THE SCIPPER PROJECT

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Shipping Contributions to Inland Pollution Push for the Enforcement of Regulations

And a few words on

EMERGE: Evaluation, control and Mitigation of the **E**nvi**R**onmental impacts of shippin**G** **E**missions

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4th Mediterranean Shipping Conference - On the way to a Mediterranean Emission Control Area
Piraeus, 2019-11-20

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nr.814893

THE SCIPPER PROJECT

Presentation Structure

- Project General Info
- Project Overview
- Methodology
- Measurement Campaigns
- Links with other projects

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Project Fiche

Call: 2018-2020 on Mobility for Growth

Section: 1 - Building a low-carbon, climate resilient future: Low-carbon and sustainable transport

Topic: LC-MG-1-1-2018: InCo flagship on reduction of transport impact on air quality

Duration: 36 months (Start date: May 1, 2019)

Budget: M€5,0

Coordinator: Aristotle University of Thessaloniki

Total Beneficiaries: 17 + 1 International partner

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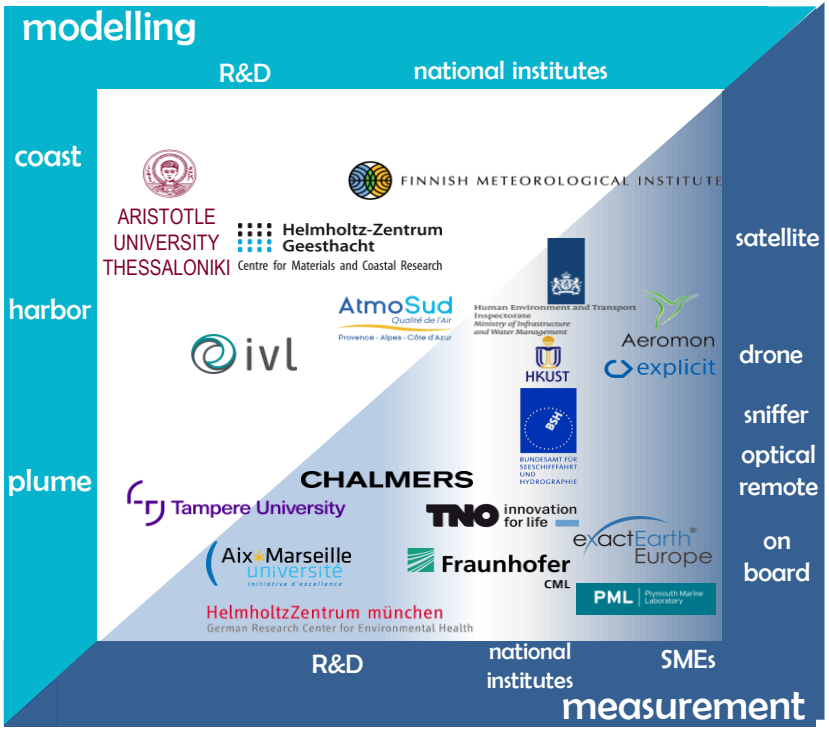
Consortium

Partners

AUTH (GR)	HZG (DE)
TAU (FI)	IVL (SE)
CHALMERS (SE)	TNO (NL)
FMI (FI)	HMGU (DE)
PML (UK)	eEE (UK)
CML (DE)	BSH (DE)
ATMOSUD (FR)	AMU(FR)
EXPLICIT (DK)	AEROMON (FI)
ILT (NL)	HKUST (CN)

