Dependable Monitoring with Wireless Sensors in Aquatic Environments

António Casimiro
LaSIGE, Faculdade de Ciências,
Universidade de Lisboa, Portugal

Gonçalo Jesus
LNEC, Portugal

LASIGE

Ciências
ULisboa

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Motivation

- Real-time aquatic monitoring, for various water-related values, like water level or flow, is essential to prevent disasters:
  - Used to confirm predictions of forecast systems
  - Supporting alerts issuing
  - Supporting decision-making (mitigation actions)
- The quality of the data that feeds the information systems depends on the **quality of the measurements** and on **knowledge about this quality**

Objectives

- Improve the dependability of WSN-based monitoring in aquatic environments:
  - Use machine-learning techniques to analyse sensor data and identify failures affecting these data (sensor failure modes)
  - Exploit the redundancy provided by other sensors and by forecast models for data fusion and failure detection
  - Use explicit knowledge about failure modes to determine the quality of data and to perform data corrections
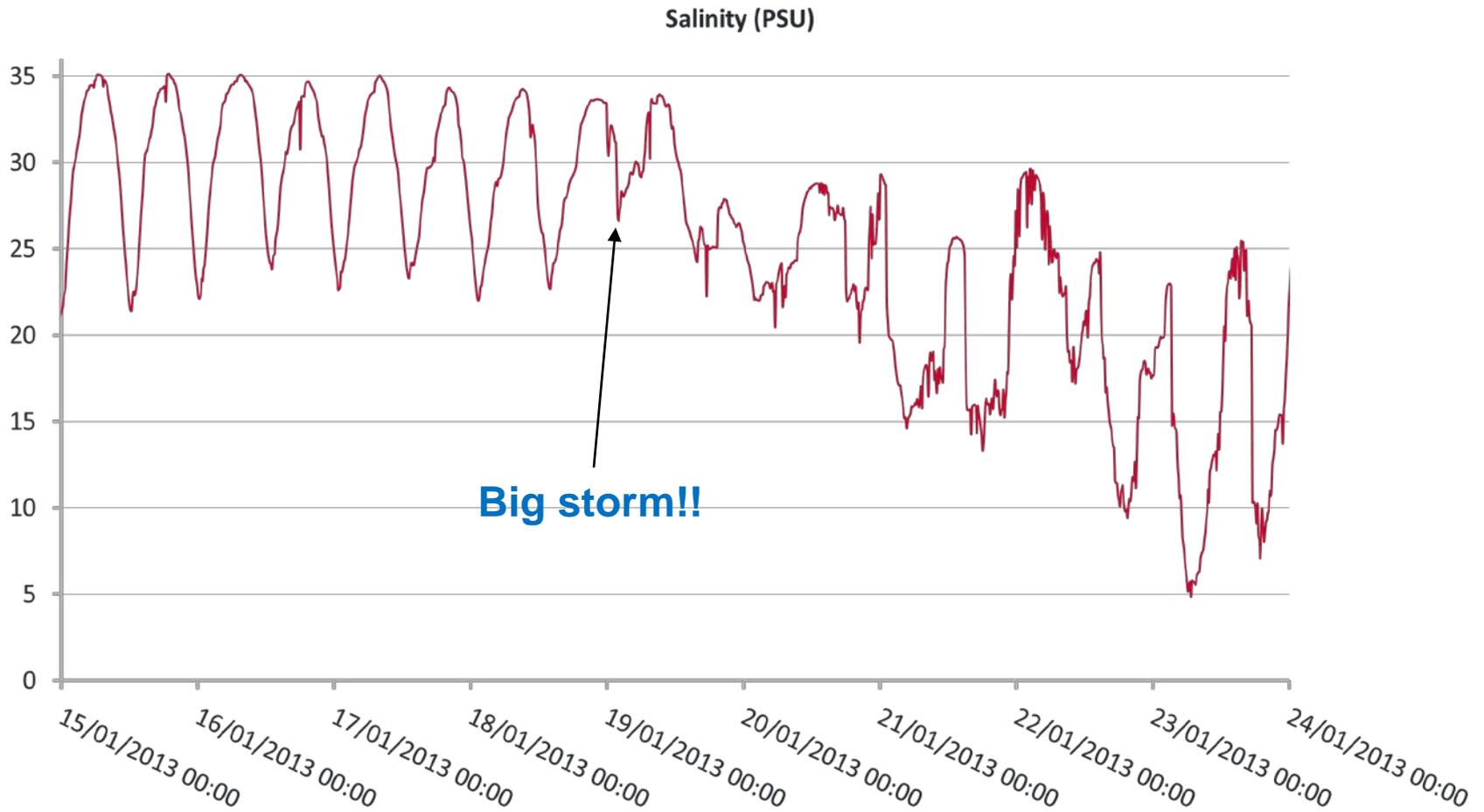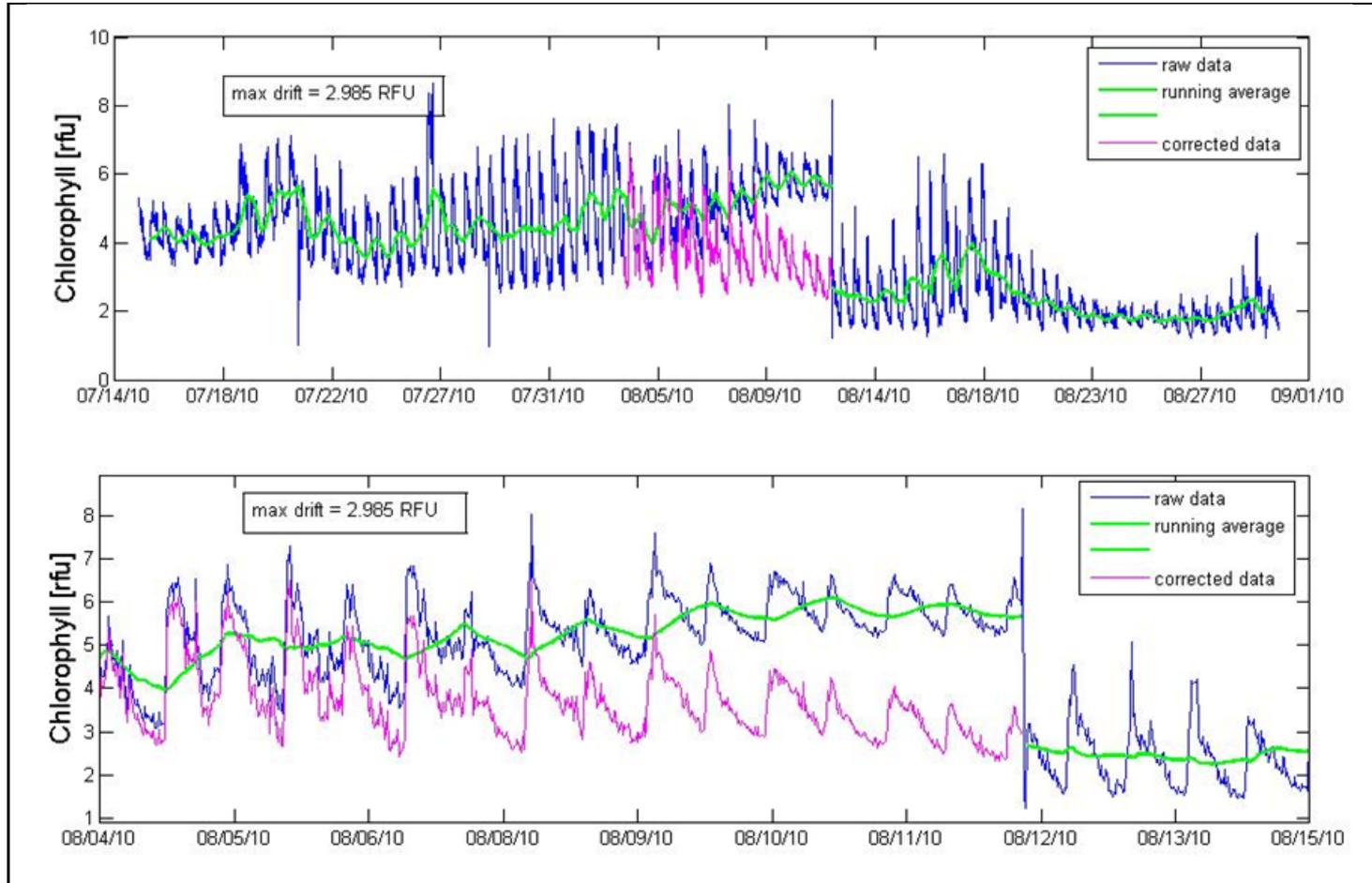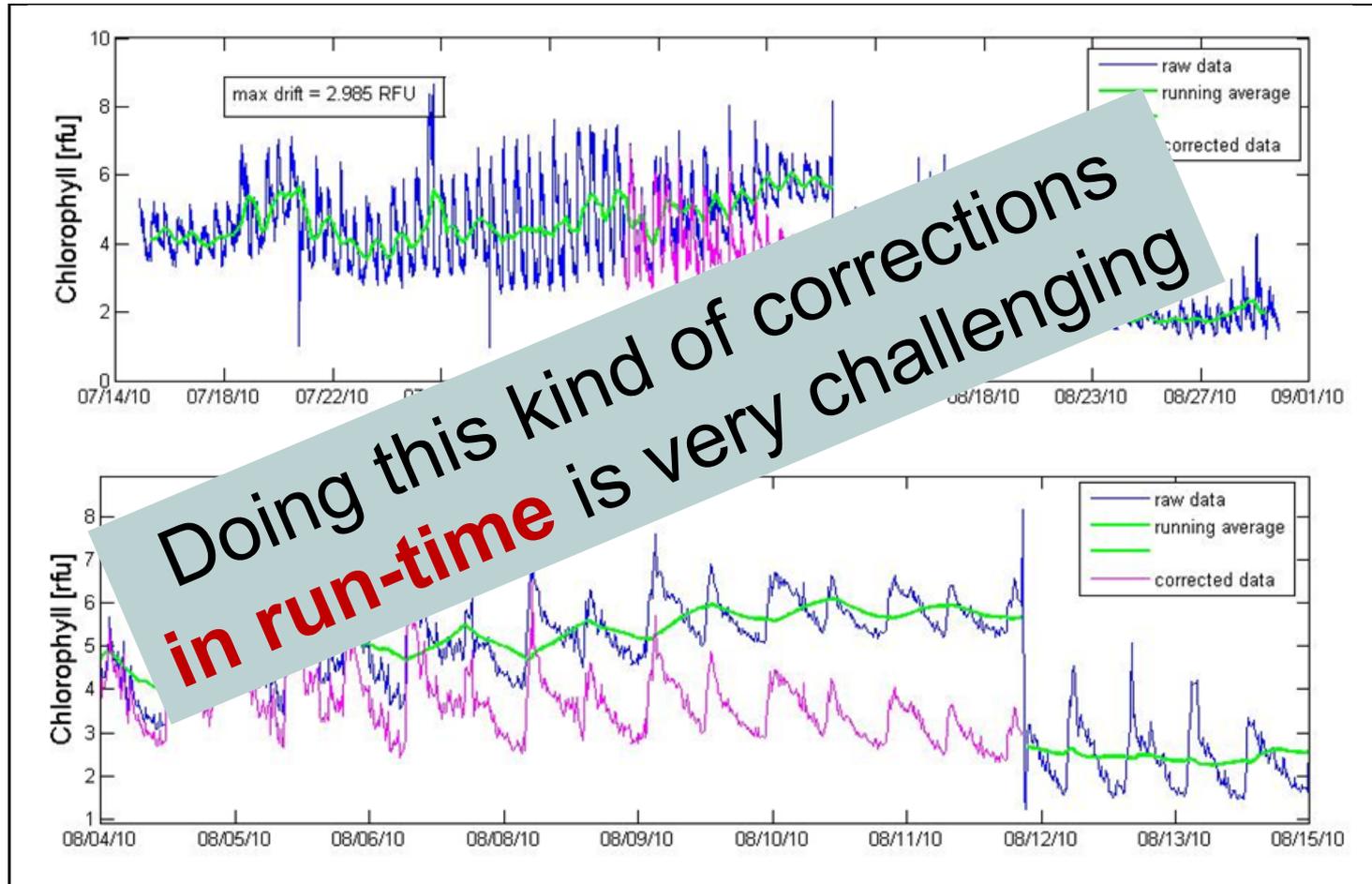
Aquatic sensors

