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Temporal stability of *E. coli* concentration patterns in two irrigation ponds in Maryland

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There are about nine million ponds in U.S., and many of them serve as important agricultural surface water source. *E. coli* concentrations are commonly used to evaluate microbial water quality for irrigation and recreation. Our hypothesis was that temporally stable patterns of *E. coli* concentrations exist across irrigation ponds, i.e. there are zones where *E. coli* concentrations are mostly or always lower than the average concentration across a pond for any sampling event, and there are other zones where *E. coli* concentrations are mostly or always higher than the average concentration across a pond for any sampling event. Two irrigation ponds in Maryland were sampled biweekly in summer of 2016. Samples were taken in 22 locations across one pond and at 34 locations across another pond on grids. Temperature, pH, turbidity, and concentrations of dissolved oxygen, nutrients, chlorophyll *a*, and generic *E. coli* were determined. Methods of temporal stability assessment included estimating Vachaud's mean relative differences, computing the Spearman correlation coefficient, and deriving empirical orthogonal functions. All three methods indicated the presence of temporally stable patterns in *E. coli* concentrations and environmental covariates. The distance from the shore seemed to serve as one of controls. Temporal stability was found for the most of environmental covariates. Smaller mean relative differences of E. coli concentrations corresponded to larger mean relative differences of chlorophyll *a*. Presence of temporal stability in *E. coli* concentrations across ponds means that (a) the selection of sampling locations may strongly affect the microbial quality assessment, (b) the microbial quality of water at the pumping intake for irrigation can be affected by the intake location, and (c) one or more locations can be found where *E. coli* concentrations remain close to the median concentrations across the pond, and can be used to characterize the overall microbial water quality.