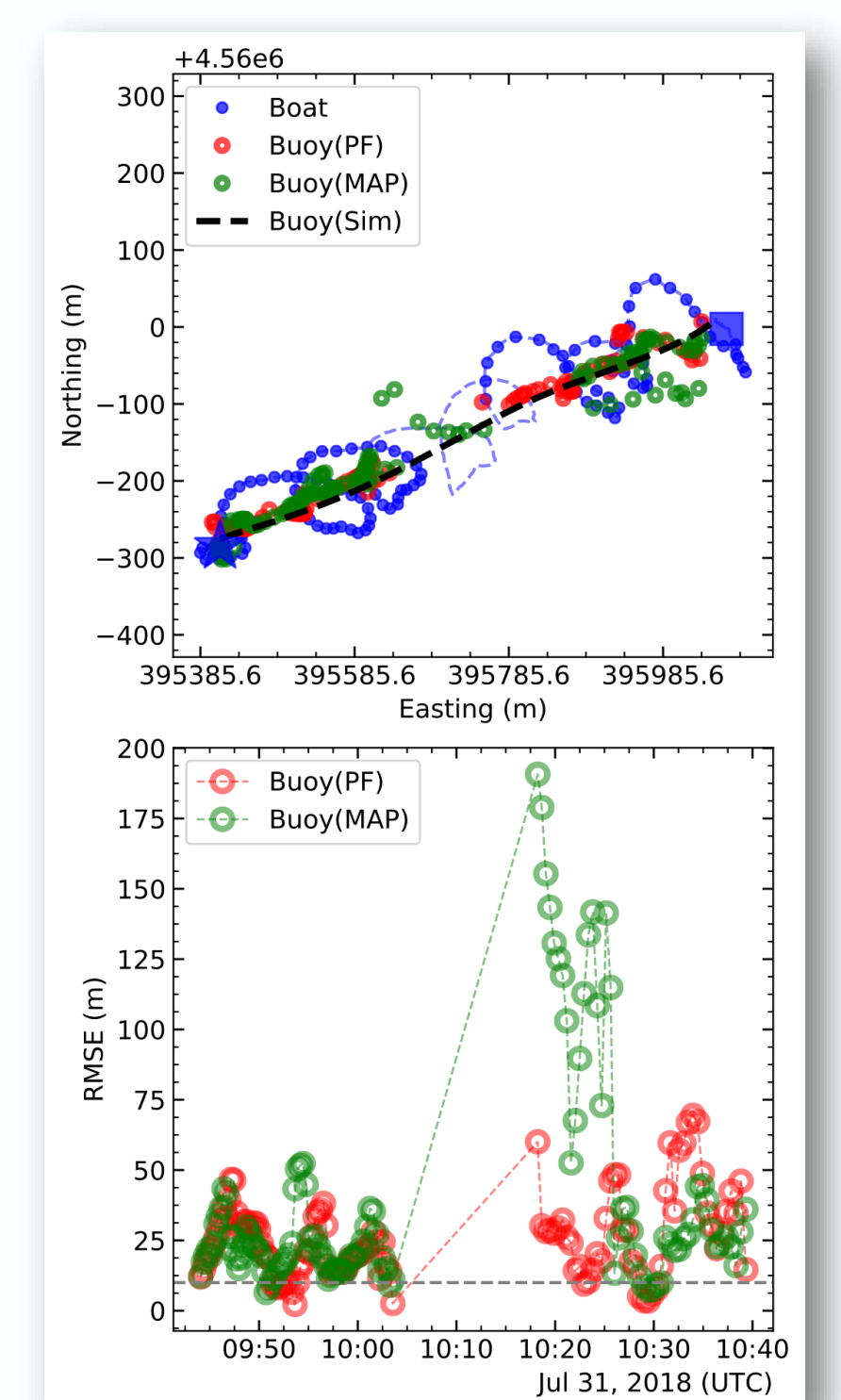
Static Target Tracking

- Range-only Single-Beacon (ROSB)
- Vehicle: Guanay II AUV
- LinkQuest Acoustics modems
- Pentagon-shaped path
- Range measurement each 30 seconds



Moving Target Tracking

- Moving target: drifting buoy
- Evologics S2C-18/34 modems
- Compared Algorithms:
 - Partiel Filter (PF)
 - Maximum A Posteriori Estimation (MAP)
- PF outperforms MAP:
 - Better Precision
 - Better recovery time



