REMTECH EXPO

REMTECH Europe

SAGAcE

Sistema Avanzato di MonitoraGgio AmbiEntale

UNIONE EUROPEA
Fondo Europeo di Sviluppo Regionale

MINISTERO SVILUPPO ECONOMICO

Regione Puglia
Dipartimento Sviluppo economico, innovazione, istruzione, formazione e lavoro,
Sezione Ricerca Innovazione e Capacità Istituzionale

INNO NETWORK

Dott. Roberto Bonarelli - CMCC

RemTech Expo 2019 (18, 19, 20 September) Ferrara Fiere
www.remtechexpo.com

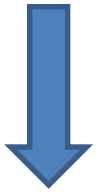
SAGAcE

Sistema Avanzato di MonitoraGgio AmbiEntale

October 2018 – April 2020

PURPOSE

Contribute to the reduction of risks to human and environmental health deriving from the presence of pollutants in soil, air and water, with the development of a set of solutions for advanced environmental monitoring.

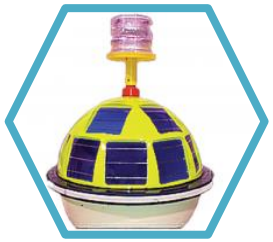


- ✓ Improve the technologies for mapping the presence of pollutants by enhancing capacity, size and data acquisition
- ✓ Reduce the time requested to identify pollutants and wastes dispersed in soil, water and air
- ✓ Reduce the risks for workers during pollutants detection operations
- ✓ Support the decisions of stakeholders and decision makers in the planning phase of mitigation actions

