



**Automated Surface Water Monitoring Stations in the City of Hamburg
as part of the EU Water Framework Directive**

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Gesundheitsschutz und Umweltuntersuchungen



Hamburg

Agenda for today:

Where is the city “Hamburg” located?

Is the WFD helpful for automated monitoring?

The water quality measuring network with biological early warning system in Hamburg

- Where are the monitoring stations located?
- Which river basins are in surveillance?
- Which equipment is used?
- What is shown in the internet?

What are the methods for unusual event recognition?

The IWAP Elbe – International **W**arn- and **A**lert **P**lan from the ICPE

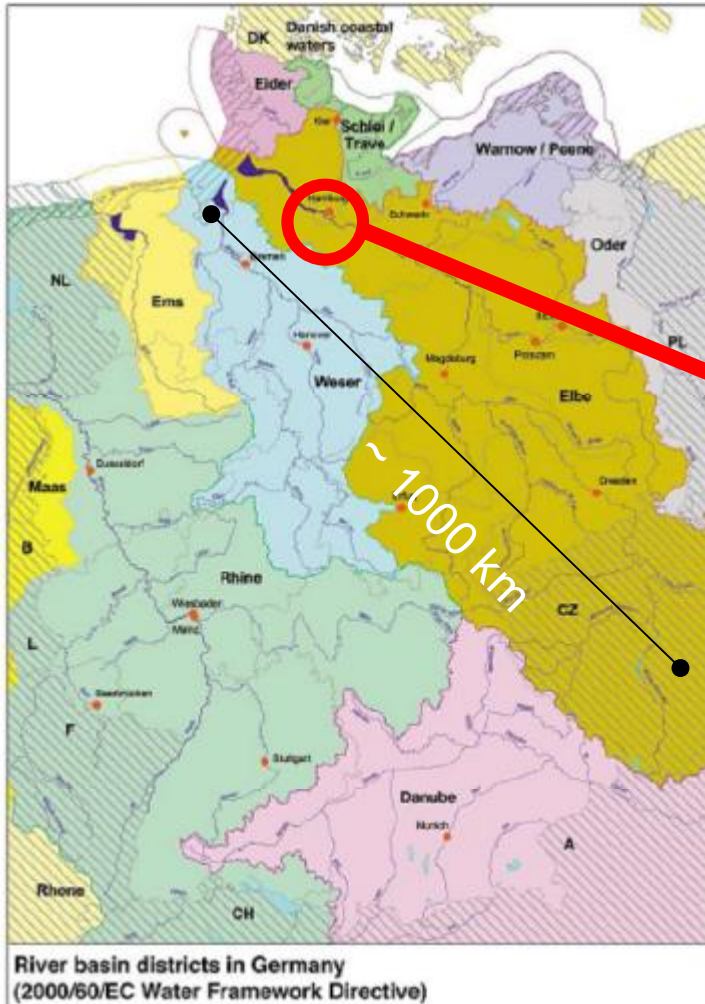


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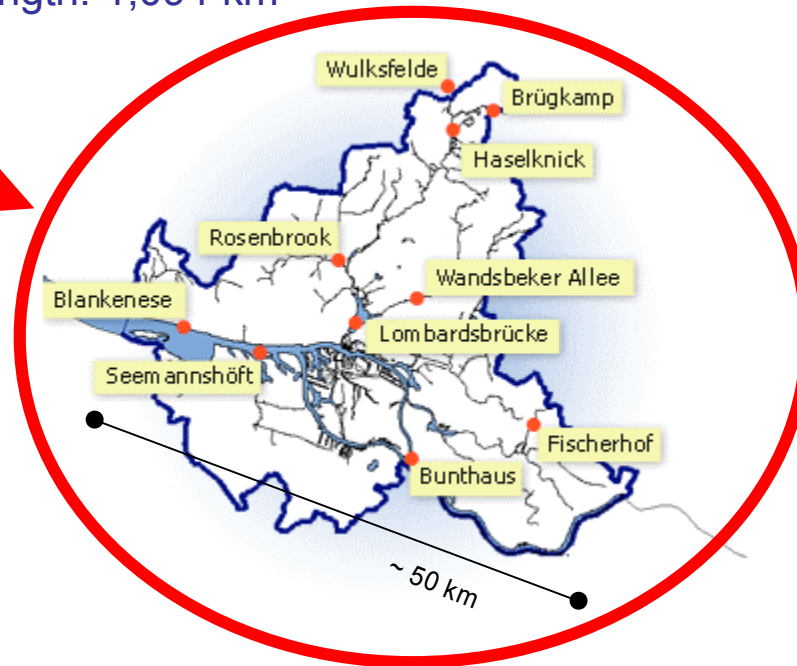
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Hamburg



