CHLORIDE SIGNATURE AND TRANSPORT IN AN URBAN-AGRICULTURAL WATERSHED

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Analyses (n = 525) of chloride (Cl^-), bromide (Br^-), nitrate as nitrogen (NO_3-N), sodium (Na^+), calcium (Ca^{2+}), and potassium (K^+) in stream water, tile-drain water, and groundwater were conducted in a small urban-agricultural watershed (10% urban/impervious, 87% agriculture) in Central Illinois to investigate the importance of stormflow to Cl^- transport and to explore potential differences in the signature of Cl^- originating from an urban source as compared to an agricultural source. Water samples were collected on a weekly interval and during storm events from February 2018 to February 2019 at three stations along the stream and from tile drains and wells. Nearly all surface water and tile water samples had Cl^- concentrations above the calculated background threshold of 18 mg/l. A Mann-Whitney U test show ratios of Cl^- to Br^- ($p = 0.045$), NO_3-N ($p < 0.0001$), Ca^{2+} ($p < 0.0001$), and Na^+ ($p < 0.0001$) to be statistically significantly different between urban and agricultural waters. Cl^- ratios indicate that road salt is the dominant Cl^- source while KCl fertilizer is an important secondary source. Storm events were vital to Cl^- export accounting for 57.5% of total Cl^- load during only 19% of the study period. Winter and spring storms accounted for nearly half of total Cl^- export, while summer and fall accounted for only 10% of total export. Elevated Cl^- was flushed through the watershed following the cold season (Dec-Feb) and just after the dry season (Jun-Aug). Road salt use appears to be able to raise Cl^- concentrations to levels hazardous to ecosystems and water supplies (>100 mg/l) in a dominantly agricultural watershed. This study demonstrated that while deicing in watersheds where urban land use is minimal can have a profound impact on Cl^- dynamics, agricultural practices should not be ignored.

PRESENTER BIO: Andrew is a PhD student in the UF Department of Geological Sciences. His research interests include karst hydrogeology and hydrochemistry, groundwater quality and sustainability, and urban hydrology.