The EuroGOOS High Frequency Radar Task Team
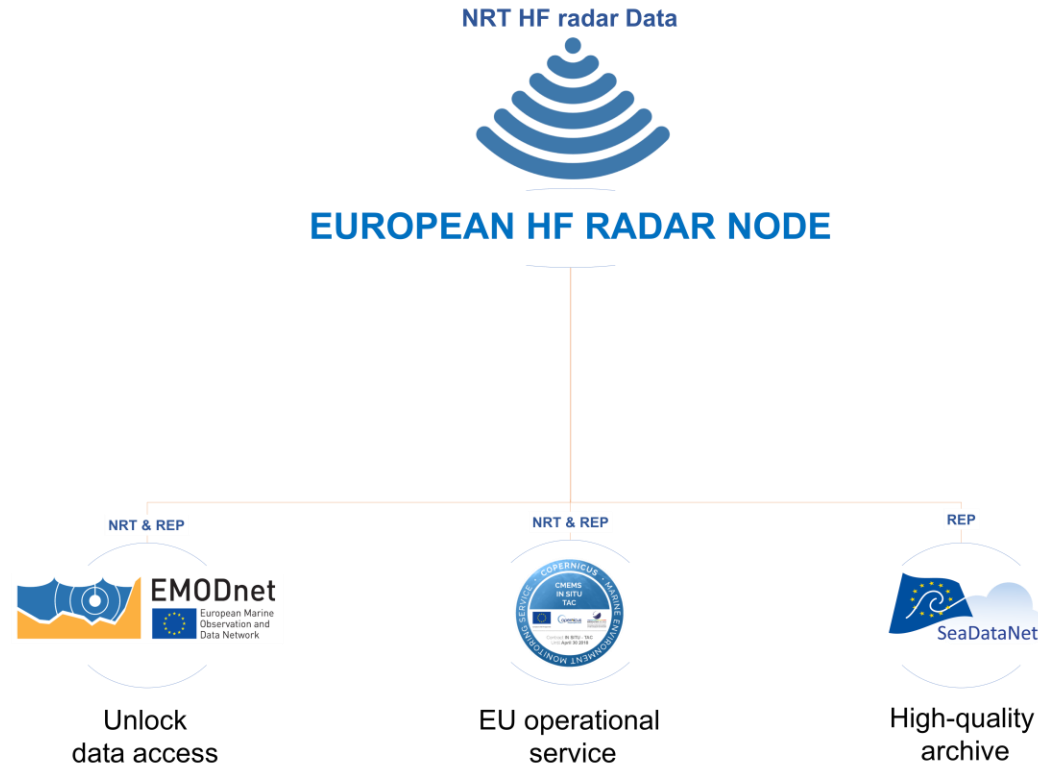
A success story of collaboration. To be kept alive and made growing.

NRT HF radar Data

EUROPEAN HF RADAR NODE

NRT & REP — EMODnet — Unlock data access

NRT & REP — CMEMS IN SITU TAC — EU operational service

REP — SeaDataNet — High-quality archive

L. Corgnati[1], C. Mantovani[1], A. Rubio[2], E. Reyes[3], P. Rotllan[3], A. Novellino[4], P. Gorringe[5], L. Solabarrieta[2], A. Griffa[1], J. Mader[2]