“Big” river basin “ELBE”
area: 148,000 km²
population: 25 mio
length: 1,094 km



“Small” town Hamburg
area: 747 km²
population: 1.72 mio.
length: (Elbe): approx. 50 km



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Is the WFD helpful for automated monitoring?

- From a technical point of view the WFD supports the use of automatic monitoring stations.
- The WFD recommends in particular for early identification and early warning purposes.

Article 11 of the WFD states details of these:

Paragraph (3) sets out the “basic measures”. “Basic measures” are the minimum requirements to be complied with...”

Under **1)** it lists: “... any measures required to prevent significant losses of pollutants from technical installations, and to prevent and/or reduce the impact of accidental pollution ...’including through systems to detect or give warning of such events including ... all appropriate measures to reduce the risk to aquatic ecosystems.”



There are a lot of other articles where the WFD calls for automatic monitoring stations.

<p><u>Preamble</u> <u>Statement</u> In addition to ... Directive and ... concrete imp...</p>	<p><u>Article 1</u> <u>Statement</u> In Article 1 ... • prevent ... of ac...</p>	<p><u>Article 4</u> <u>Statement</u> Article 4 is ... programmes ... underlines ... prevent det...</p>	<p><u>Article 7</u> <u>Statement</u> Article 7 is ... drinking wa... Paragraph 3 ... water identified with the air</p>	<p><u>Article 8</u> <u>Statement</u> Article 8 ref... waters. For details s...</p>	<p><u>Article 13 (5)</u> <u>Statement</u> Article 13 (5) s... more detailed ... particular aspe...</p>	<p><u>Article 16</u> <u>Statement</u> This article is concerned with strategies for combating water pollution. Paragraph (9) states: 'The Commission may prepare strategies against pollution of water by any other pollutants or groups of pollutants, including any pollution which occurs as a result of accidents.'</p>
<p><u>Annex V</u> <u>Statement</u> Annex V 1.1 s... surface waters... priority subst... significant qua... As well as ove... undertake "ope... Operational m... objectives, or... The monitoring... pressures can</p>	<p><u>Annex VII</u> <u>Statement</u> Annex VII lists the information which must be provided in a river basin management plan. It requires a list of the environmental objectives and the measures designed to achieve these objectives. Specifically: 7. ... 7.8. ...</p>	<p>...aims at enhanced protection and improvement of the aquatic</p>				
<p>Investigative monitoring is to be performed if the reasons for failure to achieve the environmental objectives are not known, and to establish the magnitude and impacts of accidental pollution.</p>						

The water quality measuring network with biological early warning system in Hamburg performs the following important functions for water conservation:

- Indication of short-term and long-term changes in **water quality** as a basis for water management measures
- Early detection of incidents and illegal discharges
 - assessment of hazard potential arising from discharges
 - clues to identity of water pollution offenders
 - sampling platform
- Prevention: continuous monitoring of water bodies has a deterrent effect that helps prevent illegal discharges or other water pollution
- Others:
 - e.g. verification of success of water conservation measures



Automated Surface Water Monitoring Stations as part of the EU Water Framework Directive

Water quality measuring network with biological early warning system in Hamburg



10 stations located at different rivers in Hamburg:

- Registration of emissions,
- Registration of daily and seasonal fluctuations
- Registration of means and extremes for each parameter

4 stations with biotest systems:

- Recognition of toxic effects,
- Reporting of events/alerts to central control unit,
- Automatic alert sampling



Measuring station "Bunthaus" with biotests



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3 stations located at the river **ELBE**:

- 2 stations with biotest systems:
- 2 stations with recognition of toxic effects.
Reporting of events/alarms to central control unit, automatic alert sampling
- Bunthaus at the inbound of the Elbe to Hamburg
- Seemannshöft und Blankenese at the outgoing site
- **IKSE Monitoring stations: Seemannshöft and Bunthaus**



