A Fully-Autonomous and Low-Cost Thermosalinometer for High-Resolution Monitoring of SST and SSS (TRANSMED System)

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INTRODUCTION

The fully-autonomous and low-cost thermosalinometer system TRANSMED has been developed to enable monitoring the **Sea Surface Temperature (SST)** and the **Sea Surface Salinity (SSS)** over the whole Mediterranean Sea, as a CIESM initiative initially**.** Indeed the Mediterranean displays an intense meso-scale variability in both space and time, so that capturing the long-term variability and extracting a potential climatological signal is a challenge. Moreover, its central and southern parts are little known, and lack sampling facilities. The objective of TRANSMED is to use the regular routes and schedules of ships of opportunity to record SST and SSS underway, and assemble long-term time series.

The TRANSMED system is now fully operational. It has been installed early 2012 for the Long Observing Period of HyMeX (2010-2020) aboard the M/V "Marfret Niolon", servicing the route from Marseille to Algeria.

The ultimate goal is to implement a full network…
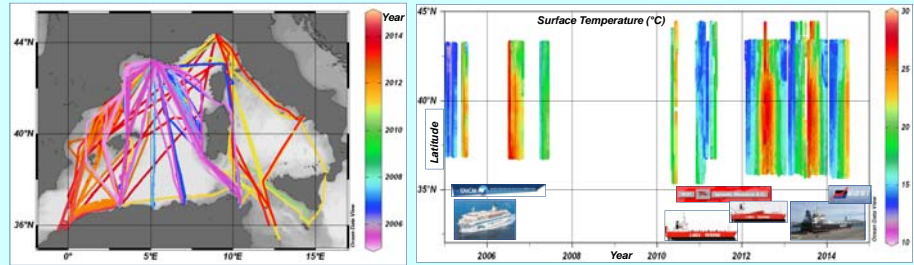
Spatio-temporal distribution of the routes surveyed during the successive phases of the TRANSMED program

THE TRANSMED SYSTEM

TRANSMED is designed as a modular and generic package, with the aims i) to be easily portable (ships assignment to a route limited in time), ii) to be remotely managed, iii) to require limited maintenance, iv) to provide high-quality data.

TRANSMED uses a thermistor SBE38 to record the SST as close as possible from the water intake (~3m deep), and a thermosalinometer SBE45 to determine the SSS in a dedicated circuit, specific to each ship. Data are recorded every 10s, allowing a spatial resolution <100m and reliable data at the km-scale. The ethernet network enables co-locating SST and SSS data with GPS, and controlling the pump and the data acquisition according to the ship's speed, in order to avoid pumping in harbours and fouling the conductivity cell. Periodic reboot is programmed, and alarms and system status are sent ~hourly along with the raw data, using the ship's emailing facility. Communication via GSM allows to take control over the PC onboard in harbour for debugging and updates. All these features would allow to deploy and manage a fleet of such systems at the Mediterranean scale.
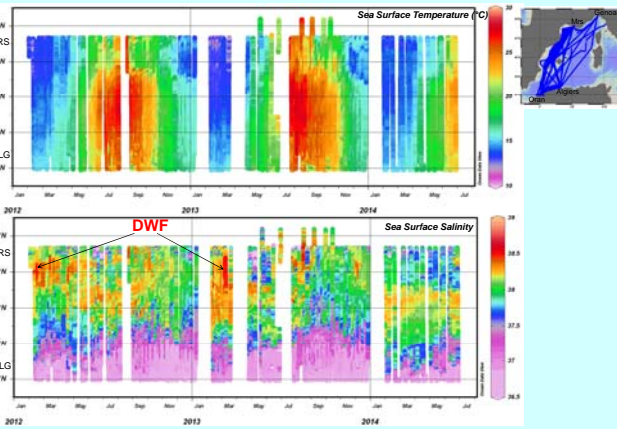
www.ifremer.fr/transmed_2014
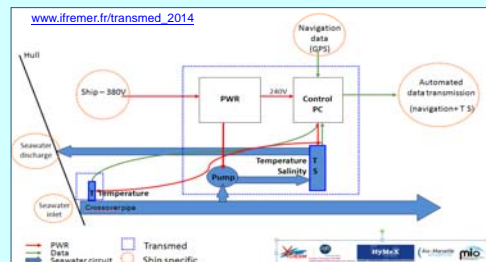
Schematic diagram of the TRANSMED system