Expertise



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Background

Emission Control Areas (ECAS) in EU waters

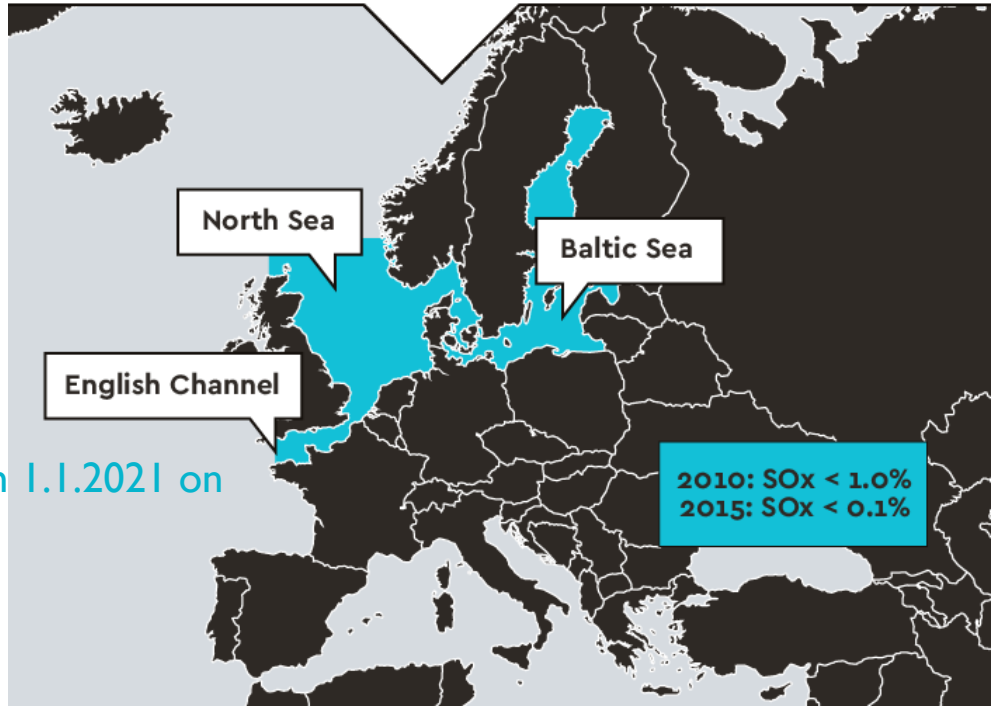
- Currently three regions:
  - Baltic Sea
  - North Sea
  - English Channel

Limits

- 0.1% max S since 1.1.2015
- Baltic and North Seas No_x Tier III ECAs from 1.1.2021 on

Developments

- On-going discussion for inclusion of the Mediterranean region as a SO_x - ECA



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Response

Some options to meet new emission standards:

- Low sulfur fuel and NO_x aftertreatment
- Heavy fuel and both NO_x and SO_x aftertreatment
- LNG
- Other fuels, like methanol, electrification, etc.

Main Question to be responded by SCIPPER:

How will authorities make sure that correct fuel or proper aftertreatment are being used?

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Overarching Objectives

Need for:

- Compliance check of environmental regulations.
- More evidence on monitoring possibilities for low sulphur levels, new pollutants, as well as implications of non-compliant ships to air pollution.

Main objectives:

- To provide evidence on the performance and capacity of different techniques for shipping emissions monitoring and,
- to assess the impacts of shipping emissions on air quality, under different regulatory enforcement scenarios.

