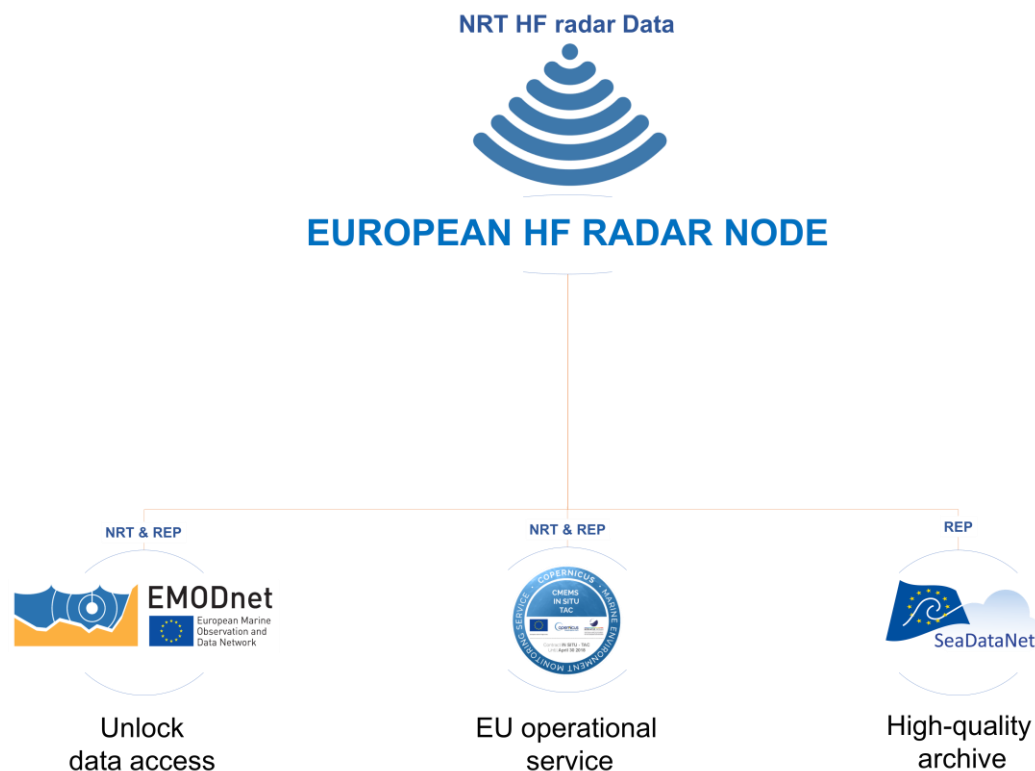


The European HFR Node

focal point to promote land-based remote sensing of coastal surface currents and its applications



L. Corgnati, C. Mantovani, A. Griffa (CNR-ISMAR), J.L. Asensio, A. Rubio, J. Mader (AZTI), E. Reyes (SOCIB), A. Novellino (ETT), P. Gorringer (SMHI)

High Frequency Radar technology

- Land-based remote sensing of coastal ocean processes
- High Frequency (HF): from 3 to 30 MHz (wavelength from 10 m to 100 m)
- Provides maps of coastal ocean surface currents
- Wide coverage areas: up to 200 km off the coast
- High spatial and temporal resolutions: typically few kms & hourly



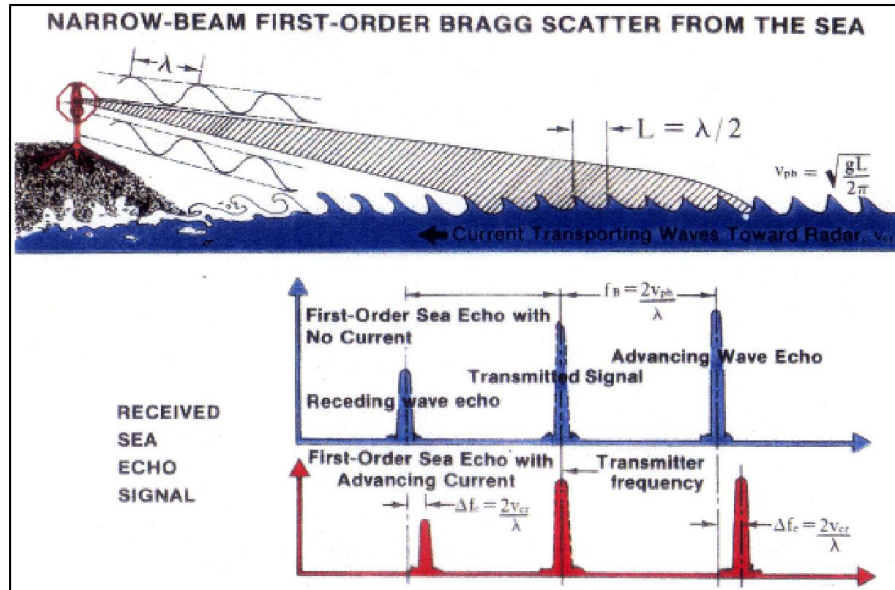
WERA HF radar (source: Elektronik Lab)