[1] CNR-ISMAR (Italy), [2] AZTI Marine Research (Spain), [3] SOCIB (Spain), [4] ETT SpA (Italy), [5] SMHI (Sweden),
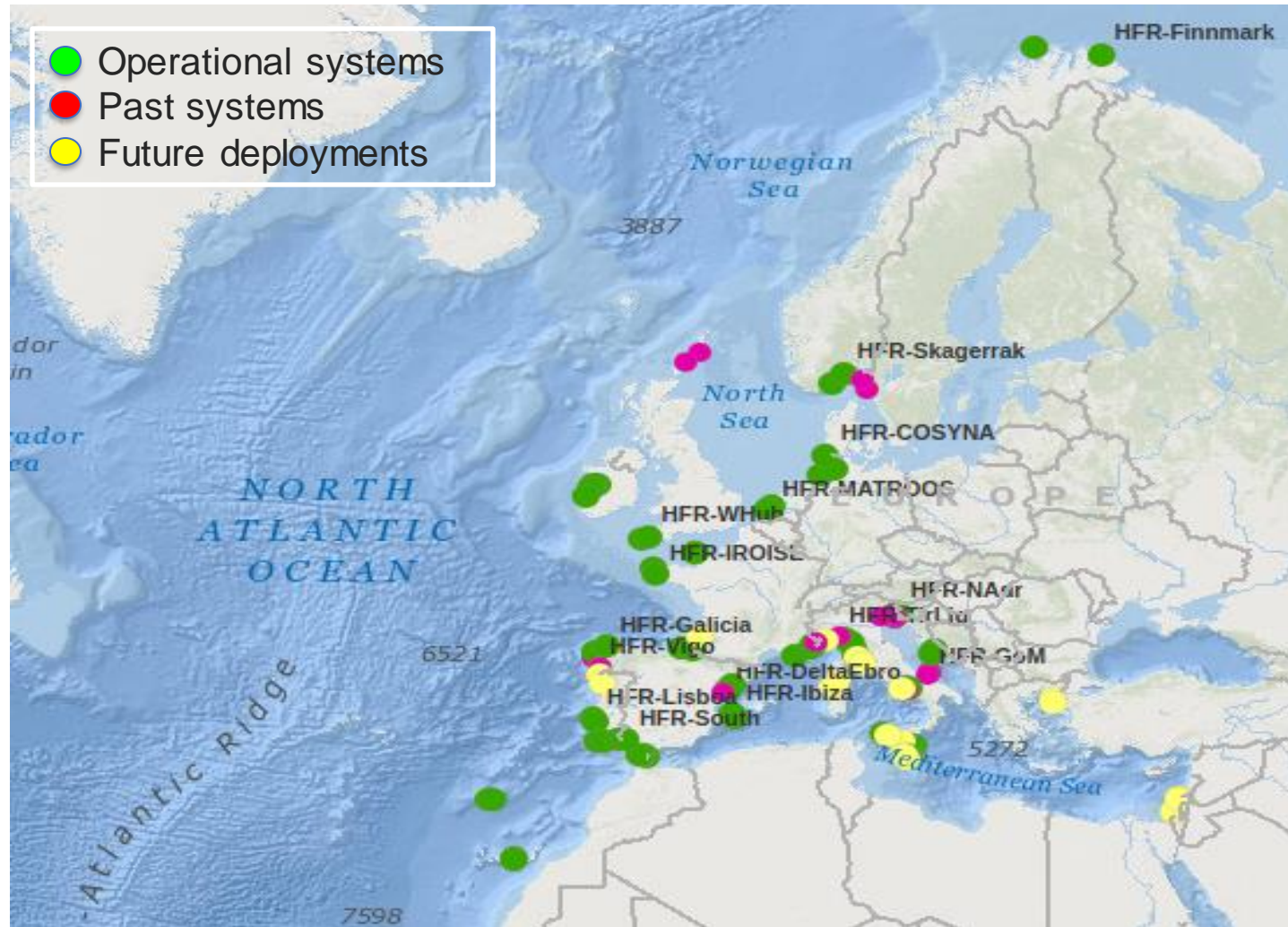
HFRadar EuroGOOS Task Team

High Frequency Radars in Europe

HFR performs land-based remote sensing of **coastal ocean processes**

HFR operate at [3-30] MHz (wavelength from 10 m to 100 m)

HFR provides maps of **coastal ocean surface currents**:
- **Wide coverage** areas: up to 200 km off the coast
- **High spatial and temporal resolutions**: few kms & hourly

Over 68 HFR sites currently operating and 15 in the planning stage.

Growth rate of 7 new systems per year since 2016.

● Operational systems
● Past systems
● Future deployments

HFR-Finnmark
HFR-Skagerrak
HFR-COSYNA
HFR-MATROOS
HFR-WHub
HFR-IROISE
HFR-NAdr
HFR-TrLia
HFR-Galicia
HFR-Vigo
HFR-GoM
HFR-DeltaEbro
HFR-Lisboa
HFR-Ibiza
HFR-South

Source: https://eurogoos.eu/high-frequency-radar-task-team/

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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.

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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 H2020 project **Jerico-S3** (**follow up of Jerico-Next** ended in September 2019)

  - EU H2020 project **SeaDataCloud**

  - **Tender CMEMS INSTAC Phase 2** (**follow up of** CMEMS Service Evolution tender **INCREASE**)

  - EU H2020 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).

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Towards a pan-European HFR network

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- **Active initiatives and projects:**
  - **EuroGOOS HFR Task Team**
  - **EMODnet Physics**
  - EU H2020 project **Jerico-S3**
  - EU H2020 project **SeaDataCloud**
  - **Tender CMEMS INSTAC Phase 2**
  - EU H2020 project **EuroSea**

Inclusion of HFR data into the major European Marine Data Portals:

- **CMEMS-INSTAC**

- **SeaDataNet**

- **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).

