Geophysical Research Abstracts
Vol. 13, EGU2011-3890, 2011
EGU General Assembly 2011

New tools to understand nutrient fluxes: Directionality and precipitation normalized loads

Douglas Smith and Elizabeth Pappas
USDA, Agricultural Research Service, NSERL, West Lafayette, Indiana, United States (drsmith@purdue.edu)

A tremendous amount of research at the plot scale has been used to assess the influence of nutrient management on P transport at the field scale. The objectives of this research were to determine if plot scale rainfall simulations could be used to assess P transport from two fields that were managed using no-tillage or rotational tillage, and to determine which in a series of metrics provided the most useful information with respect to nutrient fate and transport. Plots were constructed within the management zone, but adjacent to monitored fields. Phosphorus transport at the field scale throughout the growing season were compared to confidence limits established by the rainfall simulations, and a secondary analysis compared values from individual storms to the rainfall simulations. Soluble P (SP) loads from the no-tilled Field 1 (75 g ha-1) were greater than from the rotationally tilled Field 2 (11g ha-1) in 2004. Stratification of P in the uppermost portion of the soil profile is a known contributor to SP loading in long-term no-tilled fields. This trend was reversed in 2006 though, as SP loads were 16 g ha-1 from Field 1 and 55 g ha-1 from Field 2. The greater loads from the Field 2 were due to greater discharge and a greater P application rate compared to the Field 1. Soluble P and total P (TP) loads were generally directionally correct, but the values obtained from plots were not necessarily similar to those observed at the field scale. Precipitation normalized loads for SP and TP were the most similar metric when comparing values from the plot to the field scale (i.e. more field scale values fell within the 95% confidence limits set by the plot data than the other metrics). Using cumulative field scale data from each year or the mean values from storms by year did not appear to change the results of this study. This study confirms that the management decisions based on standardized rainfall simulation procedures are likely to be sound, and will probably lead to improved quality of runoff water from fields. Precipitation normalized loads appear to be a metric that may provide additional insight into P transport at various scales.