Building strong foundations towards a pan-European High Frequency Radar network

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HF radar technology

- Land-based remote sensing of coastal ocean processes
- HF = High Frequency (from 3 to 30 MHz)

Provides maps of coastal ocean surface currents

- Over wide areas (up to 200 km off the coast)
- At high spatio-temporal resolution (typically few km & hourly)

Multiple 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.

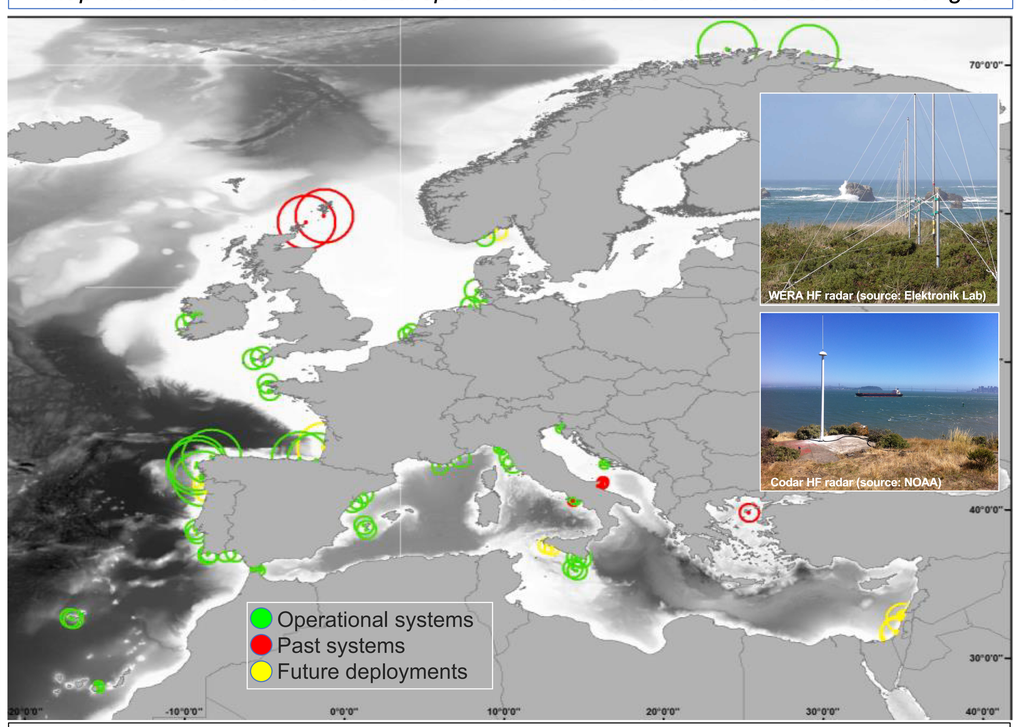
Scientific, operational and societal applications need high-quality HF radar data.

Gap

Operational pan-European HF radar network

Number of systems is growing (6 new sites/year) with over 58 in EU

Map with the locations of the European HF radar sites and their theoretical range



Source: A. Rubio et al., "HF radar activity in European coastal seas: Next steps towards a Pan-European HF radar network," Frontiers Mar. Sci., vol. 4, pp. 1–8, 2017.

Joint efforts

Towards an operational pan-European HF radar network based on a coordinated data management

- System harmonization
  HF radar data quality & standardization
- NRT and historical HF radar data:
  accessible & interoperable
- Historical HF radar data:
  standardization, integration & preservation
- HF radar data integration
  into CMEMS-INSTAC
- HF radar data standardization:
  procedures & methodologies definition
- HF radar coastal surface currents:
  new CMEMS Phase 2 product

NRT = Near Real Time
REP = Reprocessed
CMEMS-INSTAC = Copernicus Marine Environment Monitoring Service In Situ Thematic Assembly Center
SDC CF Extension = SeaDataCloud Common Format Extension
DATAMEQ = Data Management, Exchange and Quality
QARTOD = Quality Assurance/Quality Control of Real-Time Oceanographic Data

EU common data & metadata model

- For **NRT surface current HF radar data** (radial and total velocity files)
- **Compliant** with:
  - CF-1.6, OceanSITES convention, CMEMS-INSTAC requirements, SDC CF extension requirements and INSPIRE directive.
- **QC tests** applied:
  - defined according to the DATAMEQ recommendations
  - building on the QARTOD manual (produced by IOOS).

NRT HF radar Data

EU common data & metadata model

- Data format: netCDF-4 classic model
- Global attributes
- Dimensions
- Coordinate variables and their syntax
- Data variables and their syntax
- Quality Control (QC) variables and their syntax
- QC tests, policy and flags

EUROPEAN HF RADAR NODE

NRT and historical ocean data

Historical ocean data

EuroGOOS ROOSEes
ARC BAL NWS IBI MED

INTERNATIONAL OBSERVATION PROGRAMMES

INTERNATIONAL NETWORK OF NODCs

HF radar data stream implementation

EU focal point with:

- **Data providers**
- **Key EU networking infrastructures**
- **Global HF Radar network**

Key roles:

- Connection with **data providers** for NRT and REP data
- Connection with **CMEMS-INSTAC** for NRT and REP data
- Connection with **SeaDataNet** for REP data
- Ensure optimal **visibility** of HF radar data
- Foster the **applications** based on HF radar data
- Produce HF radar data **advanced products**

NRT & REP

EMODnet
European Marine Observation and Data Network

Unlock data access

NRT & REP

COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE
CMEMS IN SITU TAC
Contract IN SITU - TAC
Until April 30 2018

EU operational service

REP

SeaDataNet

High-quality archive

INTERMEDIATE and END USERS

European HF radar node

Development in 3 steps

1. **Data Centre**: - link with data providers,
   - collect & archive HF radar data
2. **Software tools:** for HF radar data standardisation
3. **Data processing** and catalogue creation

Coordinated data management