Measuring station "Seemannshöft" with biotests



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9



6 stations located at the river basin **Alster**, a tributary of the Elbe system :

- 1 station with biotest systems:
- 5 reports of events/alarms to central control unit, automatic alert sampling
- Wulksfelde at the inbound area of the Alster to Hamburg
- Lombardsbrücke close to the mouth to the Elbe
- Rosenbrook, Brügkamp and Wandsbeker Allee at tributaries to the Alster



Monitoring station "Lombardsbrücke"



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1 station located at the river basin **Bille**, a tributary of the system elbe:

- with biotest systems
- including oil-detection
- reporting of events/alarms to central control unit,
- automatic alert sampling
- special task: protect the water input to the water works "Curslack-Neuengamme"



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Physico-chemical parameters



- Oxygen electrode with water temperature registration
- pH-electrode with water temperature registration
- Conductivity electrode with water temperature registration
- Turbidity probe
- UV-absorption measurement (SAC 254 nm, dissolved organic matter)
- Oil-detector



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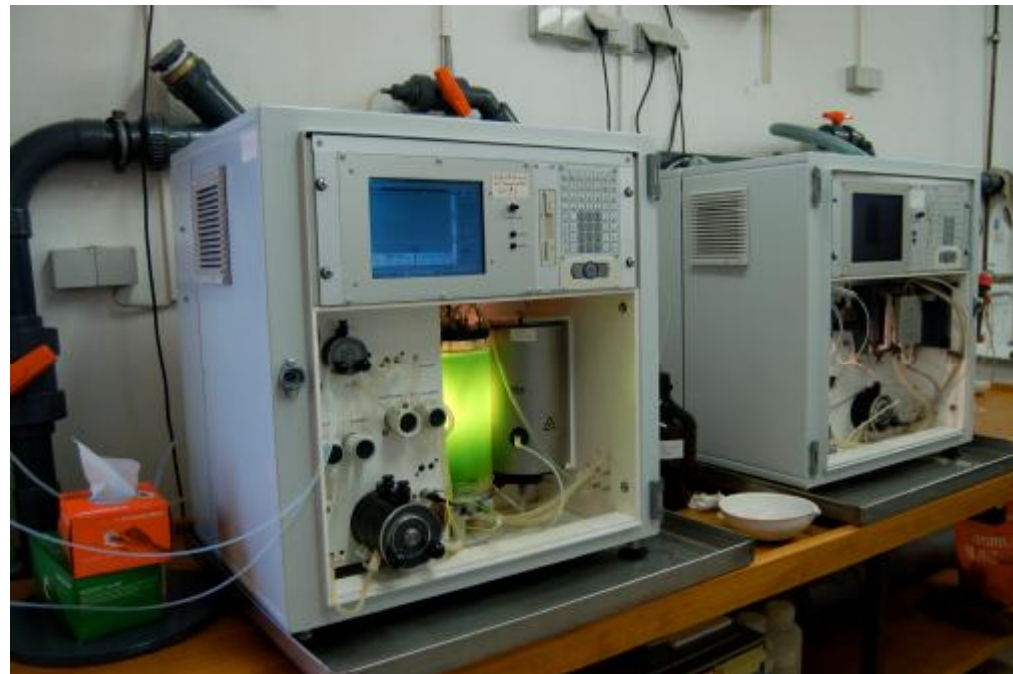
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Biological parameters and biotests

- Algae Online Monitor: continuous chlorophyll determination, algae class differentiation and photosynthetic activity measurement
- Algae Toximeter
- Daphnia Toximeter



Algae Online Monitor



Algae (left) and Daphnia Toximeter (right)



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Network

- All stations perform automatic, continuous round-the-clock recording stored in station computers database

before being

- transmitted, complete with any alarm reports, by ISDN to the central computer
- Control in the headquarters and over Internet possible



The entire measuring network with the 10 stations and the headquarters including the “biological early warning system” forms the “**water quality measuring network**”.



