



Riverine sediment-associated metal concentrations in the urban tropics: a case study from Singapore

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The impact of urbanization on river water quality is well recognized, but there is a paucity of data on sediment-associated metal dynamics in urban systems in the tropics. To begin addressing this deficiency, suspended sediment samples were collected from two residential urban catchments in Singapore; Jurong West (JW) and Ang Mo Kio (AMK). Impervious cover accounts for 84% and 60% in JW and AMK respectively. Approximately 100 suspended sediment samples were retrieved from each site under tropical storm conditions between March 2005 and August 2006. Sediment samples were analyzed for Cr, Cu, Ni, Pb and Zn, together with a range of common cations. Trace metal concentrations are highly variable under storm conditions in both catchments. Maximum concentrations exceed 100 mg kg^{-1} for Cr and Ni, 800 mg kg^{-1} for Cu and Pb, and 4000 mg kg^{-1} for Zn. At JW, there is a significant ($p < 0.01$) negative relationship between all trace metals and suspended sediment concentrations (SSC). At AMK, there is also a significant ($p < 0.01$) negative relationship between Cr, Cu, Ni and Zn and SSC. Bivariate relationships reveal a strong link between trace metals and Fe and Mn, although this relationship is much more pronounced at JW. All trace metals show strong correlation with each other at JW. Correlations between trace metals at AMK are more variable. The results suggest that Fe-Mn oxides are the predominant vector for trace metal transport, especially at JW. Other water constituents, possibly organic matter, may play a role in the transport of metals at AMK. The high levels of metals in the two catchments are likely to relate to anthropogenic inputs. The results suggest that these inputs vary between catchments, possibly driven by differences in impervious cover and/or connectivity between impervious areas.