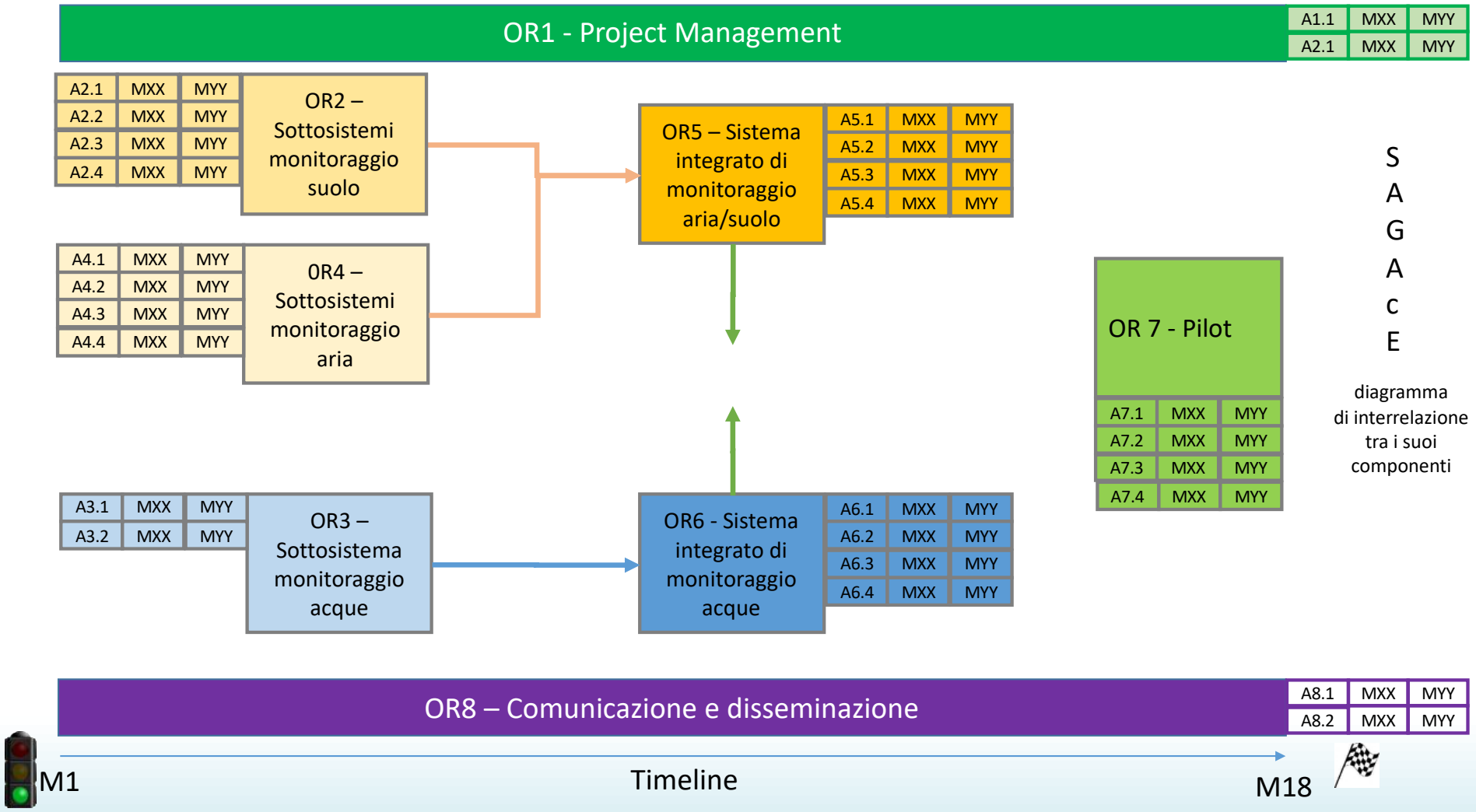
PROJECT

The proposed system will use different monitoring methods depending on the application area

- ✓ **Water** - improvement of technology (sensors, network of instruments, models) to map and forecast the characteristics (hydrodynamics and quality of water) of water flows, in order to define and evaluate interactions with possible sources of pollution. These data will be used in innovative solutions to mitigate the impacts on human health and the environment and on local economies.



- ✓ **Soil and air** - solutions of acquisition and analysis of data acquired through miniaturized and innovative sensors to be applied on UAV (<25 kg). They will be used during air missions for the punctual search for pollutants, allowing:
  - ✓ - to detect from above suspicious objects buried or hidden on the surface of the ground,
  - ✓ - to detect liquid spills and contaminants on the surface and in the subsoil.


OR1 - Project Management
A1.1 MXX MYY
A2.1 MXX MYY
A2.1 MXX MYY
A2.2 MXX MYY
A2.3 MXX MYY
A2.4 MXX MYY
OR2 – Sottosistemi monitoraggio suolo
OR5 – Sistema integrato di monitoraggio aria/suolo
A5.1 MXX MYY
A5.2 MXX MYY
A5.3 MXX MYY
A5.4 MXX MYY
A4.1 MXX MYY
A4.2 MXX MYY
A4.3 MXX MYY
A4.4 MXX MYY
0R4 – Sottosistemi monitoraggio aria
OR 7 - Pilot
A7.1 MXX MYY
A7.2 MXX MYY
A7.3 MXX MYY
A7.4 MXX MYY
S A G A c E
diagramma di interrelazione tra i suoi componenti
A3.1 MXX MYY
A3.2 MXX MYY
OR3 – Sottosistema monitoraggio acque
OR6 - Sistema integrato di monitoraggio acque
A6.1 MXX MYY
A6.2 MXX MYY
A6.3 MXX MYY
A6.4 MXX MYY
OR8 – Comunicazione e disseminazione
A8.1 MXX MYY
A8.2 MXX MYY
M1
Timeline
M18

WP1 - Project Management

Responsible: ***Wide Pilot***
Involved partners: ***ALL***

- ✓ **Appointment of internal Project Manager**
- ✓ **Advisory Board**

Domenico Spinelli	Wide Pilot	Project coordinator
Giulio Avanzini	Unisalento	PM responsible for the air monitoring subsystem
Ivan Federico	CMCC	PM responsible for the water monitoring subsystem
Giovanni Leucci	CNR-IBAM	PM responsible for the soil monitoring subsystem
Arcangelo Piscitelli	ENSU	Responsible for communication and dissemination of project results

MONTH/WP		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
WP1	A1.1																		
	A1.2																		

WP2 - Soil monitoring system

Responsible: ***IDS***
Involved partners: ***CNR IBAM***

- ✓ **Prototype demonstrators (sensors) for the aerial detection of target objects buried or hidden on the ground**

Activity
A2.1 - Design and development of a prototype of a system for measurements of the magnetic field and its gradient applicable in inaccessible areas and on board unmanned systems of micro class (<25kg), equipped with a triaxial sensor system and data acquisition.
A2.2 - Design and development of an under-foliage radar demonstrator
A2.3 - Design and development of technological demonstrator of electro-optical add-on based on optical polarimetry, to be applied on COTS video cameras / multispectrals for the identification of artefacts hidden in the vegetation
A2.4 - Design and development of sensor integration solutions