Typical sensor failures

Salinity (PSU)

Outliers

Noise

Drift

Typical sensor failures

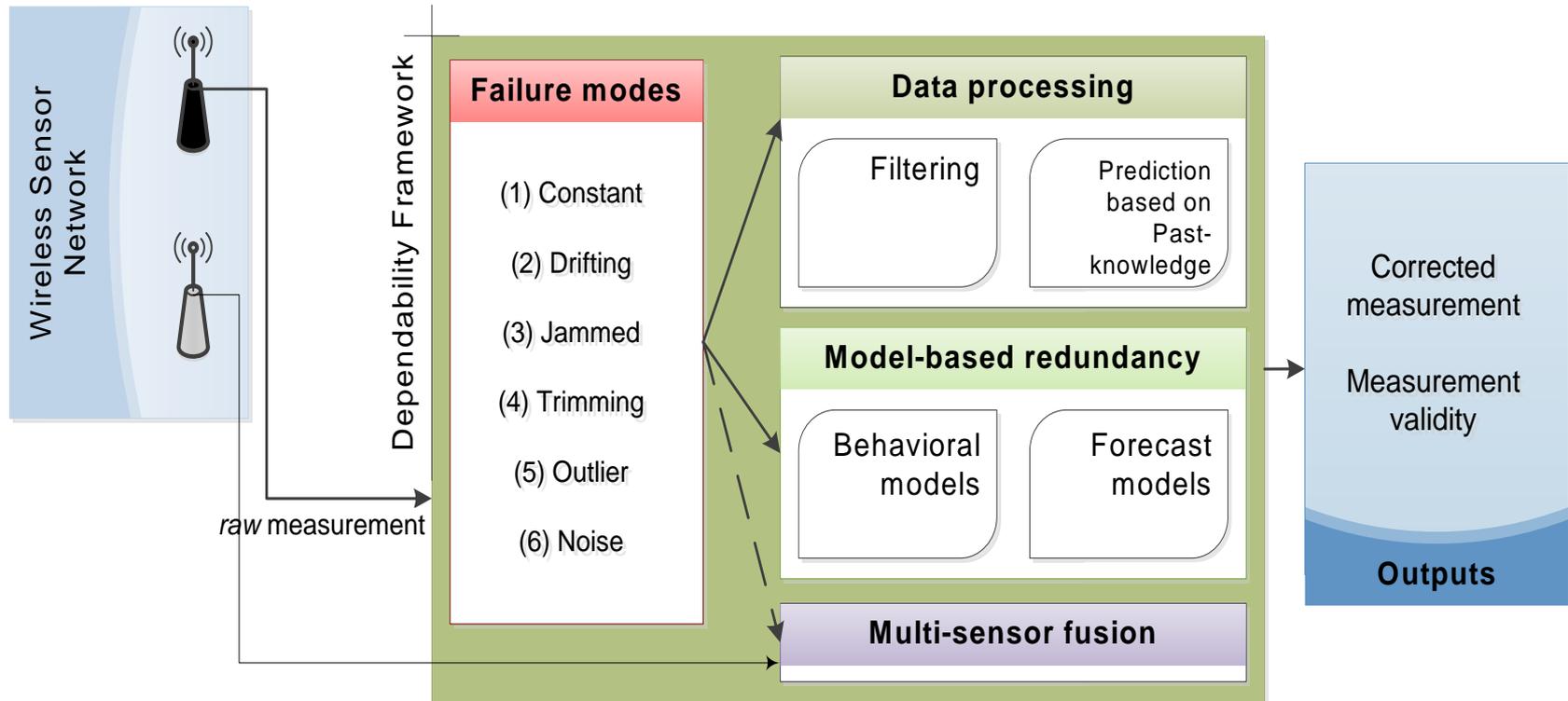Salinity (PSU)

