



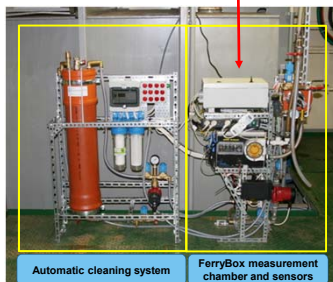
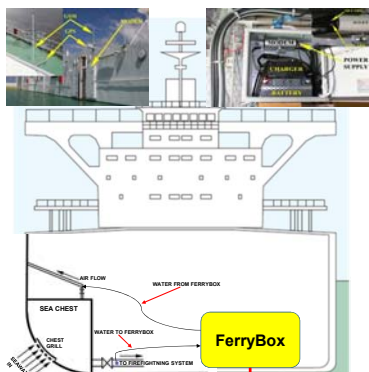
Operational *in situ* oil-spill detection in the Baltic Sea using FerryBox system equipped with oil sensor

Tarmo Kõuts, Siim Pärt and Kaimo Vahter
Marine Systems Department
Tallinn University of Technology, Estonia
Contact: tarmo.kouts@taltech.ee



PAH measurements and FerryBox system on M/S BALTIC QUEEN

M/S BALTIC QUEEN



- Compact FerryBox system developed by TUT Marine Systems Institute is used on board ferrie M/S BALTIC QUEEN. During GRACE project, UviLux (Chelsey Instruments Ltd) UV-fluorometer is intended to be used for monitoring oil compounds in surface layer of the open sea

- UviLux sensor detects the concentration of polycyclic aromatic hydrocarbons (PAHs) in water (in terms of Carbazole)

- In parallel, basic seawater properties are recorded by the same system in real time – temperature, salinity, turbidity, O₂ and pCO₂ concentration. Such system enables automated asset for detection and monitoring of oil spills on fairways, where occurrence of oil spills is highest

- We summarise the operational experience gathered from tests of the FerryBox systems equipped with the UV-fluorometer, showed its potential as an oil-spill detection and monitoring tool. Repeated tracks of ferries allow to obtain statistics of oil compounds in water in different sea areas. Especially important is the monitoring of small spills, which stay undetected with conventional remote sensing methods, but are most numerous and detectable only with *in situ* measurements

UviLux fluorometer
(Chelsey Technology Group, UK)

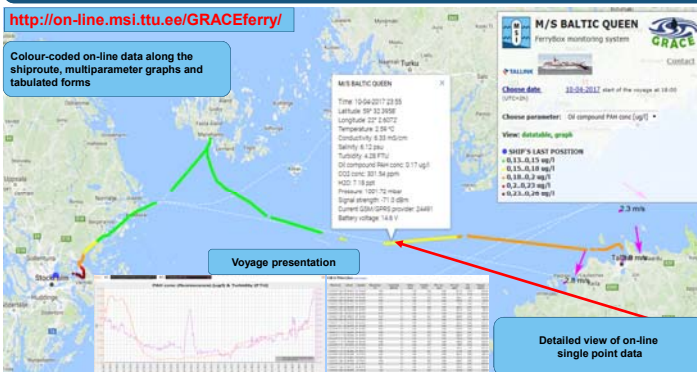
Sensitivity 0,005 µg/L or 5ppt (Carbazole)
Calibrated range 0,005 – 2000 µg/L
Excitation light 255nm
Emission light 360nm



Data management and visualisation via web-based user interface

<http://on-line.msi.ttu.ee/GRACEferry/>

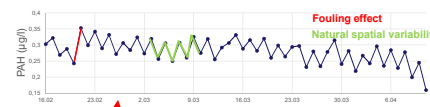
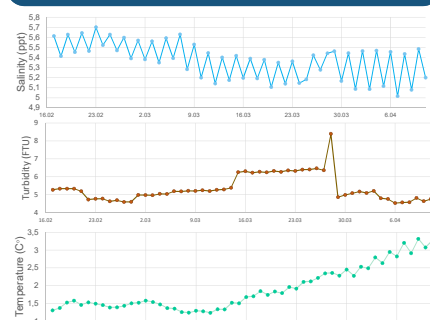
Colour-coded on-line data along the shiproute, multiparameter graphs and tabulated forms