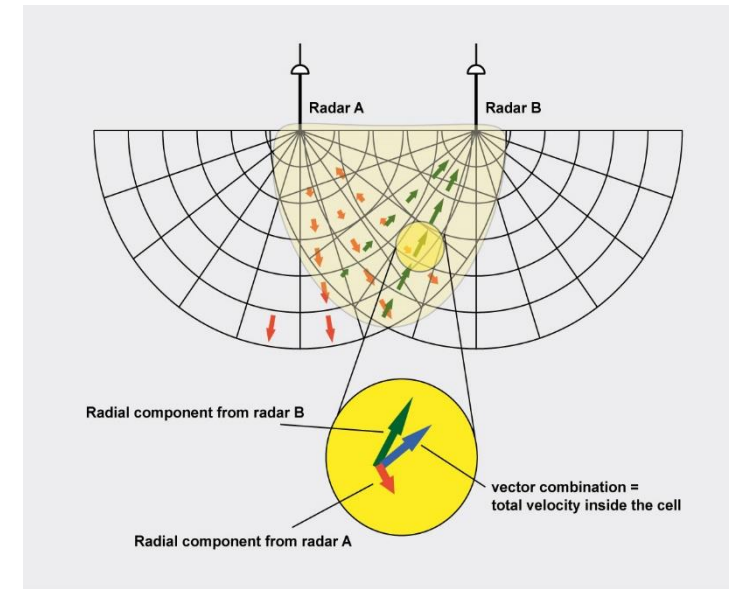
Codar HF radar (source: NOAA)

High Frequency Radar technology

- Land-based remote sensing of coastal ocean processes
- High Frequency (HF): from 3 to 30 MHz (wavelength from 10 m to 100 m)
- Provides maps of coastal ocean surface currents
- Wide coverage areas: up to 200 km off the coast
- High spatial and temporal resolutions: typically few kms & hourly

