Landscape response to a storm event in the Clear Creek IA watershed

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A major goal of the Intensively Managed Landscape CZO (IML-CZO) is to understand how the critical zone of the agricultural midwest of North America will respond to the pressures of increased landuse and climate change. As an early step towards that goal, the landscape response to a storm event of one of the IML-CZO field sites, the Clear Creek watershed in Iowa, was studied to determine the sources of sediment to the creek and the threshold of activation of each. The Clear Creek watershed is ~270 km^2 and is dominated by corn-soybean agriculture. Water samples were collected with a 6-hour frequency prior to, during and after a storm event in October 2014 at two stations ~20 km apart on the creek. The suspended particulate load was isolated via filtration and characterized by transflectance micro-FTIR spectroscopy and C, N elemental and stable isotope analyses.

FTIR spectra indicate a carbonate component throughout the hydrograph that was especially obvious at low flow. It is currently hypothesized that the carbonate is from runoff of gravel roads constructed in part from local limestone. A montmorillinite-like signature dominates at high flow. The clay signature matches that of surface soils in the watershed.

$\delta^{13}C$ values varied from classic C3 plant signatures (-25 to -35‰) to those of C4 vegetation (~-15‰). C/N ratios varied from ~7-12. Temporal trends in both parameters are consistent with the mobilization of subsurface soils at all flows and the initiation of surface erosion at ascending flow. We interpret the results as indicating that road runoff and bank erosion are chronic sources of sediment to the stream, whereas surface erosion from agricultural fields becomes important during peak precipitation.