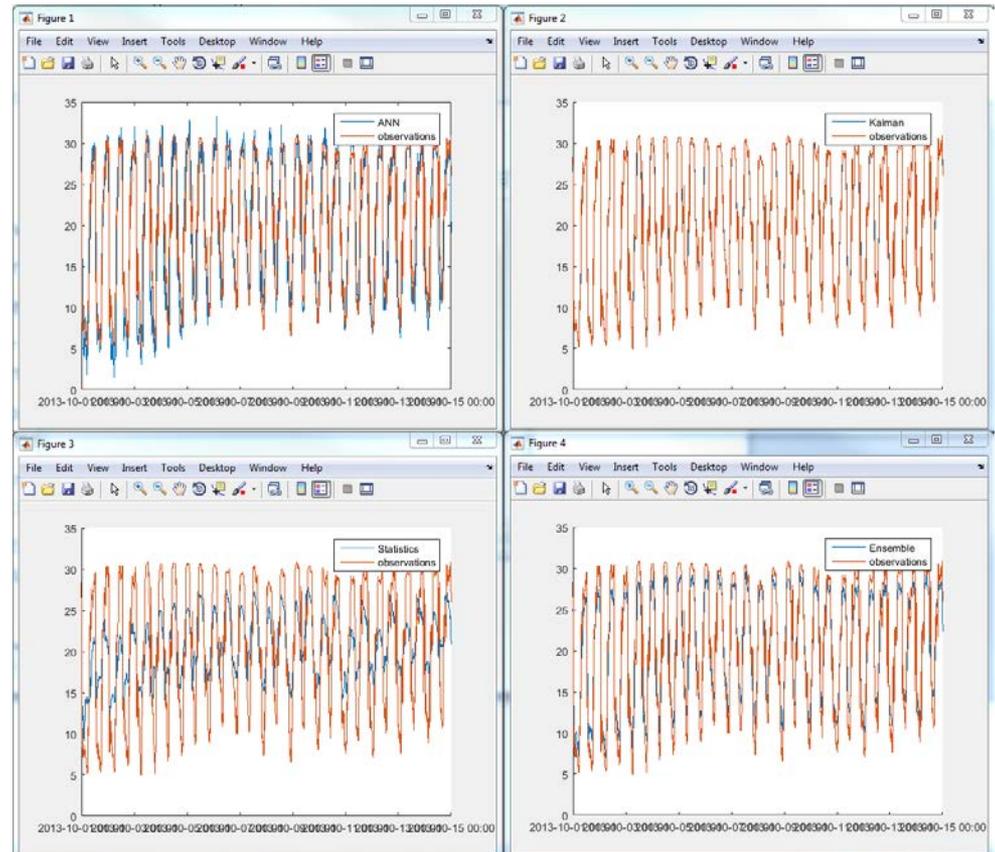**Big storm!!**
