"Statistical Evaluation of Multiresolution Model Output and Asymptotic Spectral Theory for Nonlinear Time Series"

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ABSTRACT

Abstract 1: CMAQ is a numerical air quality model which gives concentration of various air pollutants at several different scales. Our main interest is to model the conditional distribution of high resolution output (96 by 96 in space,576 hours) given low resolution output (24 by 24 in space, 576 hours). By a Haar Wavelet Packet Transform of high resolution output for each hour, we naturally link its wavelet coefficients (at a certain frequency band) with the low resolution output. A simple regression method is used to take out the conditional mean and the main task is then to model the residual space-time process for low frequency piece. Future work will be outlined, including the study of model discrepancy by comparing the runs at different resolutions under similar initial/boundary conditions.

Abstract 2: In this part, I will first present some examples of nonlinear time series models followed by discussion on the dependence assumptions commonly adopted in time series literature. For a nonlinear casual process, under the projection type of assumptions, we can show the asymptotic normality of the Fourier transform at Fourier frequencies. Another important topic in spectral analysis is the estimation of spectral density function. Under mild moment condition and geometric moment contraction, we established the asymptotic normality and maximum deviation of spectral density estimates.