

Measurement of light attenuation extends the application of suspended sediment monitoring in rivers

A.O. HUGHES, R.J. DAVIES-COLLEY & A.H. ELLIOTT

National Institute of Water and Atmospheric Research Ltd (NIWA), PO Box 11115, Hamilton 3251, Hamilton, New Zealand

andrew.hughes@niwa.co.nz

Abstract Turbidity is often monitored continuously as a proxy for suspended sediment in catchment sediment load studies, but is less often applied to measuring optical ‘loads’ as they affect water quality in downstream waters. We added measurements of visual clarity, from which light (beam) attenuation can be estimated, to auto-sampler monitoring over storm events in tributary rivers of the Kaipara Harbour, a large barrier enclosed estuary complex in northern New Zealand. This paper presents, for the first time, evidence of the mutual relationships between turbidity, total suspended sediment (TSS), and visual clarity, from water samples collected under event flow conditions. The mutual relationships between turbidity, TSS and visual clarity for our monitoring sites were fairly close over about three orders of magnitude (TSS ranging from about 1–1000 mg L⁻¹). Our results show that visual clarity (and hence light attenuation) can be predicted from turbidity, at least as precisely as more traditional predictions of TSS from turbidity. The estimation of light attenuation and corresponding load estimates from visual clarity measurements, for relatively little marginal extra effort, extends the environmental relevance and application of suspended sediment monitoring.

Key words turbidity; water clarity; optical water quality; light penetration; sediment loads