COSMEMOS: a collaborative project

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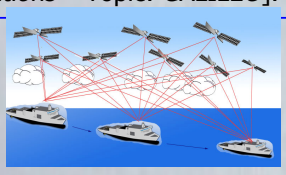
SEVENTH FRAMEWORK PROGRAMME

COSMEMOS (COoperative Satellite navigation for MEteo-marine MOdelling and Services) is a two years research and development project co-funded by the European Commission, 7th Framework Programme, managed by the European GNSS Agency (GSA) and led by the Company VITROCISET Belgium, which coordinates an international partnership of various expertise: LaMMA consortium (meteo-marine modeling and forecast - Italy), ITSLab (information and communication technologies - Italy), Starlab (GNSS environmental applications - Spain), Institute for Geodesy and Navigation (GNSS signals acquisition and analysis - Germany) and SPMJ (business consultancy - Great Britain). The company Forship (Italy) with the Corsica, Sardinia and Elba Ferries fleets takes part in the project as reference end user.
COSMEMOS started on march, 1st 2012 and is formally included in theTransport (Including Aeronautics) Theme [sub theme: *Support to the European GNSS (Galileo) and EGNOS* - Activity: 7.4.1. *Exploiting the Full Potential* - Area: 7.4.1.3 *Scientific Applications* – Topic: *GALILEO*].



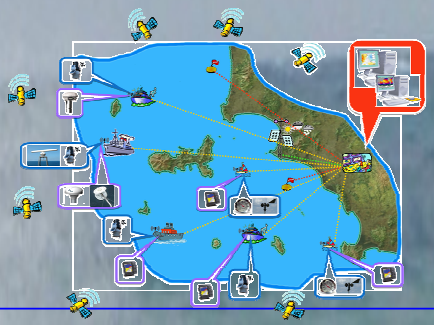
VTCB - Management

LaMMA	VTCB
R&D on Scientific Application and Services	Technologies, Business Analysis and Demonstration

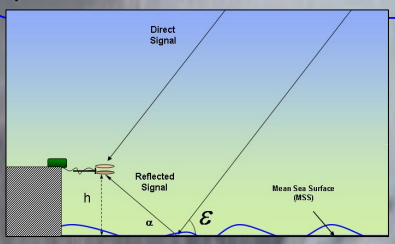
LaMMA	UniBwM	Starlab	VTCB	VTCB	ITSLab	SPMJ	VTCB	Forship
Meteo Application and Services	GNSS Meteo Support	GNSS-R Sensor	Value added services	System and services architecture	On Board technologies	Business Analysis	Demonstration and Promotion	Operational data provision

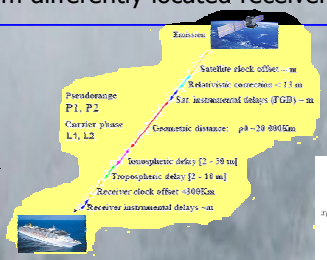
The goal of the project is to assess the scientific and operational benefits deriving from the implementation of a cooperative meteo-marine data collection schema, coupled with innovative on board sensors architectures based on both standard instruments (barometers, thermometers, hygrometers) and currently available or future GNSS (Global Navigation Satellite System) signals receivers.

Three topics are scientific and technological challenges of potentially high impact:
1. The *cooperative collection* and nearly real time use of meteo-marine data acquired by on board instruments of both commercial ships and private pleasure boats.
2. The *unconventional use of GNSS* receivers as sensors for the retrieval of important meteo-marine state parameters, namely atmospheric water vapor (WV by meteo-GNSS) and sea wave height (SWH by GNSS-R).
3. The pre-operational implementation of a *weather routing service*, following a innovative schema of data fusion between numerical weather predictions, meteo-marine data and specific ship seakeeping modeling.



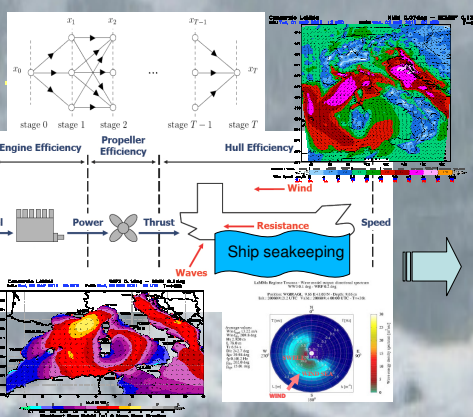
The unconventional use of GNSS receivers represents a potential source of large amounts of data, due to their widespread diffusion and the increasing number of dedicated satellites constellations (GPS, GLONASS, BEIDOU and in the next future GALILEO). Two different utilizations are foreseen: the GNSS-R, which allows the SWH retrieval detecting both the direct and the reflected (by the sea surface) signals; and the meteoGNSS for the atmospheric water vapor retrieval, by extracting the tropospheric delay of the signals with a centimeter accuracy. The main challenges are the GNSS-R on board use (instead of on fixed platforms), and the retrieval of reliable atmospheric WV profiles with meteoGNSS, taking advantage of the correlation between pieces of simultaneous information from differently located receivers.





The cooperative collection of meteo-marine data aims at gathering and exploiting the usually wasted massive information gained by on board instruments of commercial ships and private boats. The challenge is twofold: on the technological side, for the real time communication using both dedicated radio channels and modern wireless technologies (GPR-S/UMTS, WiMAX); on the scientific side to make heterogeneous data as homogeneous as possible, providing an estimate of their reliability and uncertainty for the assimilation in numerical prediction models. The assessment of the real effectiveness of such assimilation for nowcasting and short term forecast is also an objective of the project.

The weather routing service implementation is expected to provide at a pre-operational level the optimal route as regards navigation safety, fuel consumption and voyage duration. The challenging task consists in determining the best route with a selective multi stages algorithm, coupling numerical weather forecasts and ship seakeeping calculations. The latter will be based on both the specific vessel features (engine, propellers and hull efficiency, wind resistance, shipment …) and the expected meteo-marine conditions.



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