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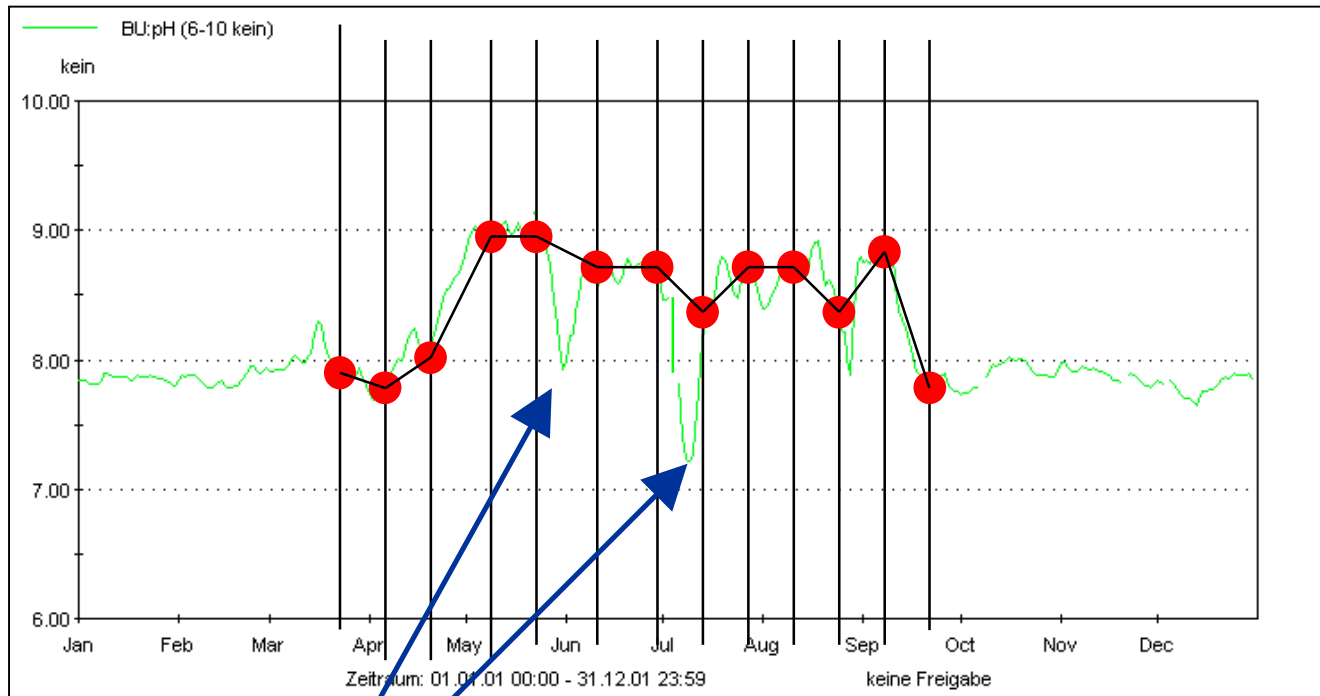
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Internet (only in German language)

- Lots of information given at www.wgmn.hamburg.de
- Ongoing stored data can be viewed at gateway.hamburg.de



- Why continuous measuring? -> long-term surveillance!