MONTH/WP		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
WP2	A2.1							D2.1.1, D2.1.2											
	A2.2														D2.2				
	A2.3														D2.3				
	A2.4																D2.4		

WP3 - Monitoring system for coastal waters and for forecasting dispersion and deposit of pollutants along the coast

Responsible: ***ENSU***
Involved partners: ***CMCC, WIDE PILOT, ISALIT***

- ✓ **Study and determination of the dispersion of pollutants in the marine environment with activities of rapid acting that allow to minimize the impact of human activities**

Activity
A3.1 - Monitoring station with low-cost prototype sensors to allow continuous data acquisition of temperature, conductivity, chlorophyll a fluorescence, CDOM fluorescence, turbidity, dissolved oxygen, ph. ***Modeling of pollutants on geomorphological characteristics s.l. of the coastal strip (rapid mapping)***
A3.2 - Realization of rapid sampling and early warning analysis with UAV for taking water samples and the subsequent delivery to a mobile laboratory for carrying out urgent analysis

MONTH/WP		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
WP3	A3.1													D3.1					
	A3.2													D3.2					

WP4 - Air monitoring system

Responsible: ***ISALIT***
Involved partners: ***UNISALENTO (DMF), IDS***

- ✓ **Implementation of demonstrators for the aerial detection of IPA, COV, PM2.5, PM10 hazardous to human health and air pollution indexes**

Activity
A4.1 - Design and development of a prototype of traps for the detection and measurement of PAHs and VOCs
A4.2 - Development of statistical models for correlating the presence of pollutants with target substances in traps
A4.3 - Design and development of a prototype for detection PM2.5/PM10
A4.4 - Design and development of sensor integration

MONTH/WP		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
WP4	A4.1													D4.1					
	A4.2																	D4.2	
	A4.3														D4.3				
	A4.4																D4.4		

WP5 - Air-soil integrated monitoring system

Responsible: ***UNISALENTO (DII)***
Involved partners: ***IDS, ISALIT***

- ✓ **Implementation of the platform for input and visualization of data for air and ground monitoring; DSS implementation for data correlation and decision support**

Activity
A5.1 - The modeling of the aspects related to the aerial survey processes
A5.2 - Development of methods and algorithms for drone control
A5.3 - Implementation of a DSS for the correlation of the data acquired
A5.4 - Implementation of a prototype of software platform

MONTH/WP		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
WP5	A5.1														D5.1				
	A5.2																D5.2		
	A5.3																D5.3		
	A5.4																D5.4		

WP6 - Water integrated monitoring system

Responsible: ***WIDE PILOT***
Involved partners: ***CMCC, ENSU***

✓ **Implementation of an integrated water monitoring system**

Activity
A6.1 - Development of the high resolution model with unstructured grids based on the SHYFEM code
A6.2 - Pollutant dispersion modeling with Lagrangian modeling
A6.3 - Risk analysis: hazard maps, vulnerability; DSS
A6.4 - Data management and analysis platform

MONTH/WP		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
WP6	A6.1				D6.1														
	A6.2													D6.2.1, D6.2.2					
	A6.3													D6.3.1, D6.3.2					
	A6.4													D6.4					

WP7 – Pilot

Responsible: ***IDS, WIDE PILOT***
Involved partners: ***UNISALENTO (DII/DMF), ISALIT, CMCC, ENSU***

✓ **Testing of the SAGAcE system**

Activity
A7.1 - Test bed and performance analysis integrated water monitoring system
A7.2 - Test bed and demonstration of the integrated air and ground monitoring system
A7.3 - Authorization procedure for flight tests drone systems + prototypes
A7.4 - Validation and analysis of results and production of guidelines for the industrial exploitation plan, specifically addressing technology transfer

MONTH/WP		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
WP7	A7.1														D7.1				
	A7.2																	D7.2.1	D7.2.2
	A7.3																	D7.3	
	A7.4																		D7.4

WP8 – Communication and dissemination

Responsible: ***ENSU, CMCC, WIDE PILOT***
Involved partners: ***ALL***

✓ Communication and dissemination

Activity
A8.1 - National and international communication plan
A8.2 - WEB site, Social Network
A8.3 - Organization of an event with sector stakeholders with the Apulian Cluster "MARINE"
A8.4 - Implementation of a public information campaign on environmental issues relating to SAGAcE
A8.5 - Production of a video presenting results of SAGAcE project