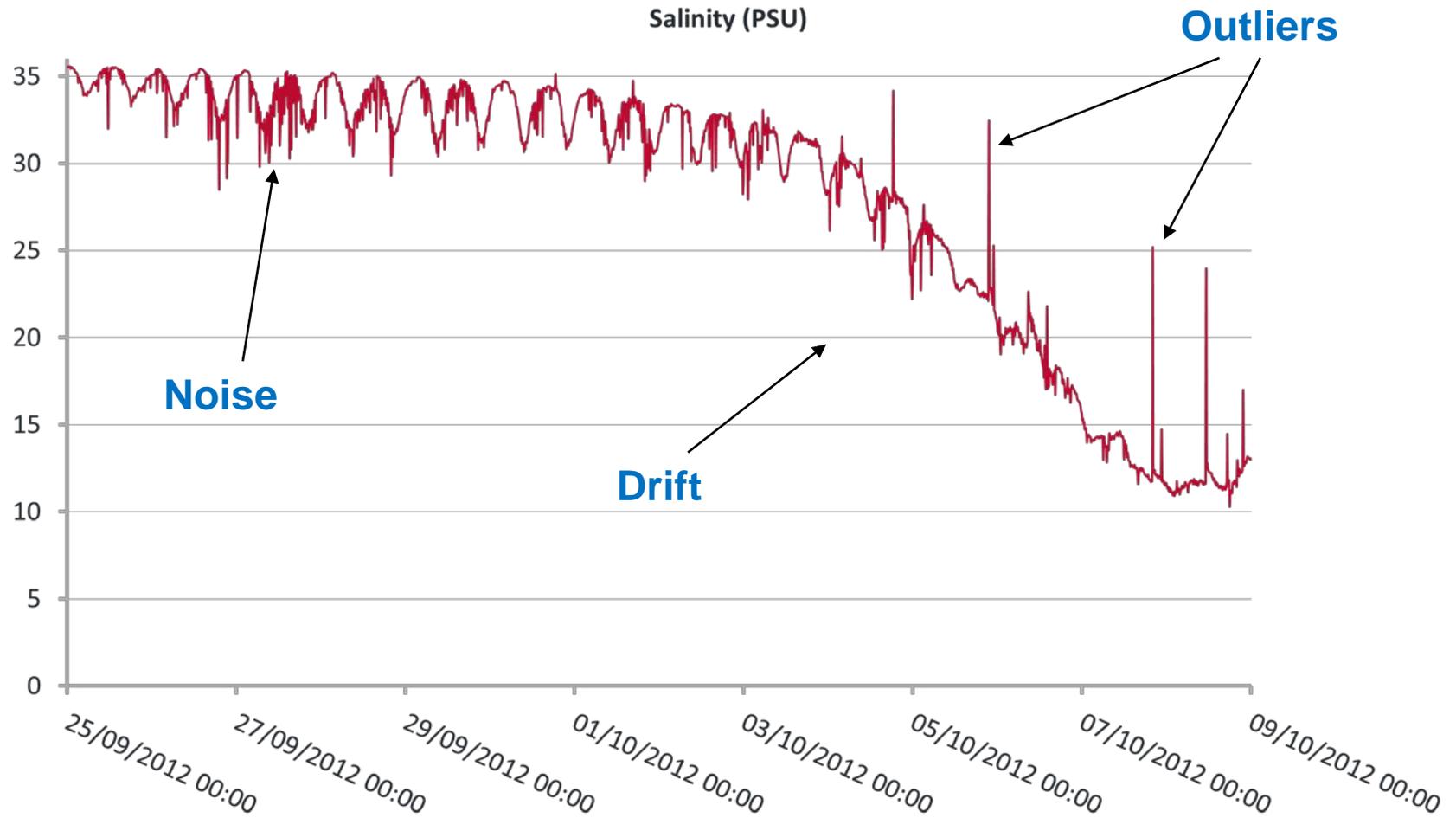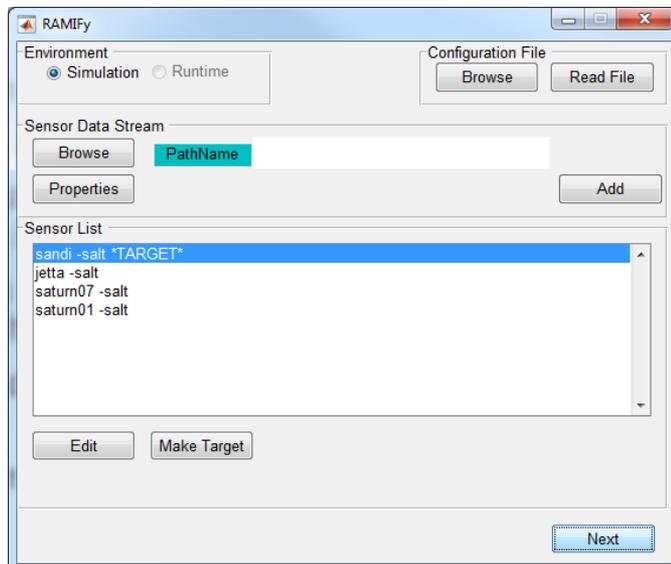
Corrected data