Example: Course of pH at a Station in River Elbe



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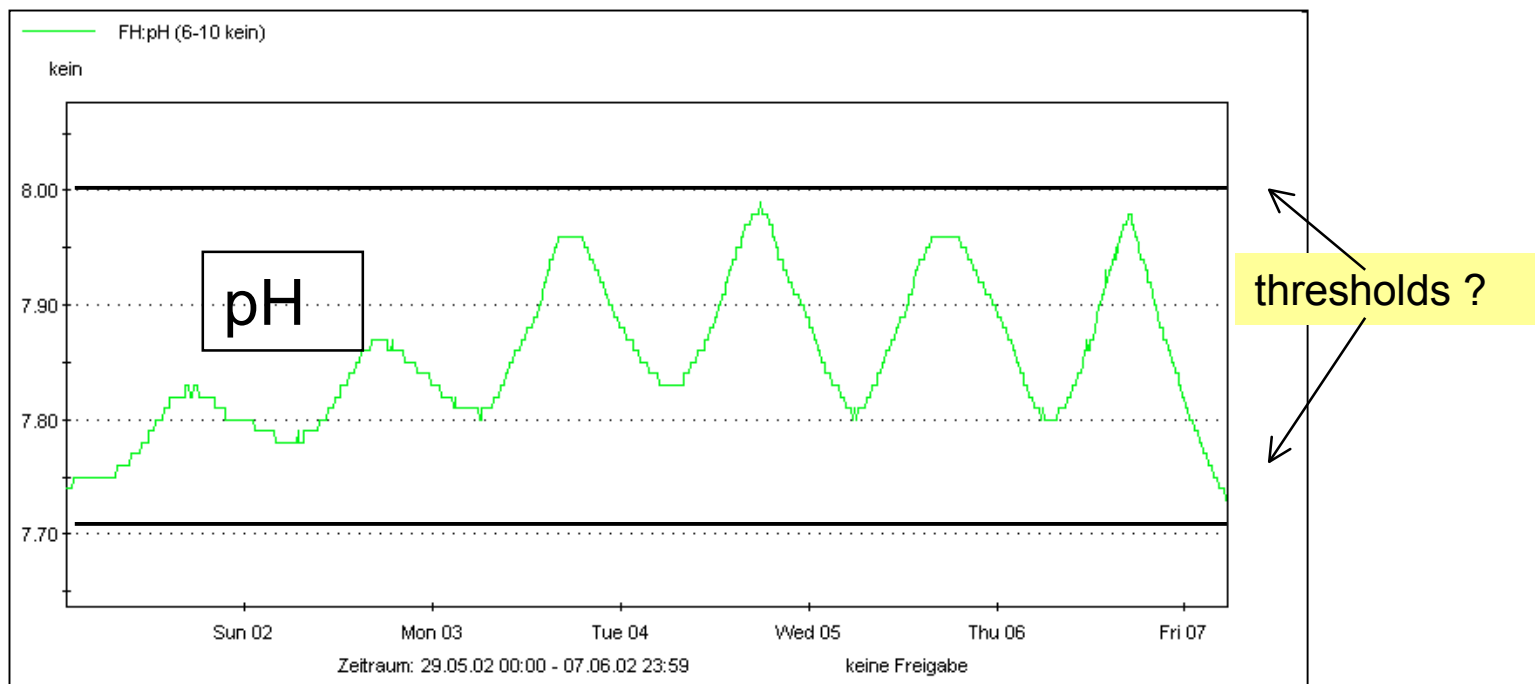
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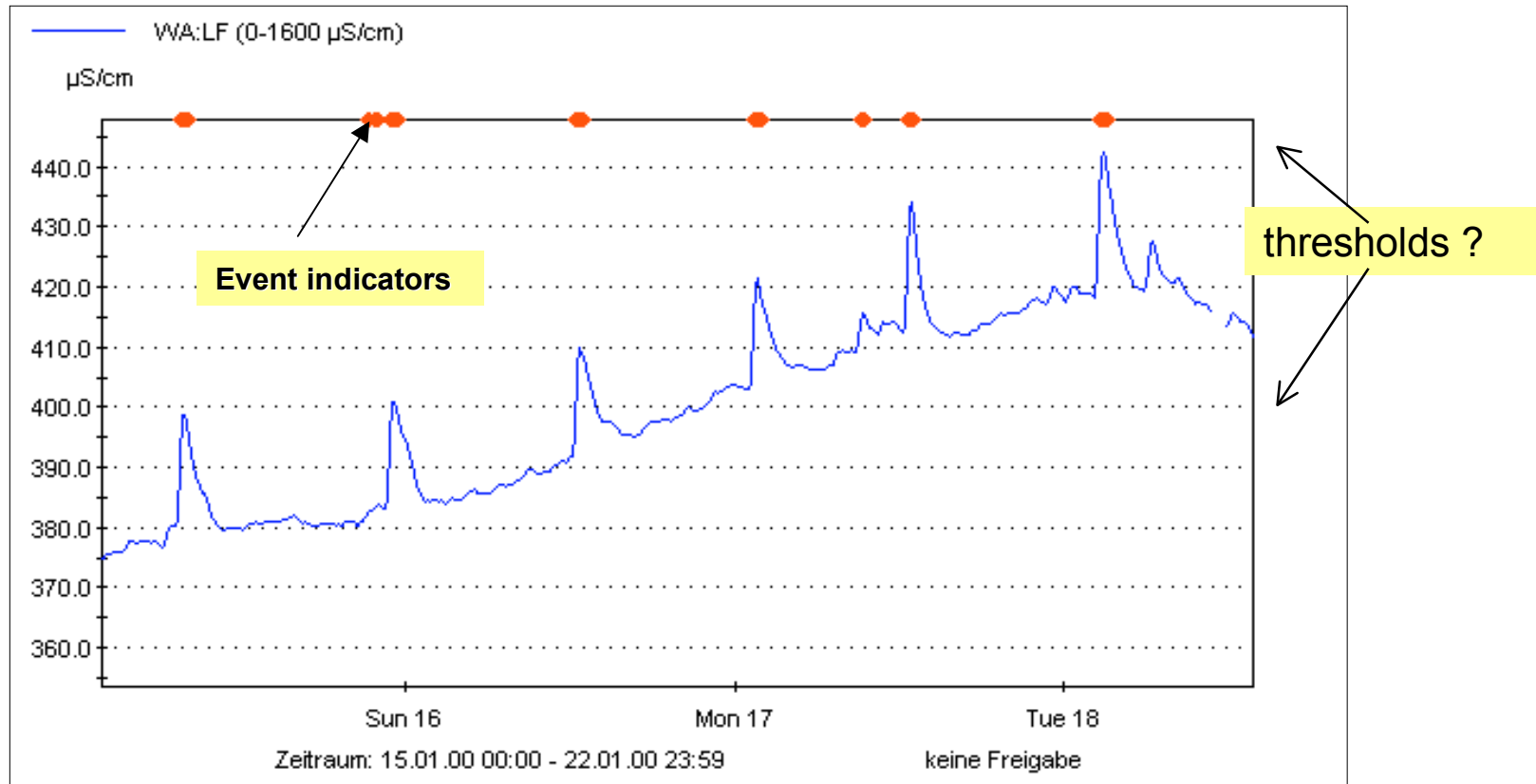
- Why continuous measuring? -> Short-term surveillance and alarm recognition

