

STATISTICS COLLOQUIUM

APRIL 25th and 26th, 2007

TALK: 3:30 PM — HSPH Kresge G1/G2

Simulcast – CGIS N031

(1737 Cambridge Street)

“Models and Diagnostics for Spatial and Spatial-Temporal Processes”

Michael Stein

Department of Statistics

Director, Center for Integrating Statistical and the Environmental Science

University of Chicago

ABSTRACT

These two talks explore basic issues concerning the modeling of spatial and spatial-temporal covariance functions. My main point is that the correct way to think about a modeled covariance function is that it should accurately reproduce the variance of any linear combination of the observations. Traditional approaches to covariance focus modeling compare empirical and theoretical versions of covariance functions (or the closely related variograms). However, both covariance functions and variograms only look at the dependence of two observations at a time and, while, in principle, one can recover the variance of any linear combination from the covariance function (or the variance of any contrast from the variogram), in practice it is difficult to do this effectively. Common structures for spatial-temporal datasets, such as monitors at fixed spatial locations, naturally lend themselves to consideration of variances of linear combinations of more than two observations, which provides useful diagnostics for spatial-temporal models. As well as suggesting useful data analytic tools, the notion of covariance functions as descriptors of the variances of all possible linear combinations of observations can help us to think more abstractly about the properties we should seek in spatial-temporal covariance functions. Various classes of models for spatial-temporal covariance functions will be considered through this viewpoint. Spectral analysis, which is an example of considering the variances of a variety of linear combinations of observations, will be particularly helpful in this regard.