

Characterisation of dissolved organic matter in the Lower Kinabatangan River, Sabah, Malaysia

Abstract

Spatial patterns and trends in the concentration and quality of dissolved organic matter (DOM) are characterised across a tropical agricultural catchment using ultraviolet (UV)-visible absorbance, and fluorescence spectroscopy. Related determination of the environmental isotopes ^{18}O and ^2H clarify the dynamics of catchment water movement. Water samples were collected from the Kinabatangan River, Borneo, and selected tributaries in August and September 2008 in four regions with oil palm plantations (KB1, KB2, KB3 and KB4). The isotopic compositions of surface waters suggest that canals were characterised by a strong evaporative effect than tributaries and streams with more natural, forested vegetation. DOM was characterised by variations in UV absorbance and spectral slope. Individual fluorescence excitation–emission matrices were decomposed by Parallel Factor Analysis (PARAFAC) and three components extracted (C1, C2 and C3). Components C2 and C3 both appear to be derived from microbial sources and/or photo-degradation. The PARAFAC components indicate a clear trend of increasing DOM degradation as waters pass through the catchment. It is hypothesised that upstream DOM is rapidly photo and microbially degraded to less fluorescent DOM, while DOM concentration and character of DOM downstream is controlled by the hydrology, specifically by variations in the rate of water movement.