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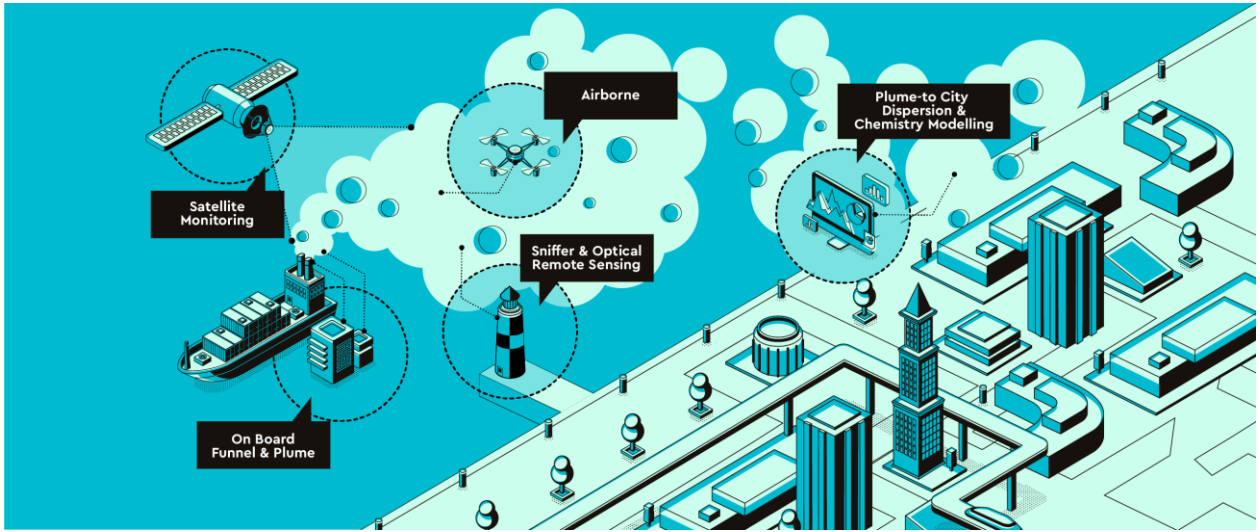
Concept

Real-world deployment of various monitoring techniques

Implementation of 5 experimental campaigns at different locations



- ❑ Application / validation / comparison of various emission measurement and monitoring techniques for emission standards compliance checking purposes
- ❑ Determination of the impact of shipping on air quality at coastal and harbor level

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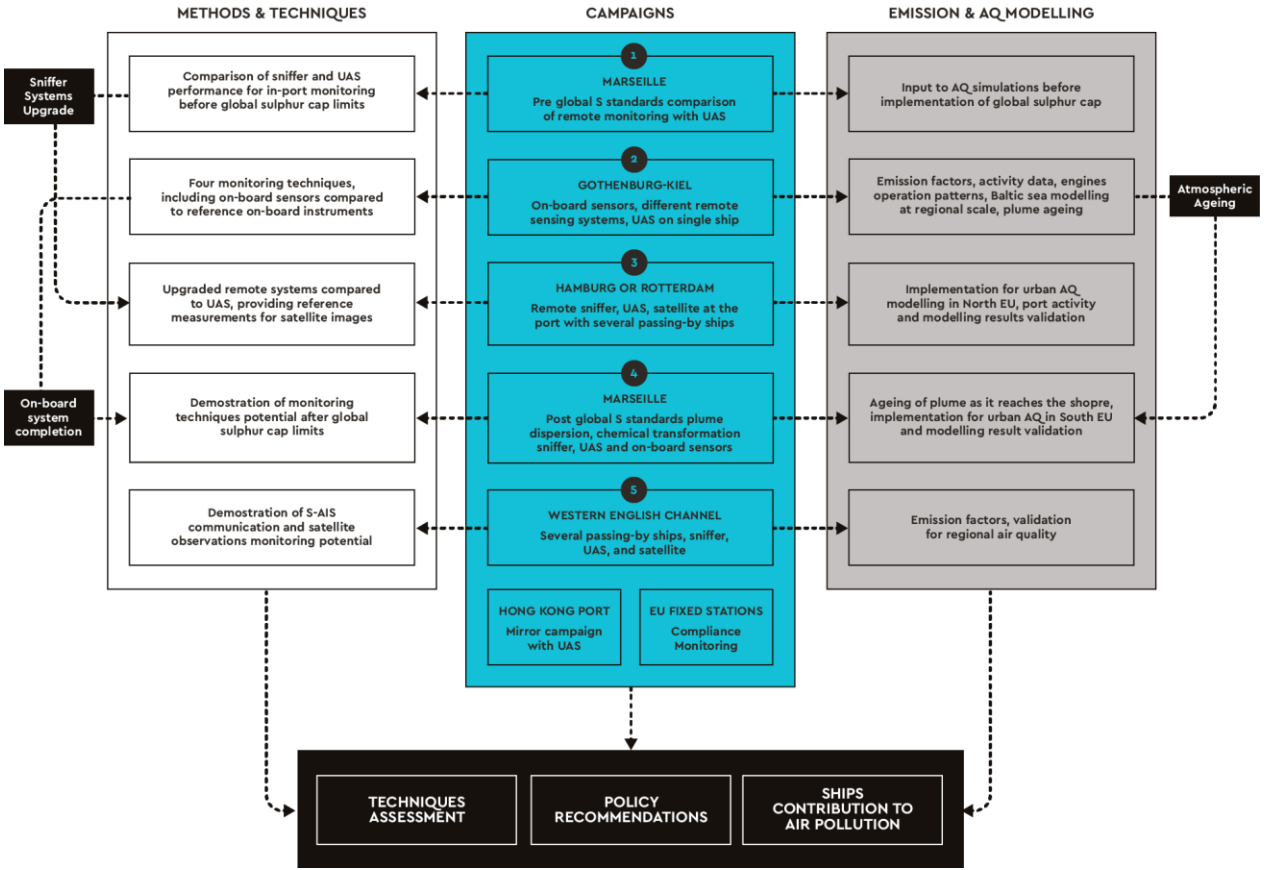
Methodology