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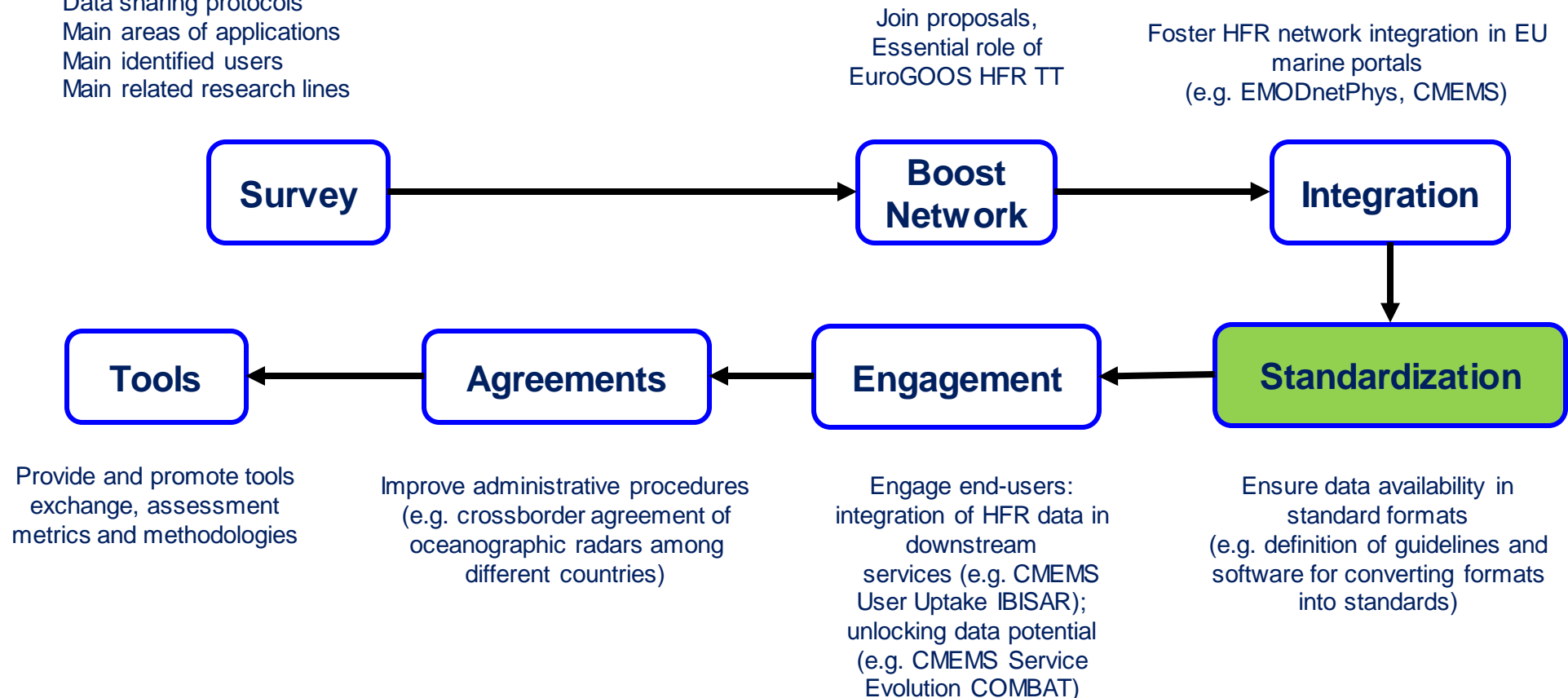
Towards a pan-European HFR network
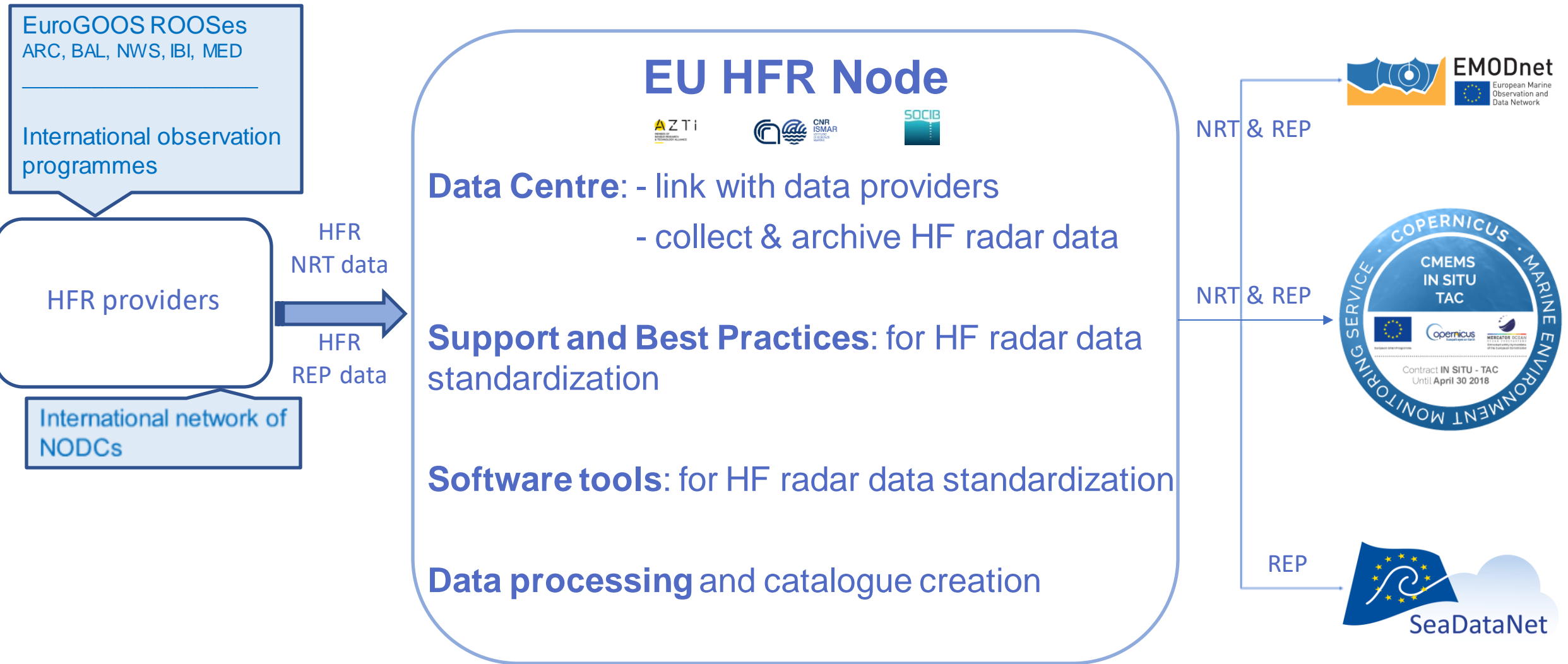
Launched by EuroGOOS HFR TT to provide:
- General overview of EU HFR system
- Main HFR operation & maintenance issues
- Standardization
- Data sharing protocols
- Main areas of applications
- Main identified users
- Main related research lines

