

SCCWRP #1111

Colored Dissolved Organic Matter (CDOM) as a tracer of effluent plumes in the coastal ocean

Nikolay P. Nezlin, Chris Beegan, Adriano Feit, Joseph R. Gully, Ami Latker, Karen McLaughlin, Michael J. Mengel, George L. Robertson, Alex Steele, Stephen B. Weisberg

ABSTRACT

Mapping wastewater effluent plumes is typically conducted using ammonia as a tracer, but this provides low spatial resolution since it is collected as discrete bottle samples. Here we evaluate the use of colored dissolved organic matter fluorescence (CDOM) collected continuously with a CTD+ water column profiler as potential plume tracer alternative. We developed an algorithm for plume detection based on the image segmentation approach in 3D space and validated it against interpolated ammonia values collected during fourteen years of water quality monitoring (2004–2017) around three southern California ocean outfalls. There was 78%–81% agreement between plume site identification by CDOM and ammonia methods at the three outfalls, with an almost equal fraction of the differences attributable to apparent error from each tracer. The biggest shortcoming of using ammonia concentration was its rapid transformation in seawater via nitrification or biological uptake, which is most problematic at stations at the plume perimeter. Shortcomings of the CDOM method include calibration problems, inappropriate excitation/emission characteristics of standard WETStar fluorometers and non-effluent (confounding) sources of CDOM in seawater around the outfalls, but these are largely correctable and are outweighed by the greater spatial and temporal resolution this method offers.

Due to distribution restrictions, the full-text version of this article is available by request only. Please contact pubrequest@sccwrp.org to request a copy.