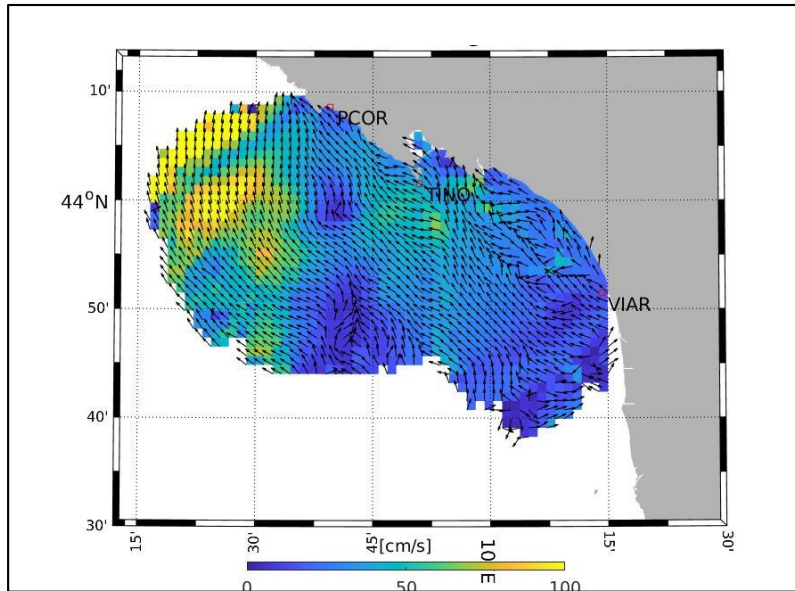


Source: Barrick et al., 1977

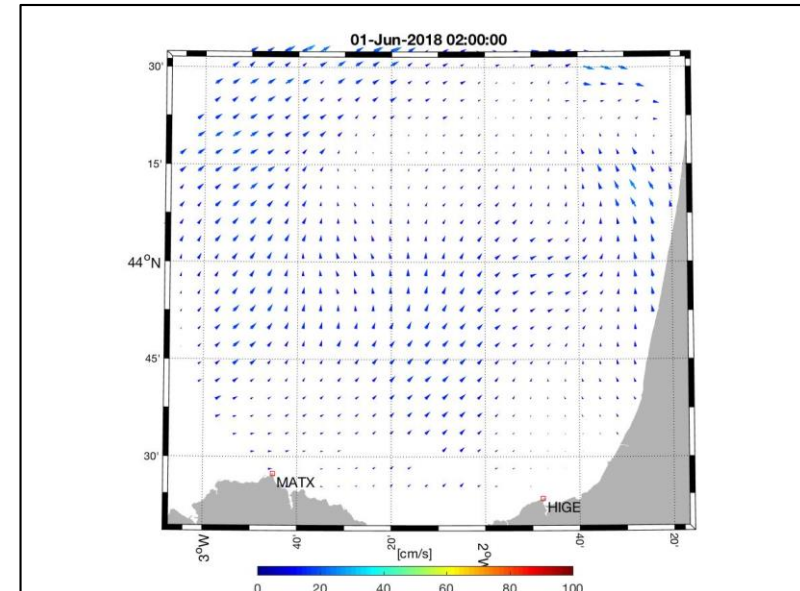


High Frequency Radar technology

- Land-based remote sensing of coastal ocean processes
- High Frequency (HF): from 3 to 30 MHz (wavelength from 10 m to 100 m)
- Provides maps of coastal ocean surface currents
- Wide coverage areas: up to 200 km off the coast
- High spatial and temporal resolutions: typically few kms & hourly



Current field from HFR-TirLig network (Ligurian Sea)



Current field from HFR-EUSKOOS network (Bay of Biscay)

