Geophysical Research Abstracts
Vol. 20, EGU2018-16623, 2018
EGU General Assembly 2018


# Modelling the fate of dissolved organic matter (DOM): Implications for hypoxia in an effluent-dominated river

Jingshui Huang (1), Hailong Yin (1), Penghui Li (2), and Qi Zhou (1)

(1) Tongji University, Shanghai, China (huangjingshui@126.com, yinhailong@tongji.edu.cn, zhouqi@tongji.edu.cn), (2) Southern University of Science and Technology, Shenzhen, China (lipenghui1987@126.com)

Many urban rivers dominated by Wastewater Treatment Plant (WWTP) effluent suffer hypoxia in China. The abundance and composition of dissolved organic matter (DOM) and its biogeochemical processes play an important role in determining instream oxygen balance. To understand the mechanism of hypoxia in effluent-dominated rivers, the source, spatial distribution and fate of DOM were investigated by excitation emission matrix fluorescence combined with parallel factor analysis (EEM-PARAFAC) in Nanfei River, China (∼70% of its flow contributed by the WWTP effluent). Besides, a hydrodynamic model and water quality model with the fluorescence intensity of identified components as variables and considering two first-order-decay processes of photodegradation and biodegradation were set up and calibrated against the measured data. Five EEM-PARAFAC components were identified, including four humic-like components (C1-C4) and one protein-like component (C5). The fluorescence intensity of C1, C2 and C4 decreased by photodegradation downstream of the WWTP. The calibrated photodegradation rates were 0.12 $d^{-1}$, 0.1 $d^{-1}$ and 0.15 $d^{-1}$, respectively. C3 was identified as a possible photoproduct and its fluorescence intensity increased with the calibrated production rate as 0.08 $d^{-1}$ in the same river section. The lower production rate of C3 compared with the decay rates of C1, C2 and C4 implied that C3 was only a part of their photodegradation products, the rest were non-fluorescent and low-molecule-weight organic compounds after photo bleaching. Meanwhile, the Biological Oxygen Demand (BOD) decay rate downstream of the WWTP with the value of 0.30 $d^{-1}$ were significantly elevated than its value in the effluent at WWTP outlet (0.09 $d^{-1}$). The phenomenon could be explained by that a large number of bio-refractory DOM contributed from the effluent was photo transformed to more bio-labile and low-molecule-weight DOM with a long residence time and exposure to light radiation in the river. Eventually, the improved the bio-availability of DOM and enhanced instream heterotrophic metabolism resulted in the rapid oxygen depletion and stimulated the occurrence of hypoxia in the effluent-dominated river.