MONTH/WP		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18
WP8	A8.1			D8.1.1															D8.1.2
	A8.2																		D8.2
	A8.3												D8.3.1						D8.3.2
	A8.4																		D8.4
	A8.5																		D8.5

SAGAcE deliverables

Project partners will develop

- **8 prototypes**
- **7 models and algorithms**
- **3 DSS**
- **2 software modules**

PROTOTYPES

- N.2 fixed networks of sensors for monitoring pollutants and parameters for water quality in the marine environment
- N. 1 miniaturized dispersed aero particulate sampler
- N.1 trap for the measurement of IPA and COV
- N.1 technological demonstrator of radar under foliage
- N.1 electro-optical add-on based on optical polarimetry
- N.1 gradiometric system
- N. 1 drone water sampler

MODEL

- N.1 model of distribution of pollutants to the sea
- N.1 statistical model for the presence of waste/pollutants in the subsoil with target substances
- N.1 navigable model, in BPMN for UAV detection
- N.3 mission planning methods and algorithms, geolocation for UAVs
- N.1 Rapid mapping, rapid sampling and analysing on early

SAGAcE deliverables

Project partners will develop

- **8 prototypes**
- **7 models and algorithms**
- **3 DSS**
- **2 software modules**

DSS

- N.1 DSS for rapid acting on impending event
- N.1 DSS for support to mitigation actions based on the topological model
- N.1 DSS for the correlation of data detected by sensor-UAV systems

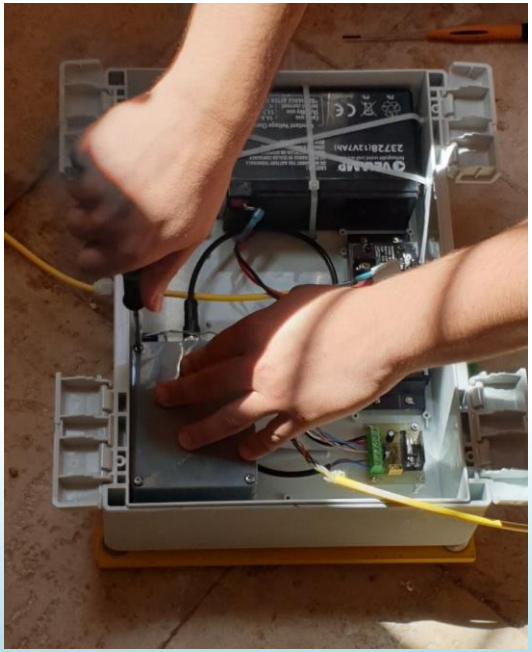
SOFTWARE MODULES

- N.2 software modules for data acquisition, management, analysis, processing:
- sensors installed on UAV
- fixed sensor networks at sea

WP3 - Monitoring system for coastal waters and for forecasting dispersion and deposit of pollutants along the coast

Updating station and buoy with with low-cost prototype sensors to allow continuous data acquisition of temperature, conductivity, chlorophyll a fluorescence, CDOM fluorescence, turbidity, dissolved oxygen, ph

- **Torre Guaceto concluded, Taranto End of September**



WP3 - Monitoring system for coastal waters and for forecasting dispersion and deposit of pollutants along the coast

