

# Innovation in meteorology for maritime navigation

cooperative and GNSS based observations - data assimilation - weather routing

## COSMEMOS project WORKSHOP 23 October 2013 9:00 -17:00



Port of Livorno

Venue: Main hall of *Corsica Ferries* ship “*Mega Express Two*”

COSMEMOS project aims at exploiting the amount of information virtually available at sea from common sensors on board ships and from innovative processing of the new GNSS signals, in order to upgrade fine-scale forecasts and generate a new class of services for marine transportation, from safety to cost reduction.

The aim of this workshop is to discuss the adopted approaches and initial scientific results of the project in a wider context of international experts. The workshop want to combine a deep attention to the different scientific issues with an active presence of professional users, towards which comparing the capability of the project to fit main needs. Main topics discussed will be those of cooperative and GNSS-based observations, data assimilation into local meteo-marine models and weather ship-routing, looking at the present state of the art and at the most promising directions for future developments.

## Workshop Programme 23.10.2013

### 9:00 Opening session

*Greetings from the hosting company.*

Corsica Ferries

*Greetings from the organising company.*

Bernardo Gozzini, Consorzio LaMMA

*Needs and target of ship companies: the vision of Corsica Ferries.*

Gabriele Luschi, Corsica Ferries

*Safety and routing services: the vision of the Italian Coast Guard.*

Italian Coast Guard (TO BE CONFIRMED)

*COSMEMOS: a GNSS-based prototype from observations to services.*

Alberto Ortolani, CNR IBIMET - Consorzio LaMMA

### 10:00 Observing solutions

#### **Frontier observing solutions for atmospheric and sea-state assessment**

*Chairperson: Prof. Torben Shueler*

*GNSS meteorology from ships as moving platforms.*

Torben Shueler, Institute of Geodesy and Navigation, University FAF Munich, Germany

*A Bayesian approach for atmospheric sounding from GNSS signals.*

Andrea Antonini, Consorzio LaMMA

*GNSS-R wave measurements: the Oceanpal instrument .*

Erwan Motte, STARLAB Barcelona

*Smart solutions for data transmission from marine areas.*

Nazzareno Marchese, ITS Lab

*The upcoming sensor network in North Tyrrhenian and Ligurian sea for waves and oceanography.*

Carlo Brandini, CNR IBIMET- Consorzio LaMMA

### 12:00 Weather forecasts

#### **Upgrading local forecasts by assimilating local data**

*Chairperson: Dr. Jordi Moré Pratdesaba*

*"Many a little, makes a mickle": the concept of cooperative data collection towards data assimilation.*

Riccardo Benedetti, Consorzio LaMMA

*Impact of local measurements on limited area forecasts.*

Jordi Moré Pratdesaba, Cataluna Weather Service

*GNSS and radar data assimilation in mesoscale models.*

Thomas Schwitalla, Institute of Physics and Meteorology, University of Hohenheim (DE)

### 13:00 LUNCH

## Workshop Programme

### 14:00 Navigation tools and services

#### **Knowledge based tools for safety and cost reduction in marine activities**

*Chairperson: Prof. Dario Bruzzone*

*Optimization of ship routes: meteorological navigation “by numerical process” .*

Andrea Orlandi, Consorzio LaMMA

*Review and state of the art of ship powering, energy efficiency and emissions control, technical problems and related international rules.*

Andrea Coraddu, Dept. of Naval Engineering (DITEN), University of Genoa

*Added resistance in waves, computational techniques and impacts on fuel consumption.*

Dario Bruzzone, Dept. of Naval Engineering (DITEN), University of Genoa

*Dangerous phenomena in adverse weather and sea conditions: when stability criteria need to be supplemented by recommendations to the master.*

Alberto Francescutto, Dept. of Naval Architecture, University of Trieste

*Wave spectral data in ship weather routing.*

Roberto Vettor, Centre for Marine Technology & Engineering, Institute Sup. Tecnico, Lisbon

*Algorithmic approaches for optimal ship route planning*

Fabio Schoen, Dept. of Information Engineering, University of Florence

*Seakeeping analysis and decision support tools for ship operations.*

Alessandro Grasso, RINA Services S.p.a.

### 16:30 Achievements and perspectives

*Chairperson: Dr. Enrico Barro*

*What we have learned today and what for COSMEMOS as a project and as a future service.*

Fabio Riva, VITROCISSET Belgium

*Growing opportunities in Horizon 2020.*

Carmen Aguilera, GSA

#### **TECHNICAL NOTES**

Workshop participation is free but **registration is requested**.