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Main Output

- **New Technology:** New sensors, new techniques, improved methods
- **Science:** Emission factors, plume ageing, Air Quality modelling
- **Policy/Regulations:** Efficient enforcement, internationally pioneering, EU policy outreach

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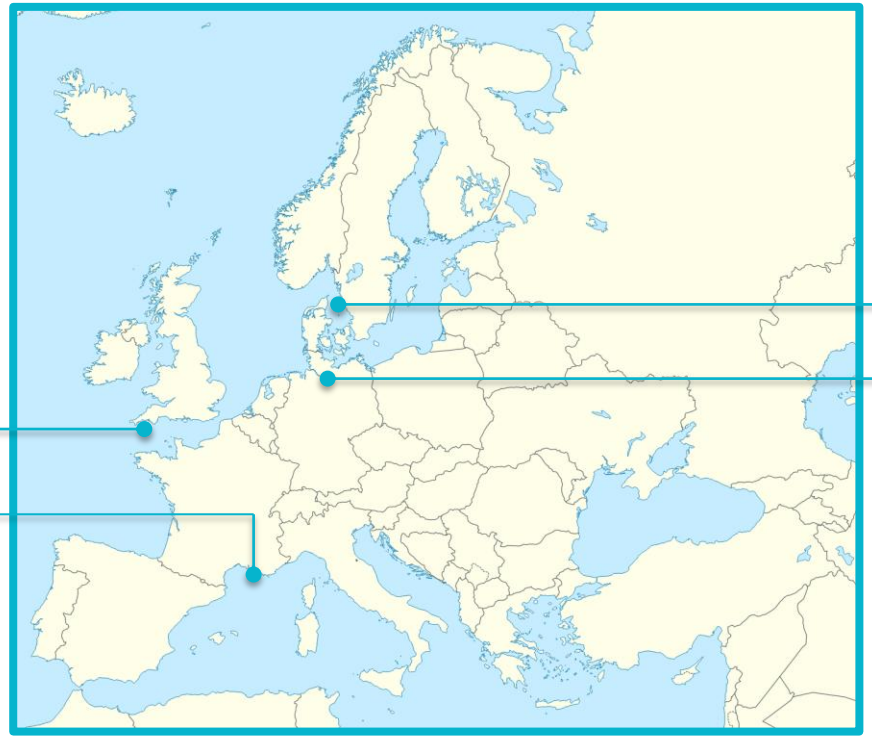
Experimental Campaigns Overview

