

**A HIERARCHICAL MODEL FOR ESTIMATING LONG-TERM TREND OF ATRAZINE
CONCENTRATION IN THE SURFACE WATER OF THE CONTINENTAL UNITED STATES**

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ABSTRACT: Atrazine is a herbicide frequently detected in both surface and groundwater in the U.S. Despite its common usage, the environmental impacts of atrazine are fiercely debated. Without general consensus about its toxicological and ecological effects, the management and monitoring work must be undertaken with great cautiousness. In this research, we study the spatiotemporal trends of atrazine using data from 1990 to 2010 in the continental U.S. We apply the Bayesian hierarchical modeling approach, which allows the trends to vary under the same distribution for different hydrological groups. This captures both the similar and unique features of the hydrological groups. Another advantage of the approach is its capability to model the left censored data (measurements below method detection limits), with a Markov Chain Monte Carlo simulation. The model results indicate slightly downward trends in concentrations in both streams and lakes. But trends in lake waters are somewhat uncertain due to small sample sizes. The results also show that there is a distinct spatial pattern, especially in trends for streams: the northern half of the continental U.S. is likely experiencing a flat or downward trend while the southern half is experiencing a slightly upward trend. Using land cover type for each hydrological group as a group predictor, we find that the trends decrease with percentage of crop land. This suggests that the growing defused applications of atrazine associated with expanding sprawling in the southern half of the U.S. is increasingly responsible for atrazine contamination in the nation's surface water.

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