The TRANSMED seawater circuit aboard the M/V Marfret Niolon

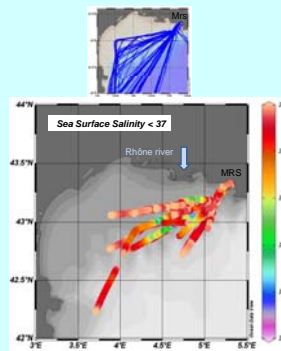## RESULTS SPAN SCALES :

FROM THE ANNUAL CYCLE IN THE WESTERN BASIN…

Time series of SST and SSS recorded on the M/V Marfret Niolon between Marseille and Algeria. DWF episodes are evidenced in the gulf of Lion by 2012 and 2013 wintertime salinity maxima (coastal route in 2014)

…TO THE REGION OF THE GULF OF LION…

SSS values < 37 show the potentially large extent of the Rhône river plume in the gulf of Lion (2005-2014)

…UP TO EVENTS IN A COASTAL ZONE
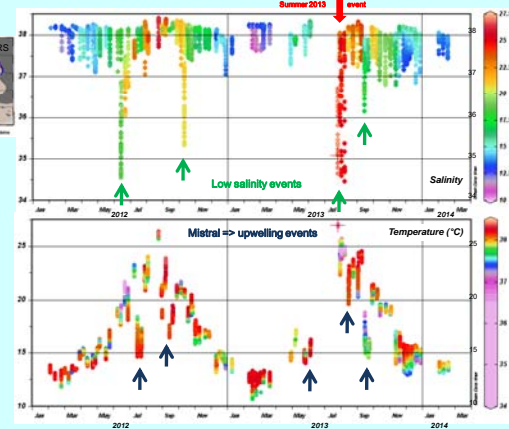
Time series of SSS show low salinity events, indicating incursions of the Rhône river plume in the Bay of Marseille (top). Time series of SST show low temperature events, indicating upwelling related to Mistral episodes (bottom)

DATA FLOW (as of sept. 2014)

Freq.	Processing	Origin	Destination
10s	acquisition	ship	local storage
1h	• 1h-data file sent • 1h-data file checked and processed on the fly (errors, missing data, thresholds…)	Ship MIO/La Seyne	Mail MIO/La Seyne TRANSMED DB
24h	• 24h of data from TRANSMED DB decimated (2min median) • 24h of data (re)checked , quality flags added	DT INSU CORIOLIS	CORIOLIS MyOCEAN GOSUD
1 month	data from TRANSMED DB manually screened for doutful data, routines for computation of derived parameters, decimation (2min median) … => **monthly provisory data files** of good quality	MIO/La Seyne	TRANSMED DB* HyMeX/ SEDOO
1 year	• recalibrations of probes (« as is » » + systematic replatinization of the conductivity cell) • replay of 1 year of data to account for sensors drifts (˜ null) => **monthly definitive data files**	SBE MIO/La Seyne	TRANSMED DB* HyMeX/ SEDOO *: not implemented yet

real time
www.ifremer.fr/transmed_2014

near- real time

delayed mode
http://mistrals.sedoo.fr/HyMeX/

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www.ifremer.fr/transmed_2014
www.hymex.org
http://www.ciesm.org/marine/programs/partnerships.htm

C/F « Méditerranée » (2005-2007)

M/V « Jolly Indaco » (2010-2013)
M/V « Jolly Grigio » (2013)

M/V « Marfret Niolon » (2012-2014)