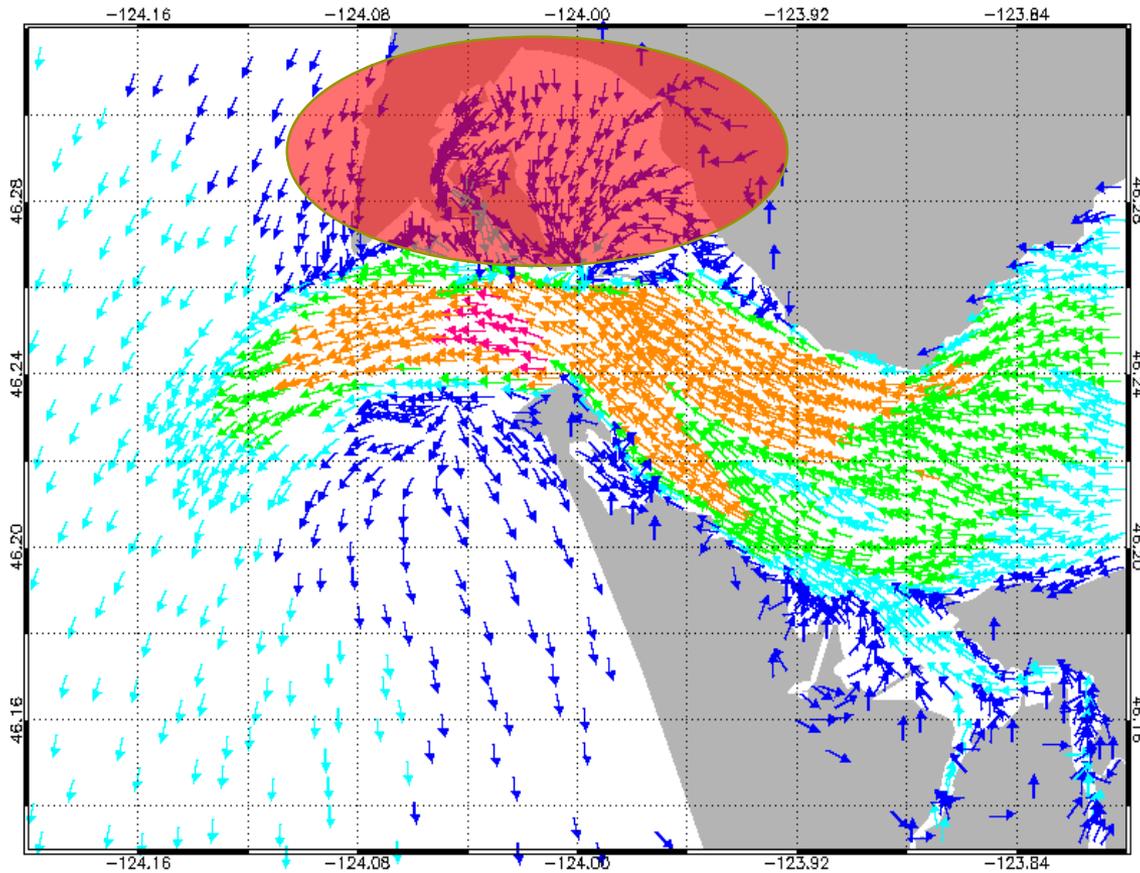# Corrected data

Dependability-oriented framework

Data analysis tool

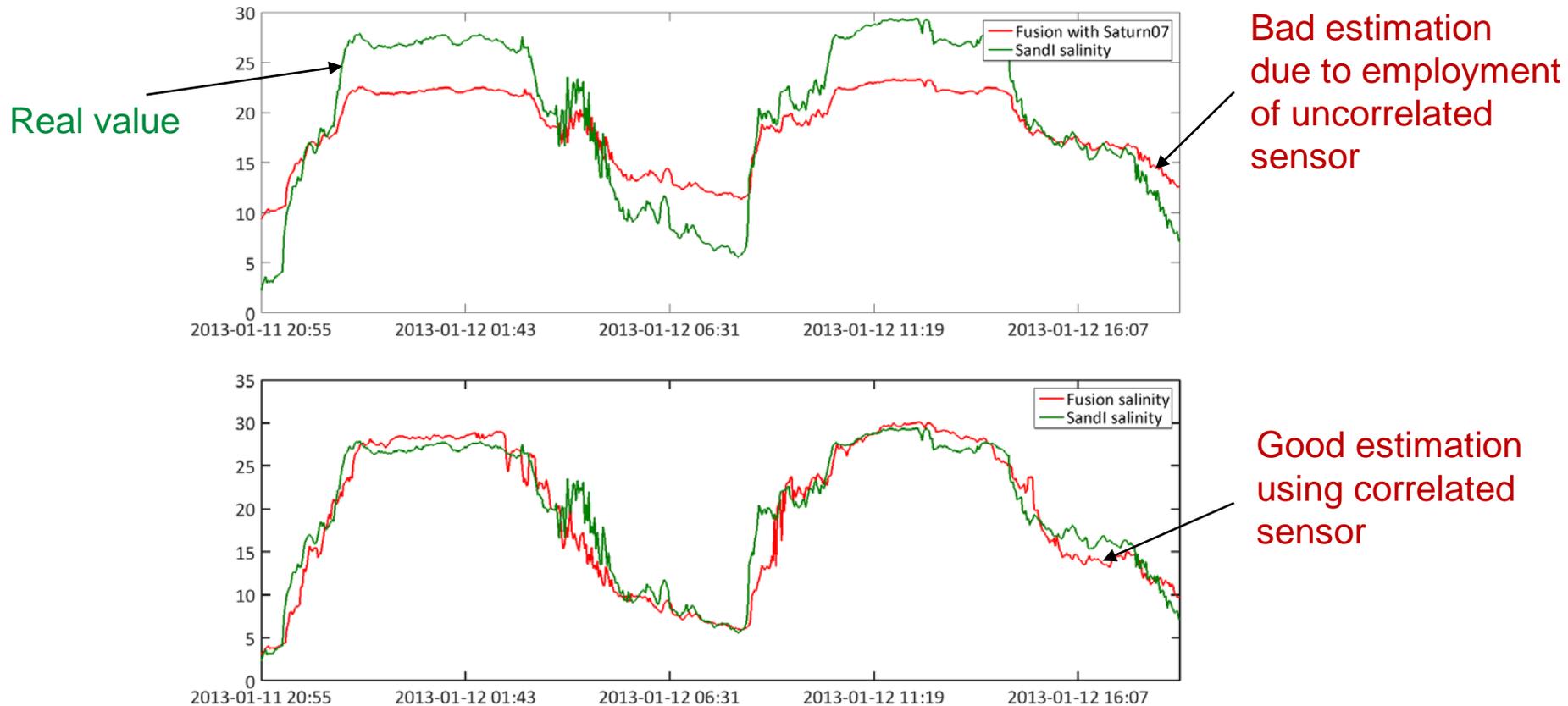- In development
- Runs some methods in simulation mode

Example of preliminary tests

Circulation patterns clearly indicate that sensor Saturn 07 is not related with the others, that are on the main circulation channel

Statistical approach

- Influence of correlation in multi-sensor fusion

Real value

Bad estimation due to employment of uncorrelated sensor

Good estimation using correlated sensor

Thank you for your attention!

To reach me: **casim@ciencias.ulisboa.pt**

Web page: **http://www.di.fc.ul.pt/~casim**

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