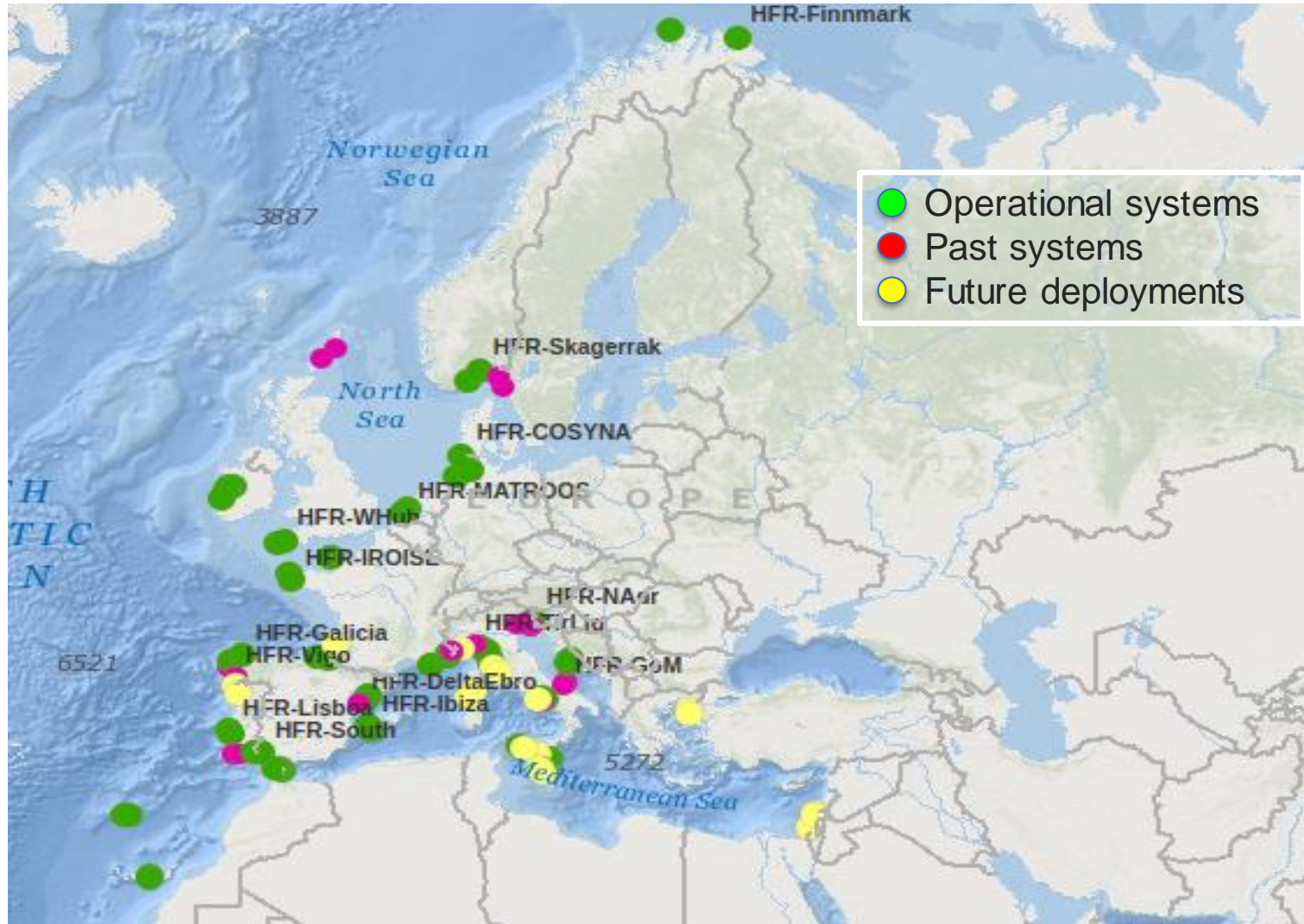
High Frequency Radar applications

- Search and Rescue
- Renewable energy
- Fishery management
- Monitoring of pollutants and biological quantities
- Lagrangian studies and connectivity between marine areas
- Monitoring of ocean processes (currents, waves)
- Ship detection
- Keystone for model assessment
- Coastal ocean model improvements, by Data Assimilation.

**Scientific, operational and societal applications
need high-quality HF radar data.**

Towards a pan-European HFR network

Over 81 HFR sites currently operating and a number in the planning stage.



Growth rate of 7 new systems per year since 2016.

Source: <http://eurogoos.eu>.

Towards a pan-European HFR network

- **Synergy of different initiatives and projects at European level aiming at:**
 - being effective in the **implementation of the coordinated development of coastal High Frequency Radar technology and its products**
 - establishing **the operational HFR European network.**
- **Active initiatives and projects:**
 - **EuroGOOS HFR Task Team**
 - **EMODnet Physics**
 - EU project **Jerico-S3 (follow up of Jerico-Next ended in September 2019)**
 - EU project **SeaDataCloud**
 - **Tender CMEMS INSTAC Phase 2 (follow up of CMEMS Service Evolution tender INCREASE)**
 - EU project **EuroSea**
- **Collaboration with: IOOS** (US Integrated Ocean Observing System), **IMOS-ACORN** (Integrated Marine Observing System Australian Coastal Ocean Radar Network), **ROWG** (Radiowave Operators Working Group).