C5

Western English channel (EN)

C1 C4

Marseille (FR)



C3

Gothenburg (SE) to Kiel (DE)

C2

Hamburg (DE)

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Experimental Campaigns – I (2)

C1

Marseille (FR)

- **Techniques**: On-board sensors, remote sensing systems, UAS
- **Targets:** Remote compliance monitoring of FSC before regulation, state of art UAS application, input to AQ models
- **Vessels involved**: Harbor vessel to sample plume of berthing and moving ships in ports

C2

Gothenburg (SE) to Kiel (DE)

- **Techniques:** On-board sensors, remote sensing systems, UAS, on board characterizing of fresh and aged exhaust
- **Targets:** On board sensors and signal tansmission, autonomous monitoring test, comparison with remote and UAS
- **Vessels involved:** Single ferry for on-board / remote comparison and, in addition, passing-by ships by remote techniques

C3

Hamburg (DE)

- **Techniques**: On-board sensors, remote sensing, UAS, coincidental satellite data on shipping routes, air quality modelling
- **Targets:** Beyond state-of-art remote measurement - uncertainty characterization for SO2, NOx and particulate components, implementation and validation location as input for AQ simulations, SOx compliance
- **Vessels involved:** Regular shipping activity served by the port

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Experimental Campaigns

C4

Marseille (FR)

- **Techniques**: Remote sensing techniques on-board (harbor vessel), at shore, and carried by UAVs, various instruments installed nearby aerosol supersite and in different port locations
- **Targets:** Remote compliance monitoring of FSC after regulation, in-depth characterization of plumes, application of remote techniques, A/Q impacts, installation of revised on board sensors
- **Vessels involved**: Harbor vessel to sample plume of berthing and moving ships in ports, Cruise ship with on board sensors

C5

Western English Channel (EN)

- **Techniques:** UAS, satellite focusing on the area, Satellite-AIS communication on RV
- **Targets:** Satellite observations potential for single or group of ships monitoring, comparison of UAS-based sensors vs remote sensing techniques, demonstration of emission signal transmission through satellite-AIS
- **Vessels involved:** Instrumented Plymouth Quest RV sampling emissions of passing-by shipping activity

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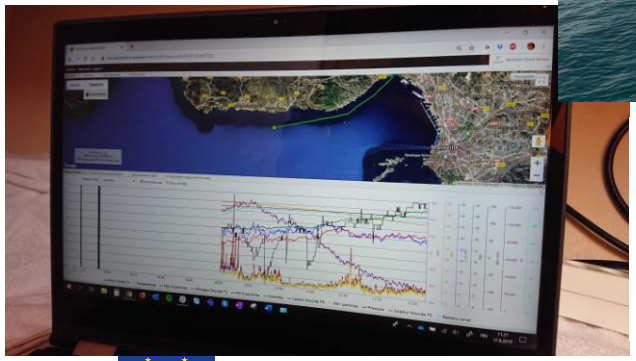
C1 campaign : 16-27 September 2019

EFs measurements before changing the S content (in 2020)

