

STATISTICS COLLOQUIUM

FRIDAY, FEBRUARY 10, 2012

TALK: 11:00 A.M. — SCIENCE CENTER RM. 705

“NONSTATIONARY MODELING THROUGH DIMENSION EXPANSION”

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ABSTRACT

If atmospheric, agricultural, and other environmental systems share one underlying theme it is complex spatial structures, being influenced by such features as topography and weather. Ideally we might model these effects directly; however, information on the underlying causes is often not routinely available. Hence, when modeling environmental systems there exists a need for a class of spatial models which does not rely on the assumption of stationarity.

In this talk, we propose a novel approach to modeling nonstationary spatial fields. The proposed method works by expanding the geographic plane over which these processes evolve into higher dimensional spaces, transforming and clarifying complex patterns in the physical plane. By combining aspects of multi-dimensional scaling, group lasso, and latent variable models, a dimensionally sparse projection is found in which the originally nonstationary field exhibits stationarity. Following a comparison with existing methods in a simulated environment, dimension expansion is studied on a classic test-bed data set historically used to study nonstationary models. Following this, we explore the use of dimension expansion in modeling air pollution in the United Kingdom, a process known to be strongly influenced by rural/urban effects, amongst others, which gives rise to a nonstationary field.