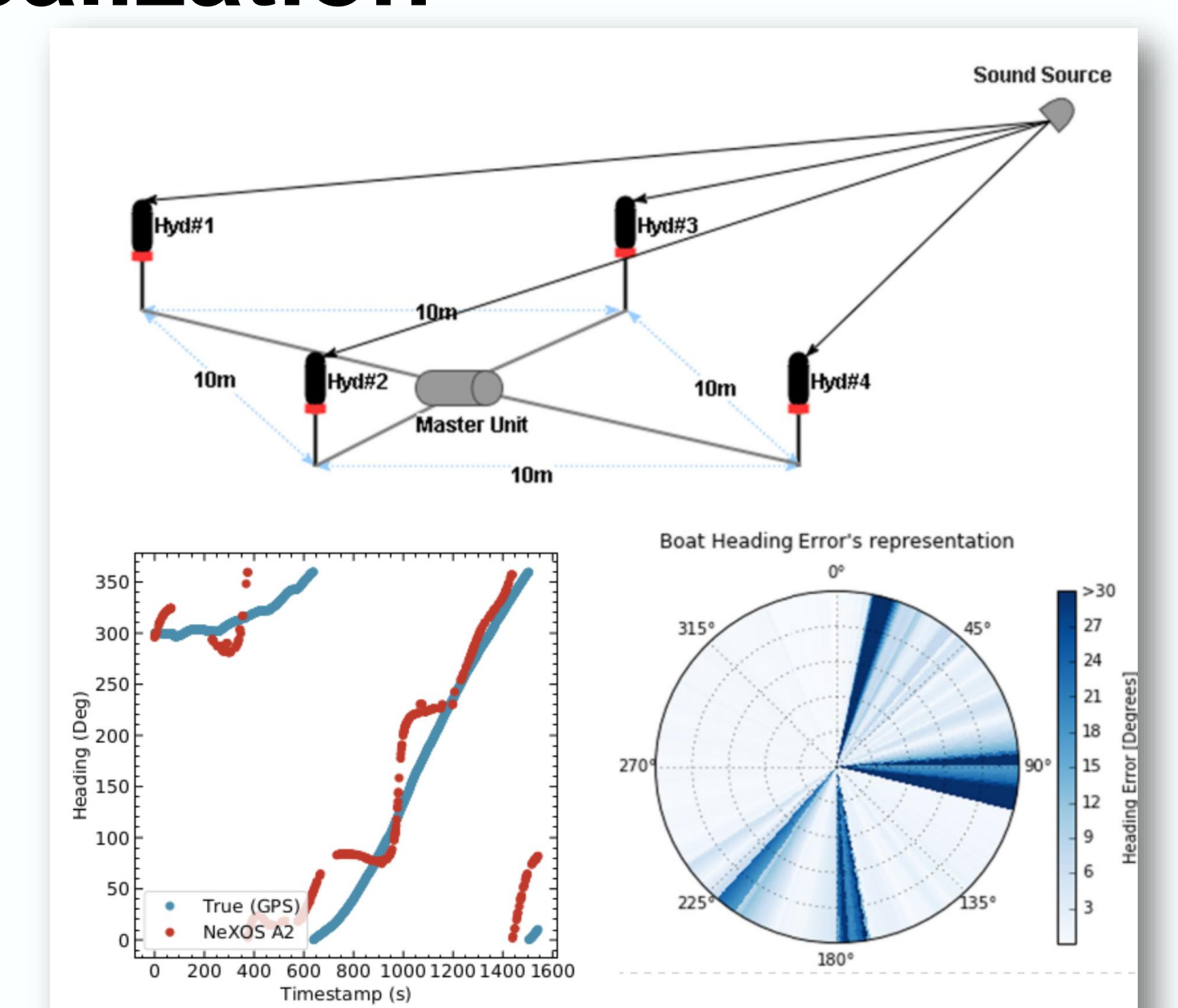
Marine Animal Tracking

- Behavioural study of Norway lobsters (*Nephrops Norvegicus*) using tags
- Sustainable fishing stock management
- Presence absence detection (tag receiver)
- Movement patterns (USBL, NeXOS A2)



Sound Source Localization

- NeXOS A2 Hydrophone Array
 - 4 Hydrophones
 - Master unit
- Synchronized with IEEE 1588
- In-situ processing
- Localization by Time of arrival difference



Acknowledgments: This work is partially funded by the EMSO-Link Project under the European Union's Horizon 2020 programme (agreement n° 731036) and by Generalitat de Catalunya "Sistemas de Adquisición Remota de datos y Tratamiento de la Información en el Medio Marino" (SARTI-MAR) 2017 SGR 371. Researchers want to acknowledge the support of the Associated Unit Tecnoterra composed by members of Universitat Politècnica de Catalunya (UPC) and the Consejo Superior de Investigaciones Científicas (CSIC).