Realization of rapid sampling with UAV for taking water samples

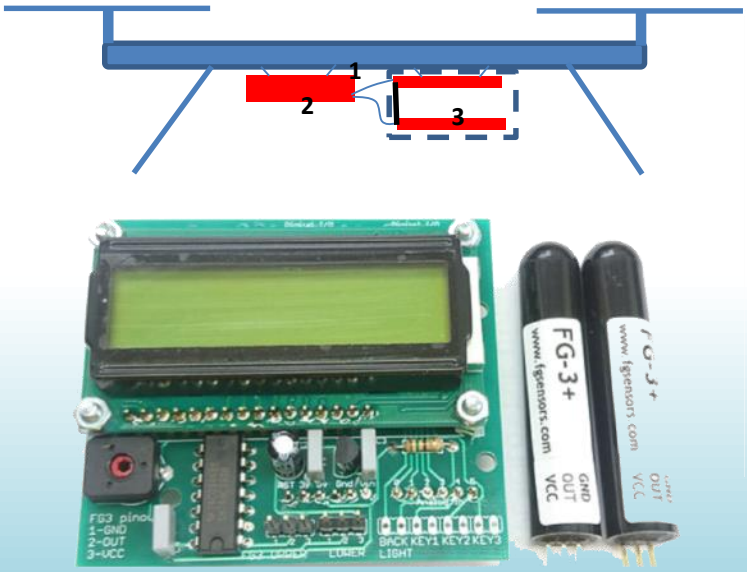
WP2 - Soil monitoring system

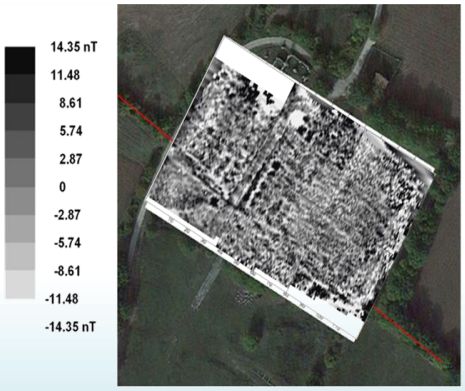
Prototype – Gradiometer: measurements of the magnetic field and its gradient

Sensor System

- **Completed : Main element consisting of two high resolution sensors (about 0.01nT) and a sampling rate of 10Hz. The two sensors are placed at a vertical distance of about 0.5m from each other (3 in Fig.).**
- **Preliminary tests (Grumentum Archaeological Area)**

In progress: Development of the sampler hooking system and miniaturized suction system to drone and remote control





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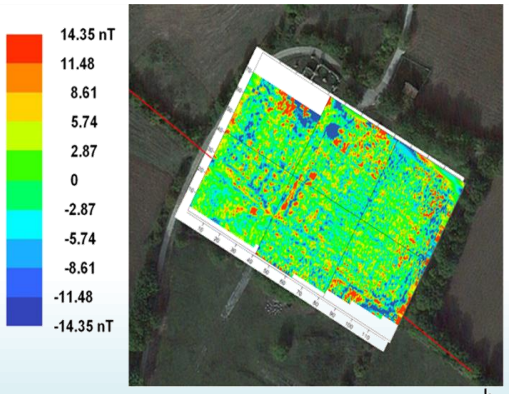

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WP4 - Air monitoring system

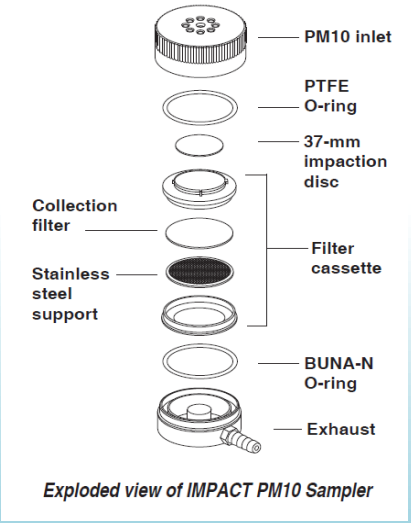
Prototype - aerial detection of IPA, VOC, PM2.5, PM10

Concluded: Sampler for monitoring atmospheric particulate matter for subsequent mounting on drones

- **Testing different types of filters and sampling intervals**
- **Testing PM2.5** e **PM10 fraction**

In progress: Development of the sampler hooking system and miniaturized suction system to drone