- METHODS OF UNUSUAL EVENT RECOGNITION IN MEASURING STATIONS



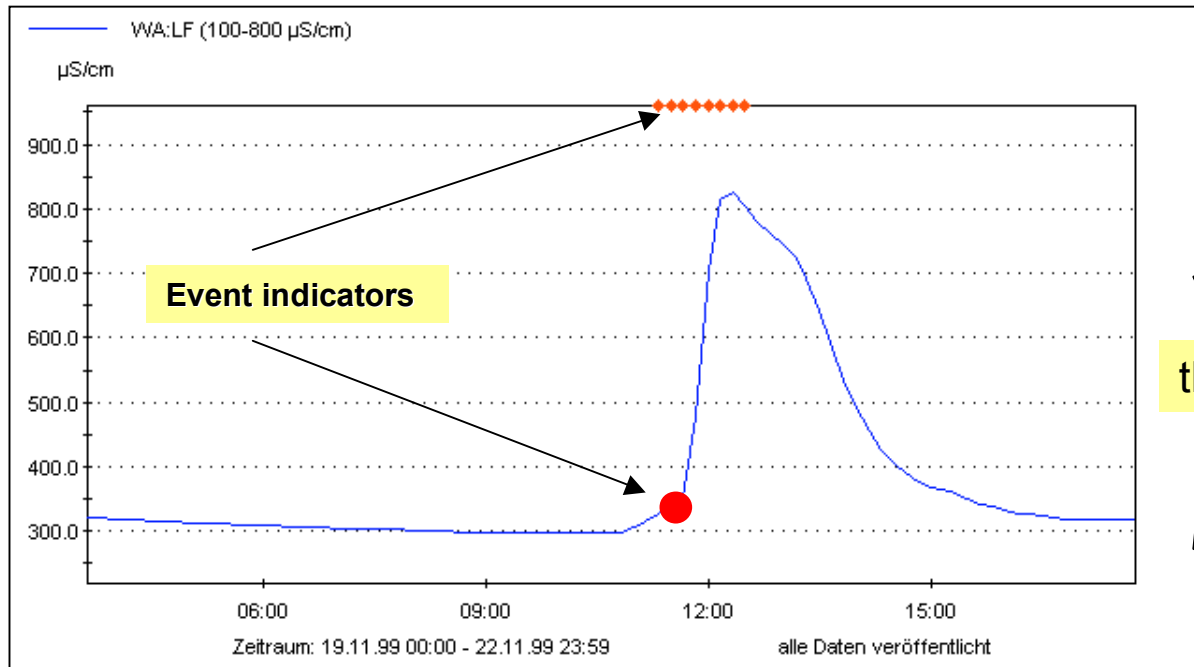
Day and night-time trends in the pH value (10-minute averages) caused by algal activity in a tributary of the Elbe river (measuring station Fischerhof, Hamburg) and static limit values (red lines)