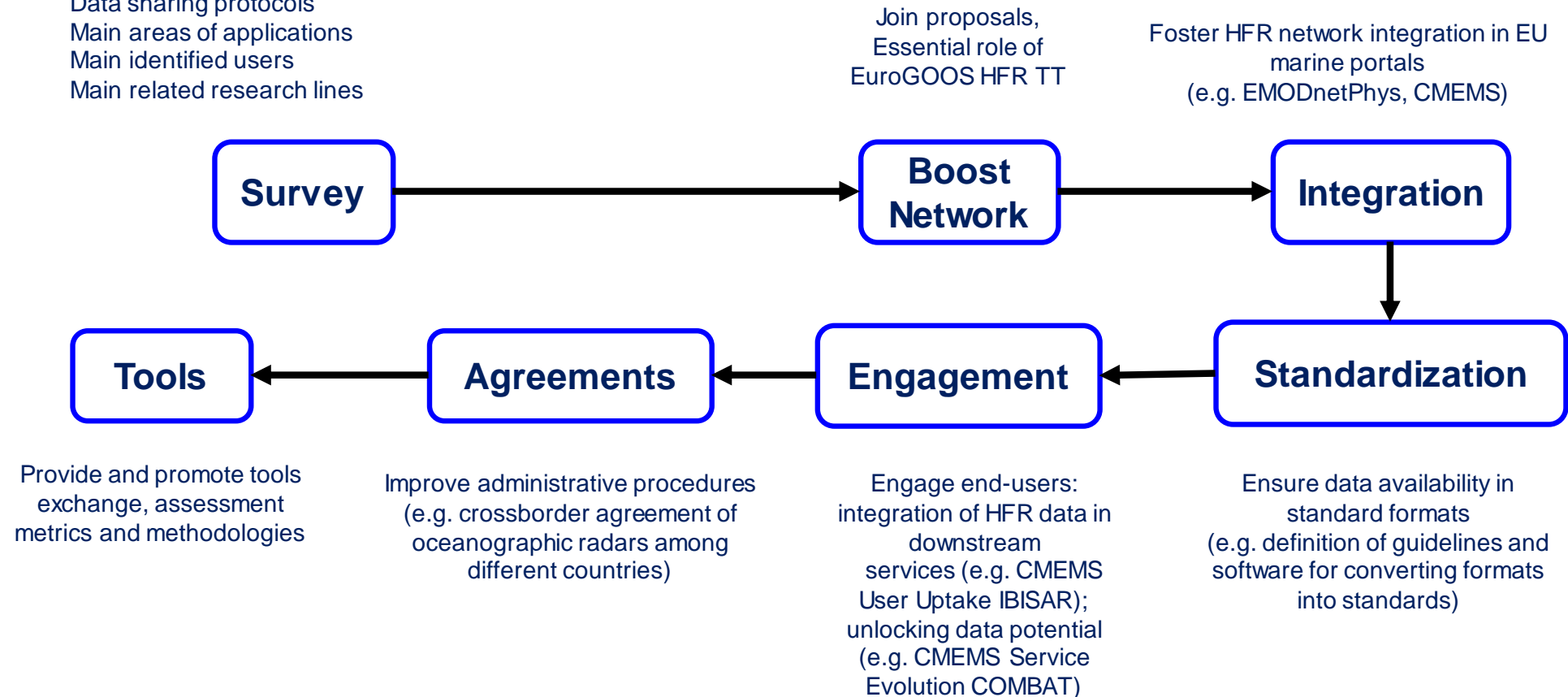
Towards a pan-European HFR network

- **Synergy of different initiatives and projects at European level aiming at:**
 - being effective in the **implementation of the coordinated development of coastal High Frequency Radar technology and its products**
 - establishing **the operational HFR European network.**
- **Active initiatives and projects:**
 - **EuroGOOS HFR Task Team**
 - **EMODnet Physics**
 - EU project **Jerico-S3**
 - EU project **SeaDataCloud**
 - **Tender CMEMS INSTAC Phase 2**
 - EU project **EuroSea**
- **Inclusion of HFR data into the major European platforms for marine data distribution:**
 - **CMEMS-INSTAC**
 - **SeaDataCloud**
 - **EMODnet Physics**
- **Collaboration with: IOOS** (US Integrated Ocean Observing System), **IMOS-ACORN** (Integrated Marine Observing System Australian Coastal Ocean Radar Network), **ROWG** (Radiowave Operators Working Group).

Towards a pan-European HFR network

Launched by EuroGOOS HFR TT to provide:

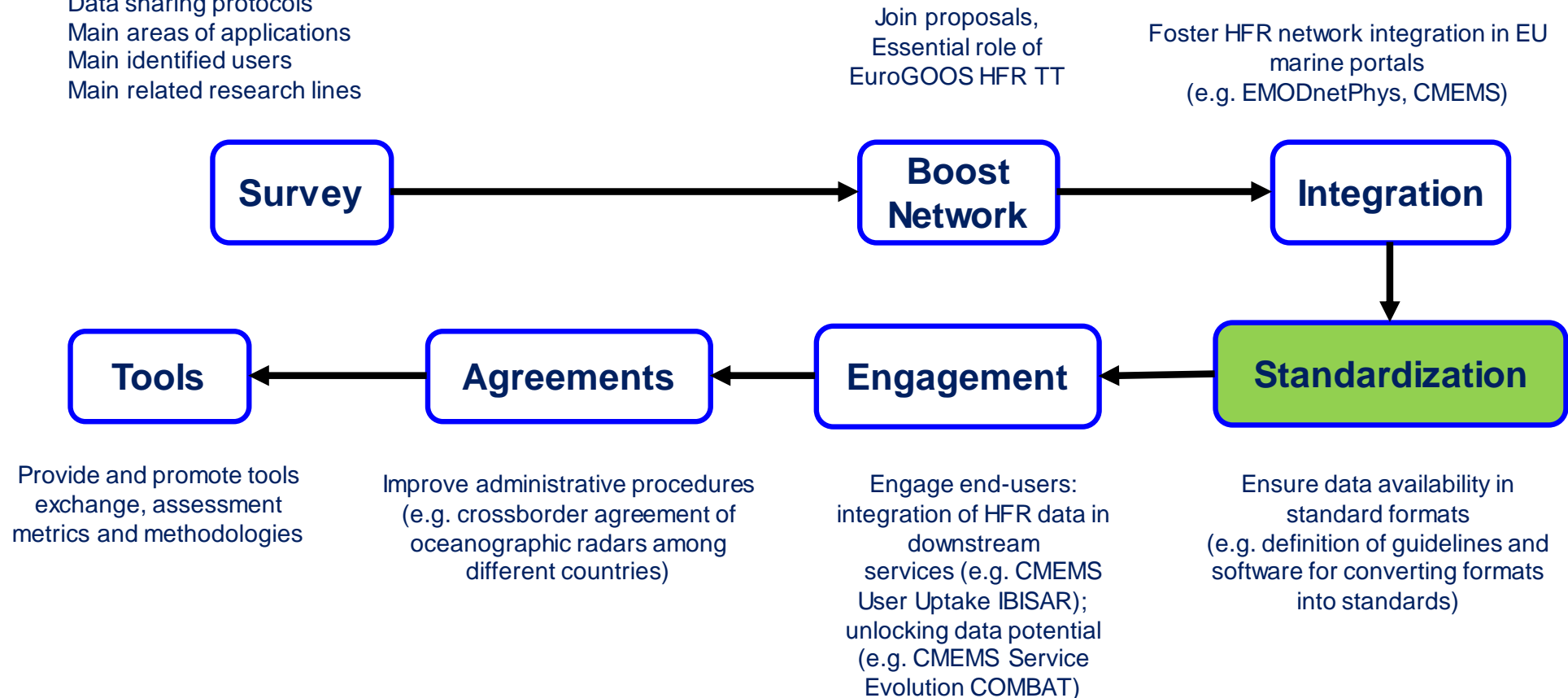
- General overview of EU HFR system
- Main HFR operation & maintenance issues
- Standardization
- Data sharing protocols
- Main areas of applications
- Main identified users
- Main related research lines



