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Spectral characterization of chromophoric dissolved organic matter (CDOM) for the detection of wastewater discharges in bathing areas.

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Coastal areas are undoubtedly the most vulnerable areas of the marine environment, as they are characterized by a large number of human activities (industries, businesses, tourism, etc.) as well as high population density. Due to the multiple roles that plays and to the many impacts it is subjected to, the coastal marine environment is highly susceptible to pollution.
Economical and productive settlements, industries and power plants, tourist and commercial ports involve the presence of numerous discharges that spill into the sea abundant volumes of organic matter, faecal bacteria, viruses and potentially polluting chemical elements (e.g. metals, hydrocarbons, pesticides, etc.). In this context, the attainment and/or maintenance of Good Environmental Status (GES) of the coastal waters is a fundamental target to preserve marine ecosystems and to protect public health.
In the light of these considerations, this study refers on the optical properties of chromophoric dissolved organic matter (CDOM) and Escherichia coli concentrations in a bathing area affected by wastewater discharge in the northern Latium, Italy.
The application of parallel factor analysis (PARAFAC) to the excitation–emission matrices (EEMs) of CDOM distinguished among three different components: C1 (λEx: 342 nm and λEm: 435 nm), C2 (λEx: 281/373 nm and λEm: 460 nm) and C3 (λEx: 286 nm and λEm: 360 nm), corresponding to the peak “C” of humic acids of terrestrial origin (C1 and C2) and to the peak "T" characteristic of the tryptophan amino acid (C3).
The relative abundance of the peaks C1 and C2 was found to be almost constant at all sampling stations, while the C3 peak was detected in correspondence of stations near the water discharge.
Microbiological analysis of coastal water samples showed that the C3 peak was strongly related to the presence of E. coli cells, as well as their enzymatic activities and physiological state.
By comparing spectral and microbiological results, it has become apparent that tryptophan, whose fluorescence in the water indicates the presence of active bacterial communities ascribable to E. coli, is an excellent tracer of untreated and potentially contaminated waters.
The results confirm the usefulness of CDOM fluorescence properties as a proxy of faecal pollution in bathing areas, providing a monitoring tool for the assessment of the potential impacts of wastewater discharges in coastal areas.