• METHODS OF UNUSUAL EVENT RECOGNITION IN MEASURING STATIONS



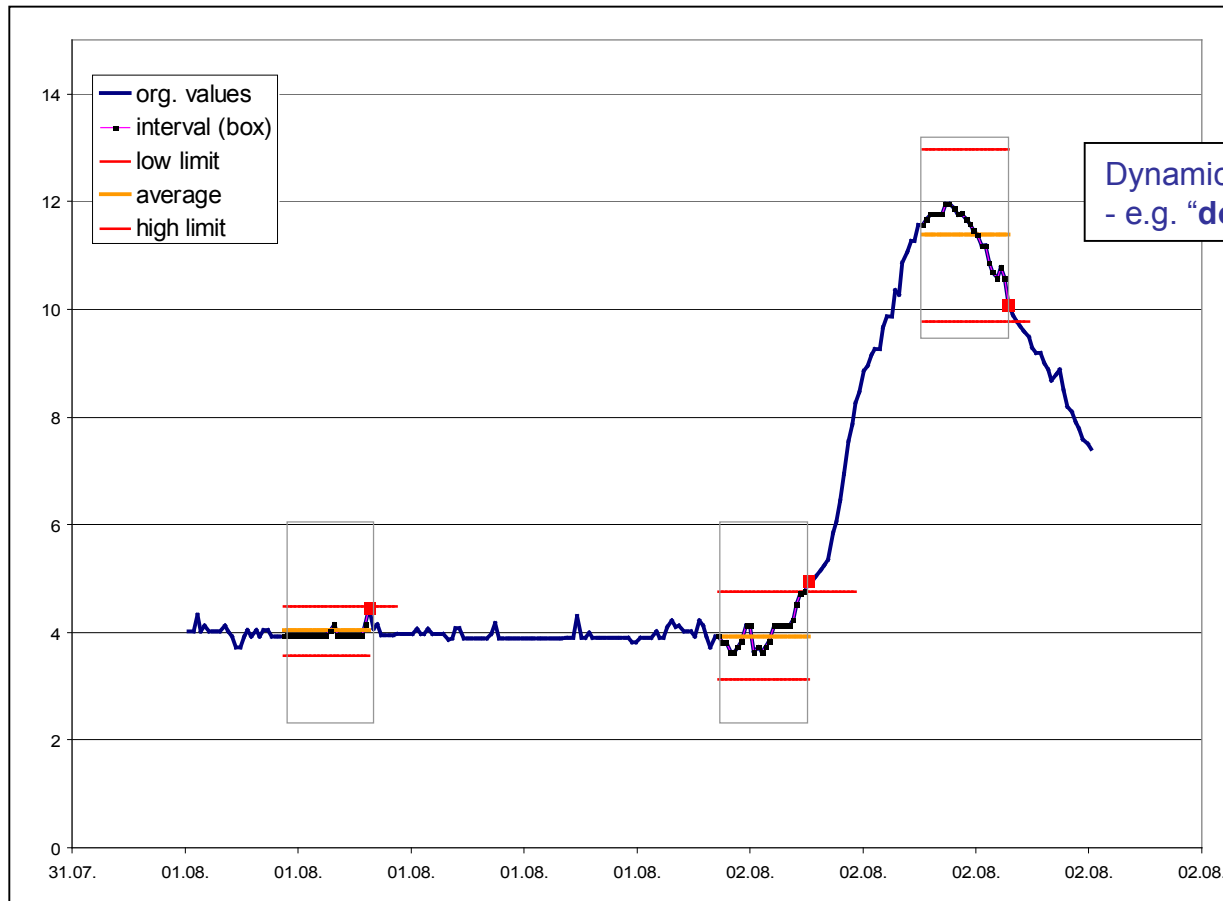
Registration of Acute Changes
in Water Quality