Towards a pan-European HFR network

Launched by EuroGOOS HFR TT to provide:

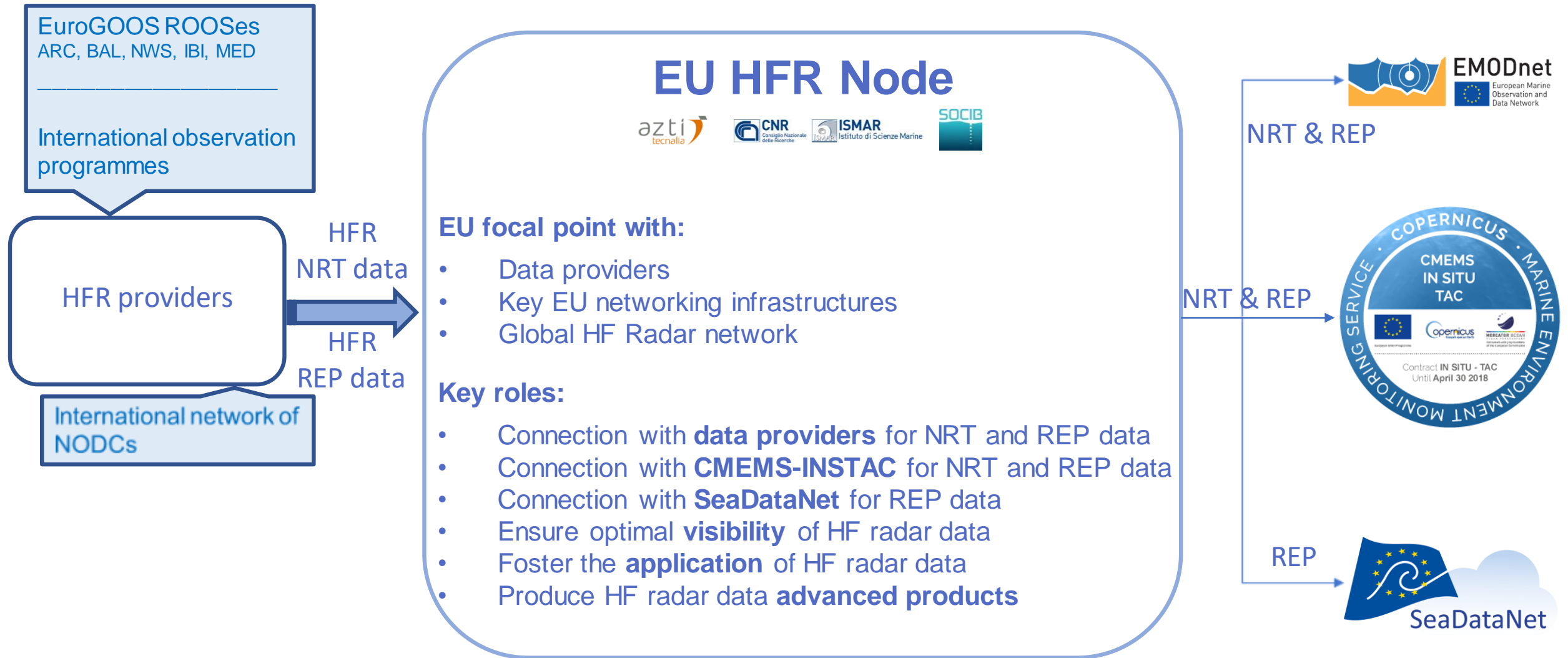
- General overview of EU HFR system
- Main HFR operation & maintenance issues
- Standardization
- Data sharing protocols
- Main areas of applications
- Main identified users
- Main related research lines



