Evaluation of the anthropogenic impact on surface water systems: case of Lower Arges Basin, Romania

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Purpose of the study

- Evaluate the degree of contamination with sewage water:
  - Bucharest sewage water
  - NO wastewater treatment facility
- Potential to use fluorescence spectroscopy for sewage water detection

Fluorescence spectroscopy – pros & cons

- Fast
- Sensitive
- Small quantities of sample
- No sample pretreatment
- Correlates with standard methods
- Qualitative
- Influenced by external factors
- Only organic contamination

Principles of fluorescence

- Excitation spectra are mirror images of the emission spectra
- Emission has lower energy compared to absorption

Fluorescence spectra

- Emission spectrum
- Excitation spectrum
- Synchronous fluorescence spectrum
- Excitation–emission matrix
- Excitation–emission wavelength

Fluorescence spectra

- Excitation 300 nm

No continuous monitoring fluorescence-based instrument
Natural Organic Matter (NOM)

- comprises the decay products of animal and plant matter.
- NOM:
  - Autochthonous – microbially derived
  - Allochthonous – terestrially derived

Natural Organic Matter

- Dissolved Organic Matter
- Particulate Organic Matter

Methodology

- NO water treatment facility

Methodology

- Samples taken every season
- Measured within 24 h from collection
- Preserved at approx. 4°C

Results

- Spectrofluorimeter PerkinElmer LS 55
- Portable spectrophotograph Ocean Optics USB2000 – FL
- Pulsed light source Xenon PX
  - Q-switched YAG:Nd Laser
  - Second, third, forth harmonics
  - 10 Hz repetition rate
  - 4-6 ns pulse duration

- 1 – Sabar River
- 2 – Colibasi on Arges River
- 3 – Hotarele on Arges River
- 4 – Budesti on Dambovita River
- 5 – Shihalane on Arges River
- 6 – Clășeni on Arges River
- 7 – Sampling point on Dambovita
- 8 – Dambovita River
- 9 – Dambovita River

- 250 300 350 400 450 500 550
- 0.0 0.2 0.4 0.6 0.8 1.0
- Intensity (a.u.)
- Wavelength (nm)

- Sabar
- Hotarele
- Colibasi
- Clășeni
- Budesti (morning)
- Budesti (noon)

- February 2007
Conclusions

- Significant contamination with wastewater discharged from Bucharest, especially at Budesti.
- An hourly organic matter trend connected to increased human activity in morning and afternoon hours.

- The usefulness of fluorescence spectroscopy in the quick evaluation of pollution for the water management (Amelene)