



Characterization of Air Quality and Hydro-Meteorological Factors based on Noise-assisted Empirical Mode Decomposition (NAMEMD) and Time-dependent Intrinsic Correlation (TDIC)

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This study aims to elucidate the correlation between and hydro-meteorological variables using the multivariate nonlinear and non-stationary filtering method (NAMEMD algorithm) and moving correlation analysis (TDIC algorithm). The EEMD algorithm and the NAMEMD algorithm are compared with respect to scale identification. The annual, diurnal and semi-diurnal scales are determined to be significant in the time series, based on NAMEMD filtering. The global correlation of and hydro-meteorological variables is compared with the global correlation and the TDIC plot at the above scales, based on the NAMEMD algorithm. The nonlinear, non-stationary and multiscaled property make measuring the correlation in a physically representative way difficult. The TDIC algorithm is then introduced to study the temporal fluctuations of local correlations. At diurnal scale, a seasonal variation of the local correlation between temperature and humidity is observed.

Compared the observed correlation between air pollutants and hydro-meteorological variables in previous works, a scale-dependent moving correlation analysis provides more information in both the time domain and the frequency domain. The observed correlations of with hydro-meteorological factors are weaker than those of pollutants without complex compositions (Wise and Comrie, 2005). The correlation analysis using NAMEMD-based TDIC algorithm represents a considerable improvement over the limitations including linearity, non-stationarity, multiple scales and window size selection.