- Suction flow = 10 L / min, Filter size = 47mm
- Total system weight = 1.5kg



Exploded view of IMPACT PM10 Sampler

WP4 - Air monitoring system

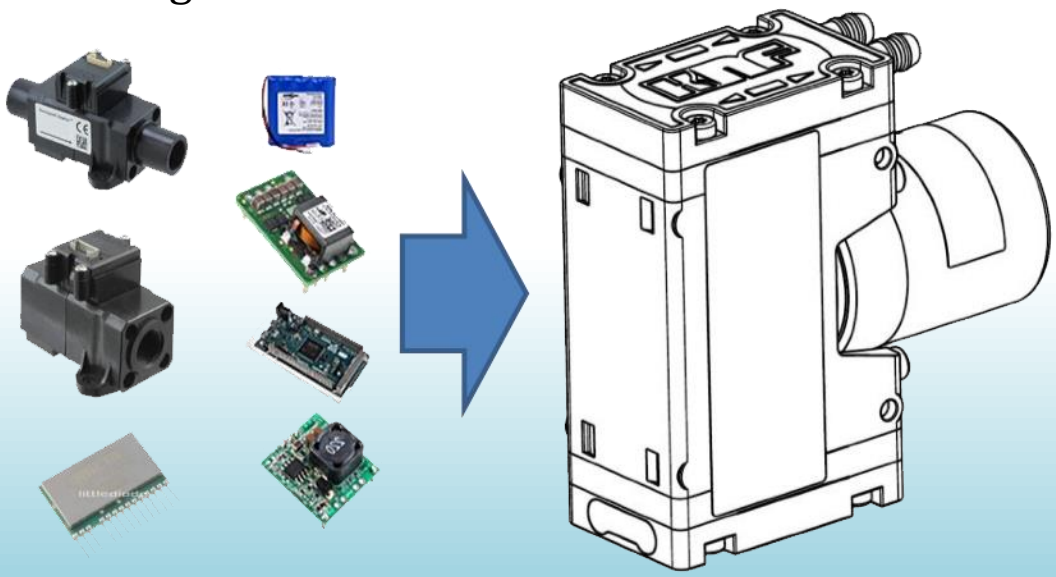
Prototype - aerial detection of IPA, VOC, PM2.5, PM10

Traps for the detection and measurement of PAHs (polycyclic aromatic hydrocarbons) and VOCs (volatile organic compounds), for subsequent assembly on drones

- **Sampler tests**
- **Testing PM2.5** e **PM10 fraction**

In progress: Development of the sampler hooking system and miniaturized suction system to drone

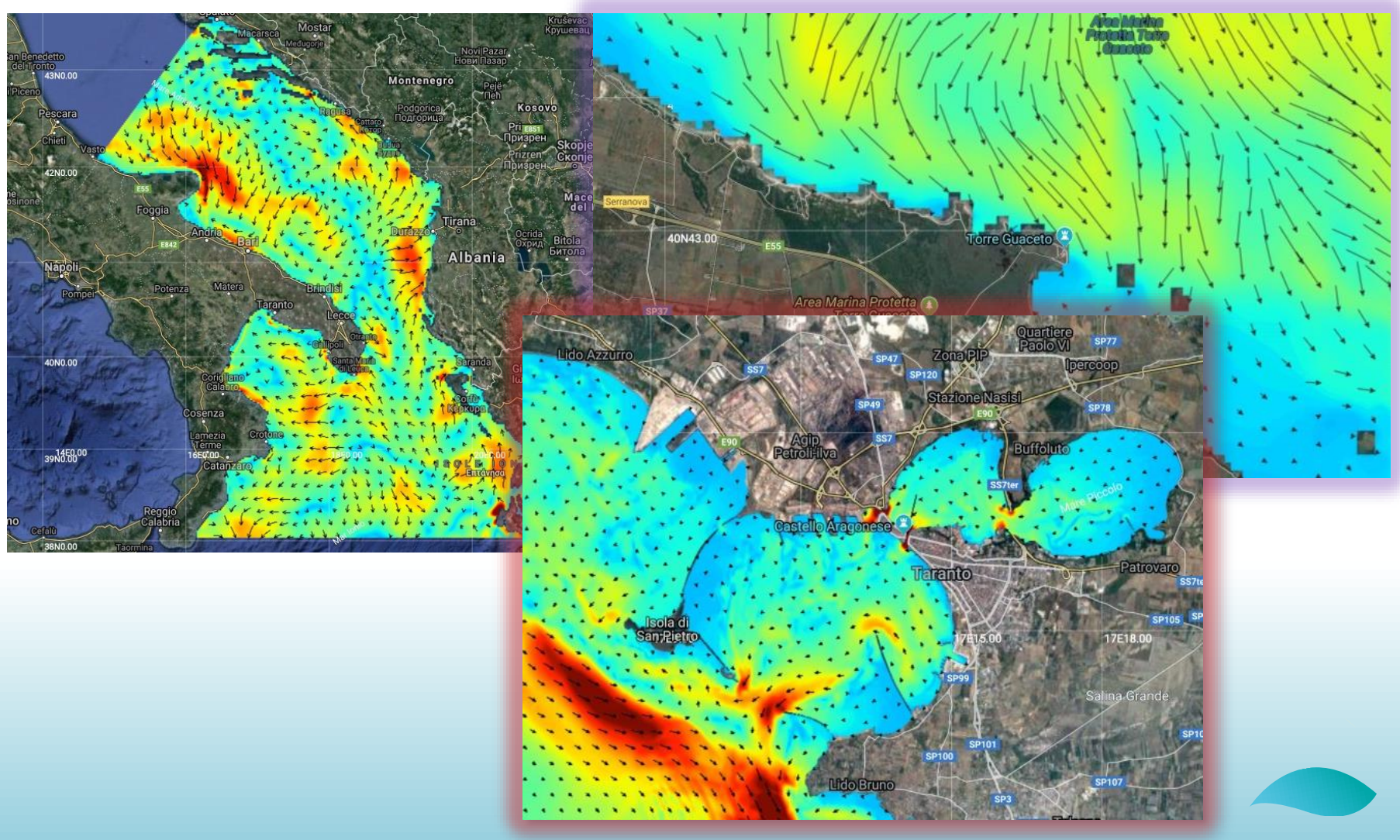
- Suction flow = 12 L / min, traps for PAHs and VOCs consisting of adsorbent resins
- Total system weight = 0.7 kg