Join proposals, Essential role of EuroGOOS HFR TT

Foster HFR network integration in EU marine portals (e.g. EMODnetPhys, CMEMS)

```
Survey  →  Boost Network  →  Integration
                                   ↓
Tools  ←  Agreements  ←  Engagement  ←  Standardization
```

Provide and promote tools exchange, assessment metrics and methodologies

Improve administrative procedures (e.g. crossborder agreement of oceanographic radars among different countries)

Engage end-users: integration of HFR data in downstream services (e.g. CMEMS User Uptake IBISAR); unlocking data potential (e.g. CMEMS Service Evolution COMBAT)

Ensure data availability in standard formats (e.g. definition of guidelines and software for converting formats into standards)

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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](DOI: 10.25607/OBP-944)** (**DOI: 10.25607/OBP-944**), 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 uses **controlled vocabularies** and complies with **CF-1.6, OceanSITES convention and INSPIRE directive.**

- The QC model has been defined according to the **DATAMEQ recommendations** and building on the **QARTOD manual (produced by IOOS).**

- The specific manual for NRT and REP HFR data distributed via CMEMS-INSTAC is published in the **[Copernicus Marine In Situ NetCDF format manual](DOI: 10.13155/59938) (DOI: 10.13155/59938)**

- The specific manual for historical HFR data distributed via SeaDataNet is published in **[SeaDataCloud D9.12 deliverable](DOI: 10.25607/OBP-1011) (DOI: 10.25607/OBP-1011)**.

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The EU HFR Node

EuroGOOS ROOSes
ARC, BAL, NWS, IBI, MED

International observation programmes

HFR providers

International network of NODCs

HFR
NRT data

HFR
REP data

EU HFR Node

Data Centre: - link with data providers
- collect & archive HF radar data

Support and Best Practices: for HF radar data standardization

Software tools: for HF radar data standardization

Data processing and catalogue creation

NRT & REP

NRT & REP

REP

EMODnet
European Marine Observation and Data Network

CMEMS IN SITU TAC
Contract IN SITU - TAC
Until April 30 2018

SeaDataNet

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Status of the activities

HFR NETWORKS INTEGRATED IN THE EU HFR NODE WORKFLOW

Delivery of
NRT HFR total and radial current data to:
- *CMEMS-INSTAC*
- *EMODnet Physics*

Delivery of
DM HFR total and radial current data to:
- *CMEMS-INSTAC*
- *EMODnet Physics*
- *SeaDataNet*

The EU HFR Node manages **15 European HFR networks** (41 radar sites), **representing 8 countries** included in **5 different ROOSes** (Arctic ROOS, BOOS, NOOS, IBIROOS, MONGOOS) and **US HFR data** (5 sub-networks, 173 radar sites), operating with both **Direction Finding and Phased Array systems**.

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Thanks for your attention