• METHODS OF UNUSUAL EVENT RECOGNITION IN MEASURING STATIONS



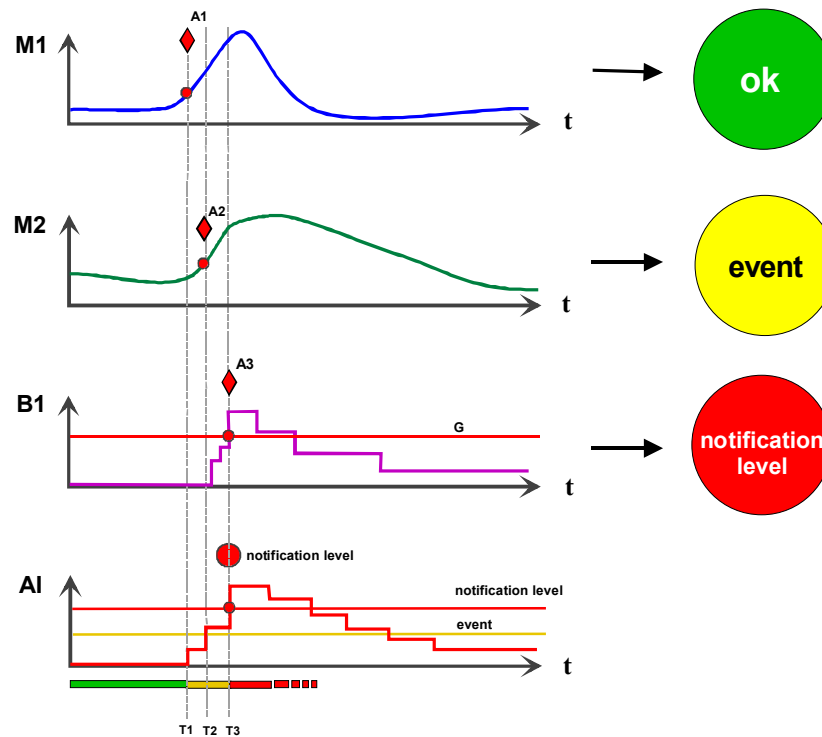
Representation of an unusual event (red marks) detected in the conductivity measurements (online module for monitoring data at the Hamburg measuring stations)

• METHODS OF UNUSUAL EVENT RECOGNITION IN MEASURING STATIONS



Integrated alarm-identification through an "alarm index"

•METHODS OF UNUSUAL EVENT RECOGNITION IN MEASURING STATIONS



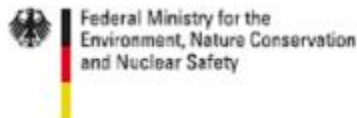
The EASE project:

“Development of Alarm Criteria and Detection of Major Incidents in Measuring Stations in the Elbe Catchment Area for International Emergency Planning”

see: www.ease.hamburg.de

- **Improvement** of automated measuring stations and international measuring
- **Optimization** of detection and assessment of contaminant waves
- **Automated registration** of unusual events and accidents
- **Development** of criteria for alarms

• Project commissioned by



From our point of view, the use of continuous chemical, physical and biological measurement methods can make a major contribution to implementing the requirements of Article 11.

There are also further references that argue in favour of the continuous use of such systems. The use of continuous measuring systems should therefore be established, their operation standardised, and their integration in warning and alarm systems intensified.

... but how to manage this?

- The project EASE gives lots of references on how to set up early warning systems.
- There will be a new project in Germany, which will discuss the statements shown.

In article 11.3.I are two chances:

- This is the place where monitoring stations are justified
- This is a connection for the combined approach between emission-oriented and ambient assessment for water bodies

This project will be a cooperation between the University of Leipzig and our institute. It will start this autumn. These results might help the Serbian twinning project.



Vielen Dank
für Ihre Aufmerksamkeit!

Thanks for your attention!

Werner Blohm



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