WP6 - Water integrated monitoring system

PreOperational - high resolution oceanographic model

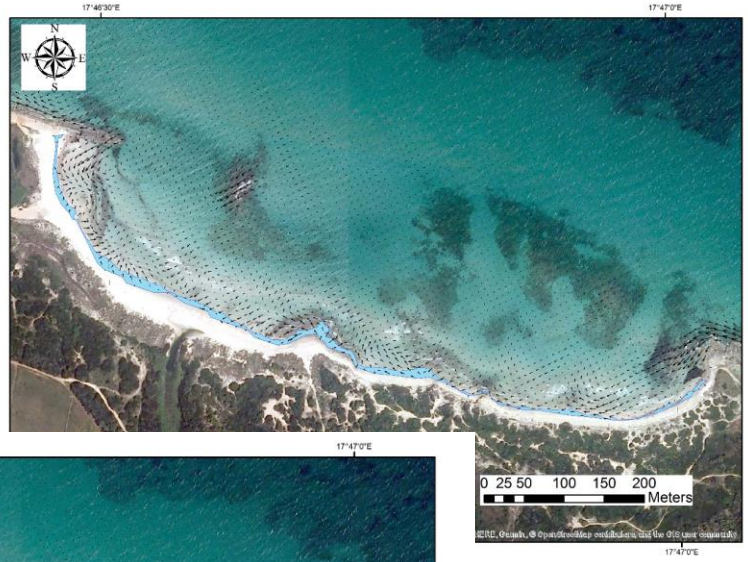
High resolution model , unstructured grids

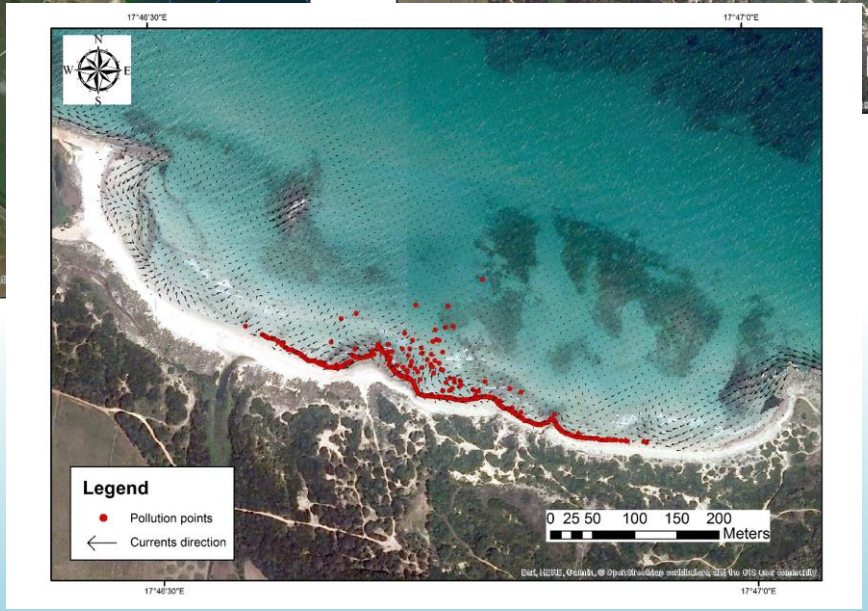


WP6 - Water integrated monitoring system

Risk analysis: hazard maps, vulnerability

- **Torre Guaceto**






thank you
danke
рахмат
謝謝
ngiyabonga
teşekkür ederim
gracias
merci
obrigado
спасибо
Баярлалаа
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