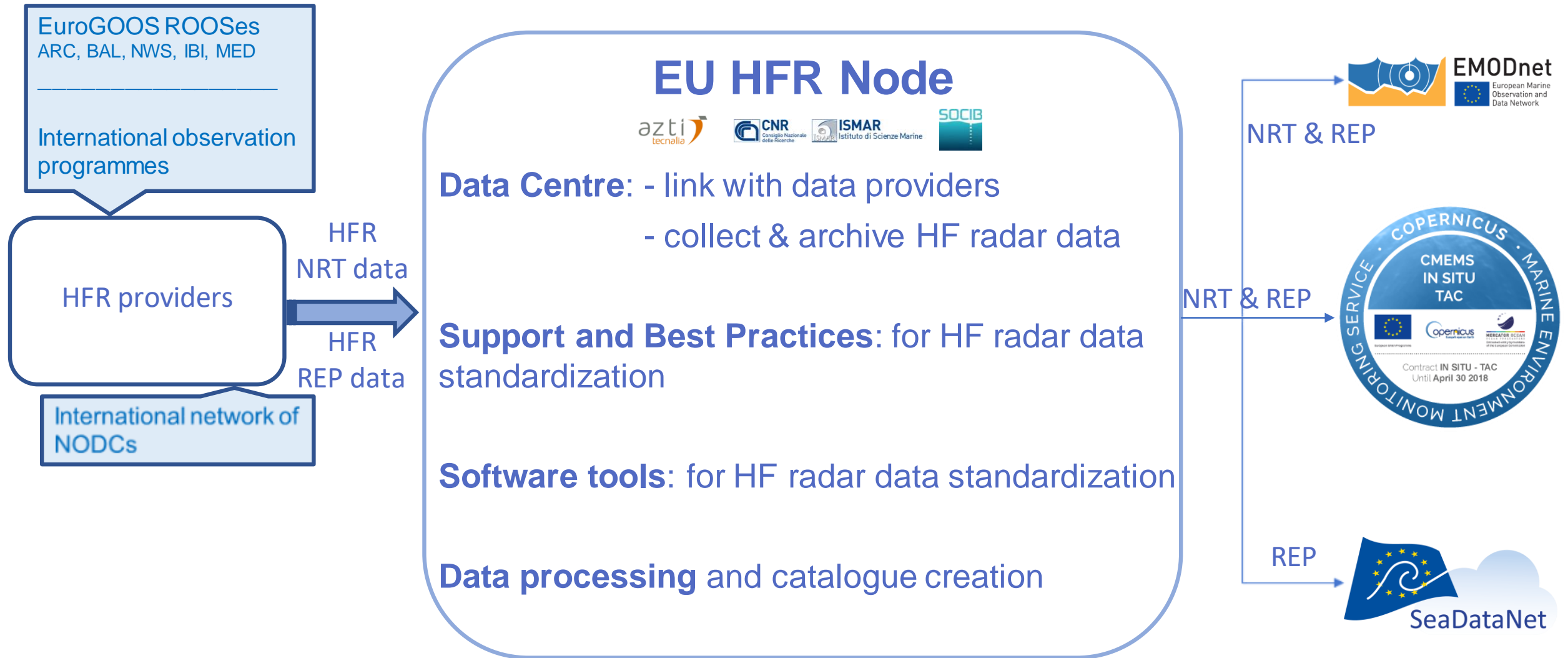
The standard data, metadata and QC model

- The purpose of the data model specification is to ensure both efficient and automated HFR data discovery and interoperability, with tools and services across distributed and heterogeneous earth science data systems.
- The recommendations for producing HFR data in the European common model have been published in **Jerico-Next D5.14 deliverable** including **SDC compliance**, specifying:
 - File format: *netCDF-4 classic model*
 - Global attribute scheme: mandatory and recommended attributes
 - Dimensions, coordinate variables, data variables and QC variables specification and syntax
 - Quality Control tests and flagging policy
- The data model complies with **CF-1.6**, **OceanSITES** convention, **CMEMS-INSTAC** requirements, **SDC CF extension requirements** and **INSPIRE** directive.
- The QC model has been defined according to the **DATAMEQ** recommendations and building on the **QARTOD** manual (produced by **IOOS**).