Massalya Mobile Laboratory LCE



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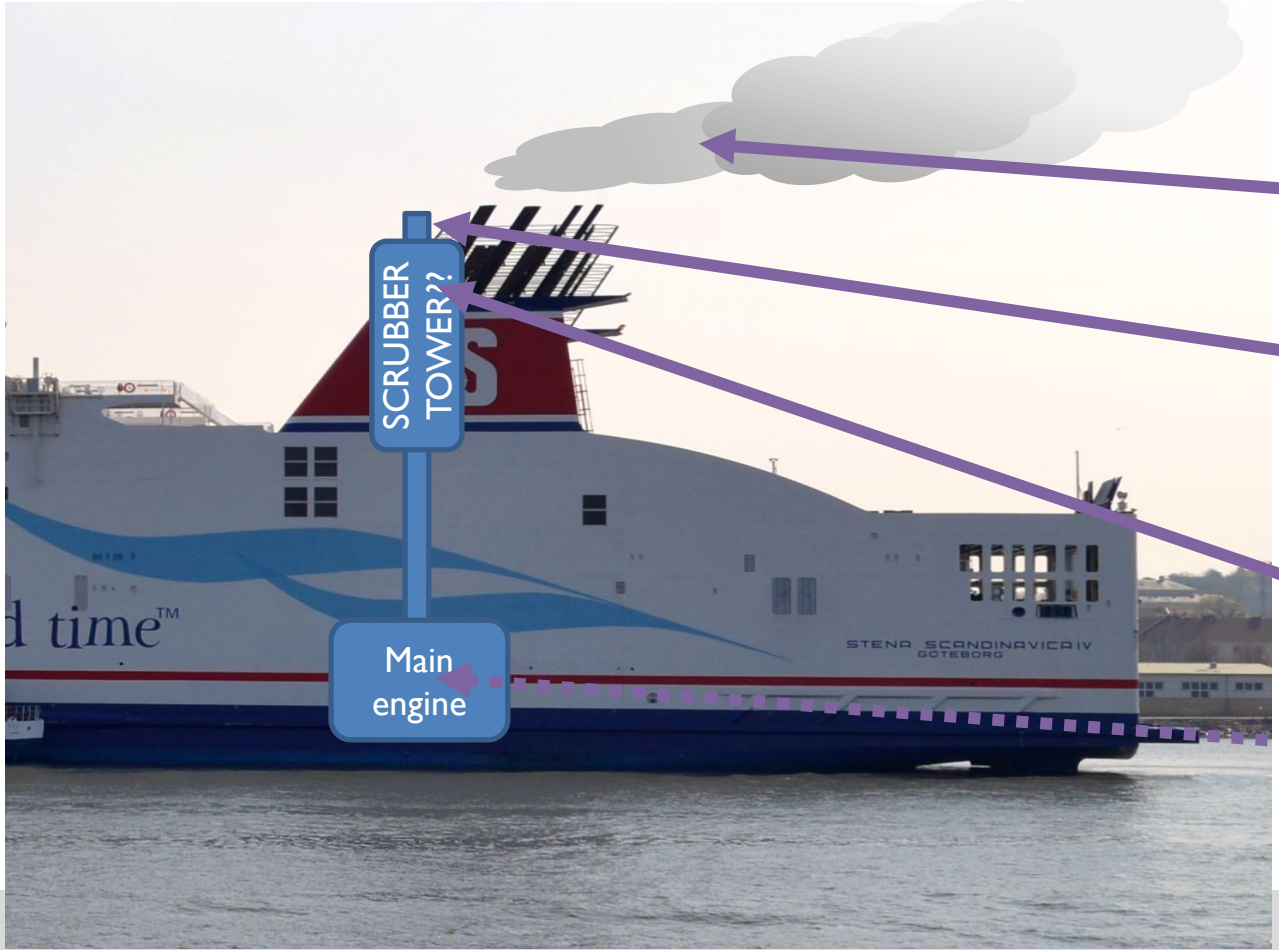


WP2
Remote sensing:
SO2, PN, BC

WP1 On deck – sensor stack + high end for gas

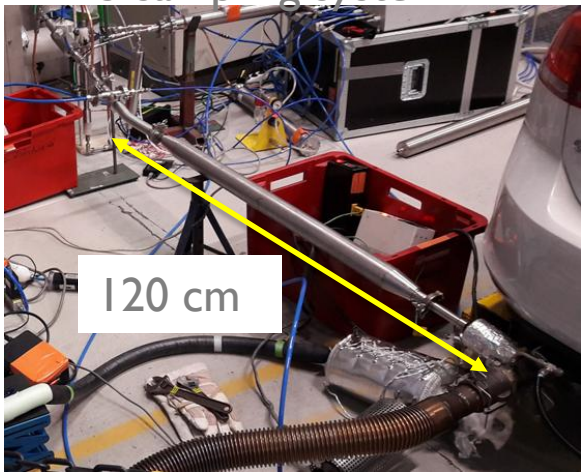
WP1, WP3
Sensors: SO2, NOX, BC, PN
High end: gases, PM, PN, BC volatilizing system/oxidation reactor