Web-based user interface:

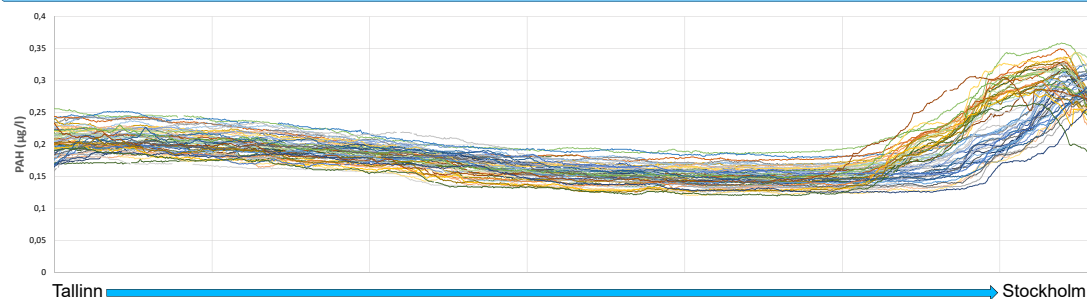
- Real time detailed (1 minute interval) map view of data, color-coded for each parameter
- Data-table and graphs from the past for analysis, comparative multiparameter graphs
- Parameters are measured in one minute intervals, which give a 100-150m spatial resolution along the fairway
- *In situ* measured data can be overlaid in the same system with satellite data, if available

Data quality analysis through ship voyage averages

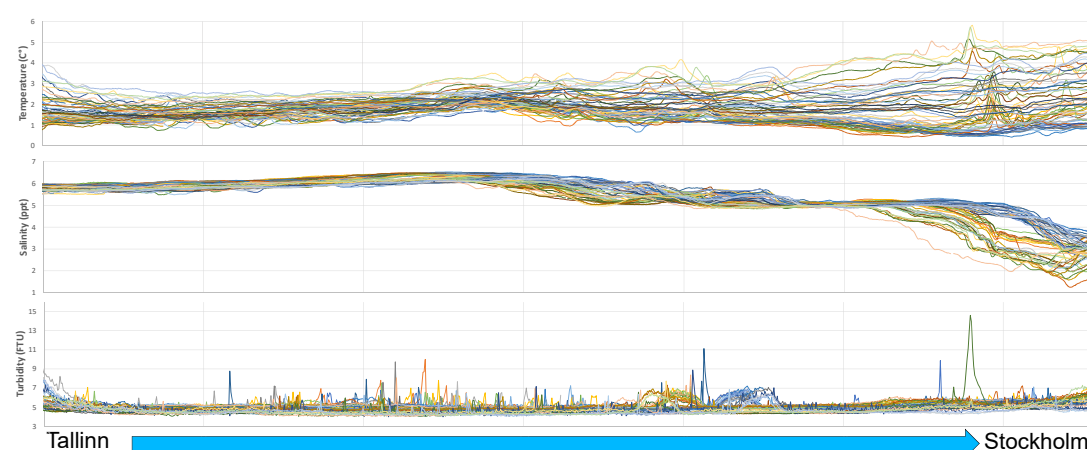


Results

Variability of oil compound PAH concentrations
16.02.2017 – 11.04.2017



Variability of physical parameters
16.02.2017 – 11.04.2017



Summary

- Asset for in-situ oil detection and monitoring has been developed based on FerryBox technology and equipped with on-line data management
- 55 ship voyages analysed (16.02 – 11.04.2017), 960 data points each, 52 800 in all e.g. very good ensemble for statistical analysis
- Max PAH concentration 0,36 µg/l
- Measured PAH concentrations are not absolute values, but rather relative, variability patterns can be still estimated
- Remarkable variability of PAH concentrations near the coasts and the open sea
- General pattern of spatial distribution of the PAH concentration seems to be rather stable
- Sudden concentration rises which would directly indicate oil spills, have NOT been detected during the observation period, all PAH concentrations have stayed far below those defining an oil spill