The EU HFR Node



The EU HFR Node



Status of the activities

HFR NETWORKS INTEGRATED IN THE EU HFR NODE WORKFLOW



From marineinsitu.eu/dashboard

Status of the activities

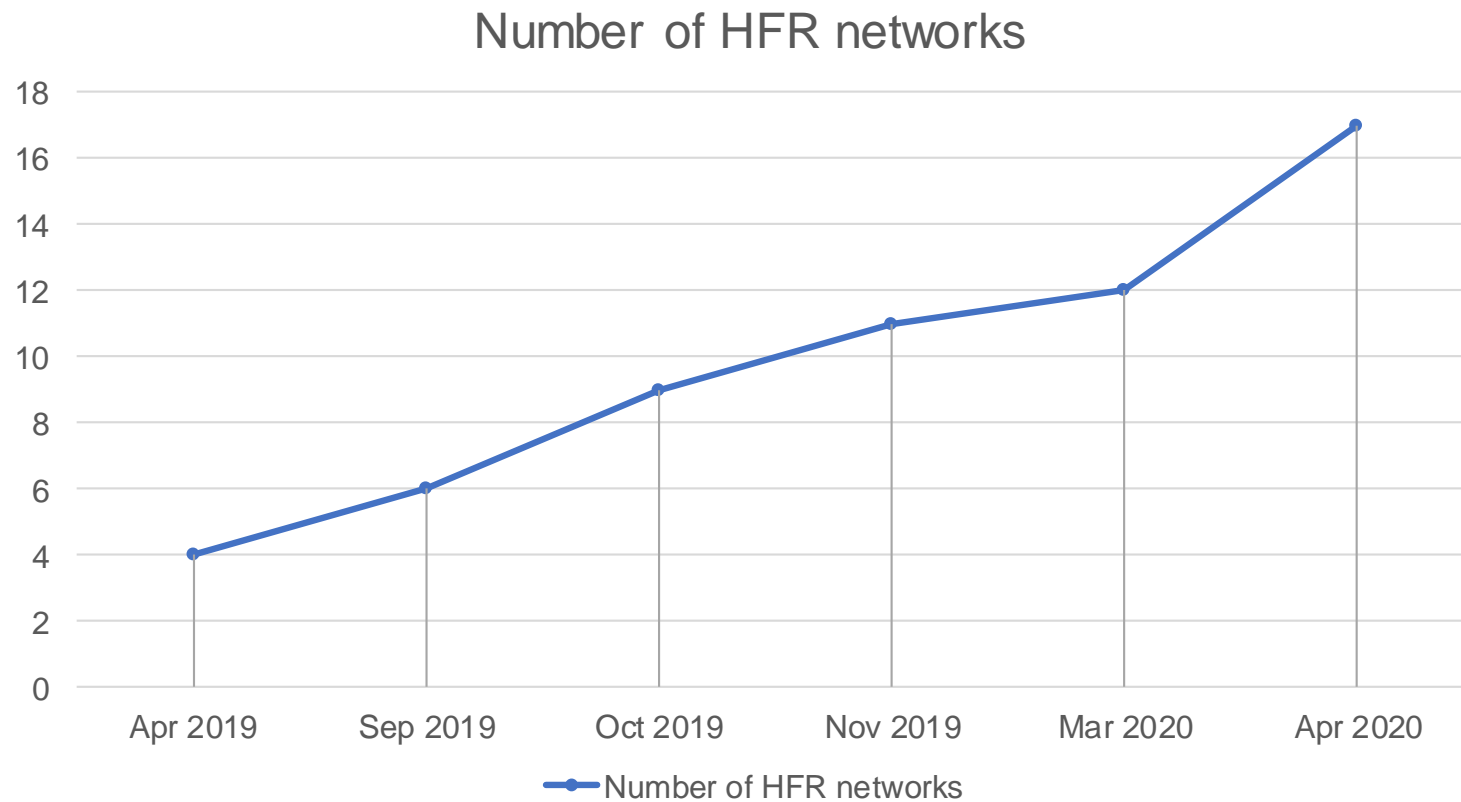
HFR NETWORKS INTEGRATED IN THE EU HFR NODE WORKFLOW



From marineinsitu.eu/dashboard

Status of the activities

HFR NETWORKS INTEGRATED IN THE EU HFR NODE WORKFLOW



Useful links

- Documentation: [EU HFR Node SharePoint](#)
- Best Practices for HFR system deployment and maintenance: [DOI: 10.3389/fmars.2020.00210](#)
- Data format manual for NRT and REP HFR data distribution via CMEMS-INSTAC: [DOI: 13155/73192](#)
- The EU HFR Node data entry WebForm: <http://150.145.136.36>
- Guidelines for data synchronization: [DOI: 10.25704/9XPF-76G7](#)
- The software tools:
 - Matlab local processing : [DOI: 10.5281/zenodo.3569501](#)
 - Matlab centralized processing: [DOI: 10.5281/zenodo.3608880](#)
 - Java: <https://github.com/llasensio/JRadar>
- SDN Metadata services: <https://www.seadatanet.org/Metadata>
- Contacts: euhfrnode@azti.es

Thanks for your attention