WP1
Sensors: SO2, NOX, BC, PN/aerosol
High end: gases, PM, PN, BC,

(If scrubber)WP1
Sensors: PN/aerosol

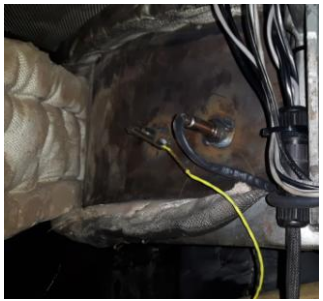
ExactSens transmitter

WP3 sampling system



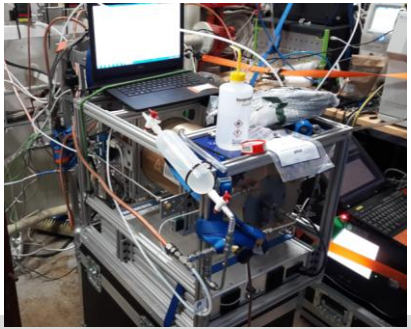
SEMS box (TNO)

NOx sensor in exhaust pipe



BC Sensor (AUTH)

Aging system



Optional

NH3 automotive sensor

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The EMERGE project

1. Comprehensively quantify and evaluate **the effects of a range of potential emissio reduction solutions, mainly scrubbers,** for shipping in Europe, and
2. Develop more effective **strategies and measures** to reduce the environmental impacts of shipping.

EMERGE

Project Fiche

Call: 2018-2020 on Mobility for Growth

Topic: MG-BG-02-2019: Ship emissions control scenarios, marine environmental impact and mitigation

Duration: 48 months (Start date: Feb 1, 2020)