To register send an email to: [cosmemosworkshop@lamma.rete.toscana.it](mailto:cosmemosworkshop@lamma.rete.toscana.it)

**English will be the official language of the workshop. No translation provided.**

See more on workshop web page: <http://www.lamma.rete.toscana.it/cosmemos-workshop>

# COSMEMOSproject

innovation in meteorology for maritime navigation

**A collaborative project, developing new meteorology data acquisition and processing at sea, exploiting new GNSS signals, namely Galileo, aimed at improving marine navigation safety and cost reduction.**



In the maritime navigation - both commercial and yachting - meteorological information are crucial. The scarcity of real-time in situ measurements, indispensable for running precise regional meteo models, is a constrain factor for the improvement of forecasting capabilities on local scale.

COSMEMOS propose an original and challenging approach based on:

An innovative **cooperative schema**, for gathering marine-weather data, where users of meteo services cooperate with their own data. Available meteo data are provided from private ships in navigation, normally from the sensors already installed, but in some cases also from other two types of innovative sensors, using an adaptive data-transfer solutions for optimising efficiency and costs.

**New sensors aboard**, exploiting the value given by the joined GPS and Galileo positioning systems through particular techniques to determine the significant wave height and the vertical profiles of atmospheric parameters (essentially temperature and humidity). These on-board techniques are completely new.

**Innovative data processing**, through advanced data-fusion procedures to extract information from this amount of data, with a proper quality for the assimilation into high resolution meteorological models, for improving meteo-marine forecasts.

This new class of weather information enables the development of **new services for maritime navigation**, tailored on short-distance navigation, as needed for highly detailed weather routing and navigation assistance services at the Mediterranean scale. Such services will be based on the integration of accurate models of the characteristics of each ship with improved high-resolution meteo-marine forecasts, also allowing frequent envoyage re-routing.

**COSMEMOS è un progetto collaborativo che sviluppa nuove soluzioni per l'acquisizione e l'elaborazione di dati meteo in mare sfruttando i nuovi segnali GNSS, in particolare Galileo, per migliorare la sicurezza della navigazione marittima e ridurre i costi.**



Nella navigazione marittima -sia commerciale che da diporto- le informazioni meteorologiche sono cruciali. La scarsità di misure in situ disponibili in tempo reale, indispensabili per la meteorologia di precisione, è un fattore limitante per il miglioramento delle previsioni a scala locale.

COSMEMOS propone un approccio totalmente nuovo basato su:

Un **nuovo schema cooperativo** per la raccolta di dati meteo-marini, in cui gli utenti di servizi meteo cooperano con i propri dati. I dati meteo vengono forniti da navi private in navigazione, misurati dai sensori normalmente già installati, e in alcuni casi anche da altri due tipi di sensori innovativi, utilizzando soluzioni adattative per il trasferimento dei dati, per ottimizzarne efficienza e costi.

**Nuovi sensori a bordo**, che sfruttano il valore congiunto dei sistemi di navigazione satellitare GPS e Galileo tramite tecniche specifiche per determinare l'altezza significativa delle onde e i profili verticali di parametri atmosferici (temperatura e umidità). Queste tecniche per misure a bordo sono completamente nuove.

**Elaborazione innovativa di dati**, attraverso procedure avanzate di data-fusion per estrarre informazioni dall'insieme di dati disponibili, con opportune caratteristiche che ne consentano l'assimilazione nei modelli meteorologici ad alta risoluzione, per migliorare le previsioni meteo-marine.

Questa nuova classe di informazioni meteo consente lo sviluppo di **nuovi servizi per la navigazione marittima**, focalizzati alla navigazione su rotte brevi, necessari per l'ottimizzazione meteorologica delle rotte e l'assistenza alla navigazione su scala mediterranea. Tali servizi saranno basati sull'integrazione di un'accurata modellistica delle caratteristiche di ogni nave con previsioni meteo-marine ad elevata risoluzione, in modo da consentire anche il calcolo di correzioni ricorsive lungo la rotta.

## The Project

COSMEMOS is a two years R&D project, funded by the European Commission, 7th Framework Programme, managed by the European GNSS Agency grant agreement n°287162.

Partners are:

- VITROCISSET Belgium (leader)
- LaMMA consortium (Italy)
- ITSLab (Italy)
- Starlab (Spain)
- Institute for Geodesy and Navigation (Germany)
- SPMJ (Great Britain).
- Forship S.p.A. (Italy) owner of the brand Corsica, Sardinia and Elba Ferries.