Budget: M€8,0

Coordinator: Finnish Meteorological Institute

Total Beneficiaries: 18 partners

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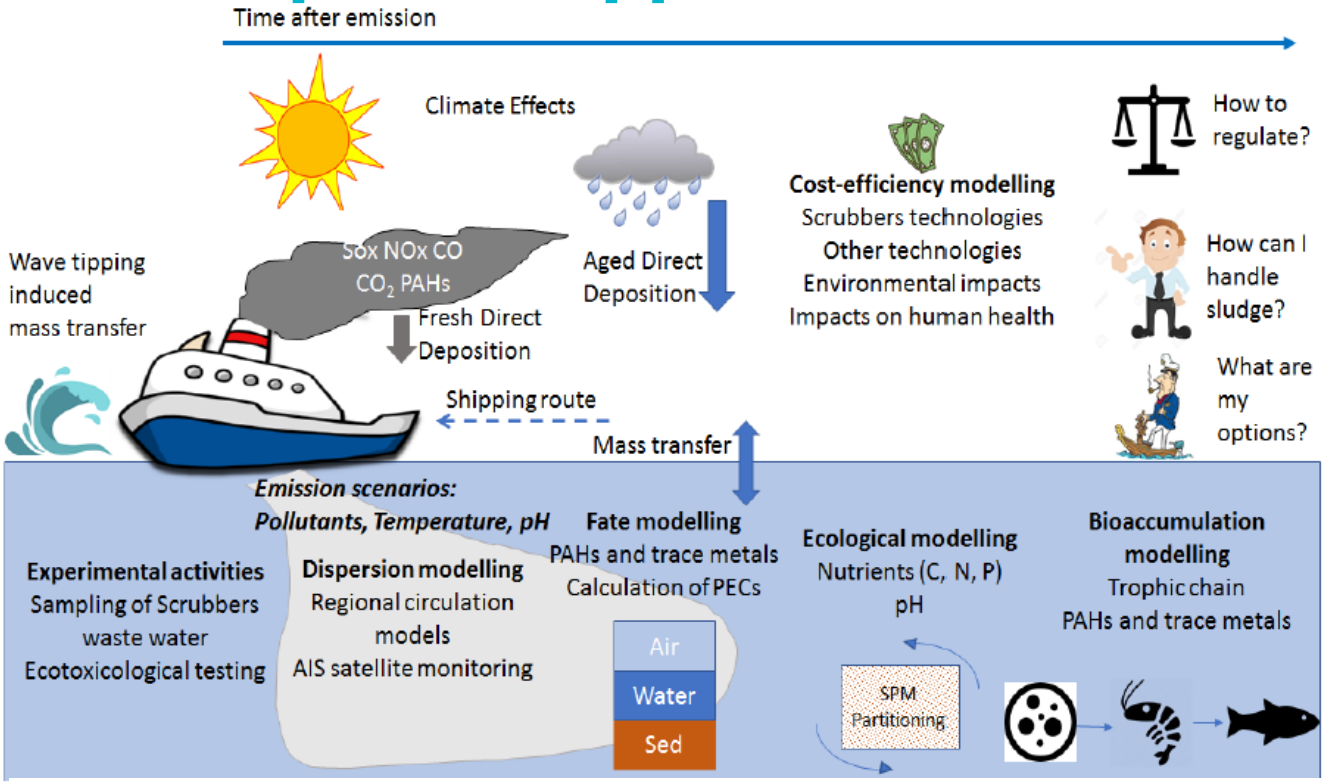
EMERGE

The scope and approach

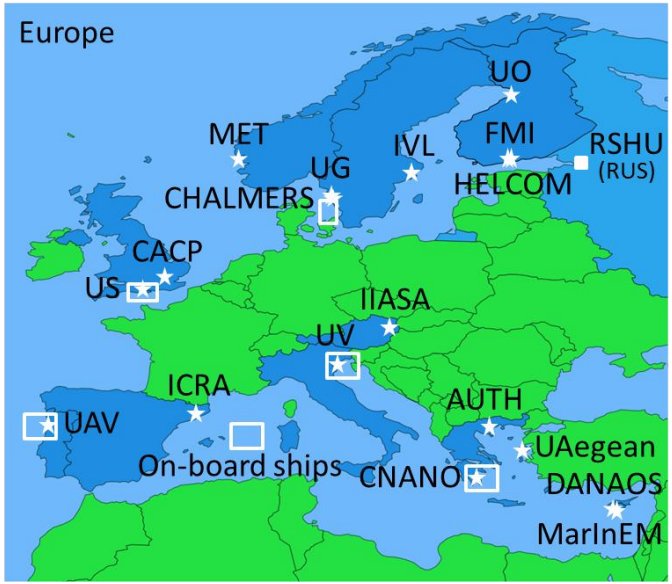


Wide scope, includes impacts on

- marine environments, ecology, plants, animals, bioaccumulation, etc.
- Atmosphere and health
- Climate
- Cost-benefit analyses

Notation: PEC = predicted environmental concentration, SPM = suspended particulate matter, PAH = polycyclic aromatic hydrocarbon.

Case Studies



Five selected geographic case studies and one mobile onboard case study:

- ✓ Öresund case study (Sweden)
- ✓ Solent case study (U.K.)
- ✓ Aveiro Region case study (Portugal)
- ✓ Northern Adriatic Sea case study (Italy, includes Venice)
- ✓ Eastern Mediterranean case study (including Piraeus, Greece)
- ✓ On-board case study (mainly in Mediterranean)

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Thank You

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