# Composite Likelihood Approach for Multivariable Spatio-Temporal Processes

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In recent years, modelling and predicting spatio-temporal processes has received numerous attention in research. However, the high dimensional problem posed a great computational obstacle in practice. Traditional estimating approaches including likelihood and Bayesian methods become inefficient, if not infeasible, owing to inverting high dimensional matrices or computing high dimensional integrals. To rectify the problem, some authors suggested the composite likelihood approach, a simplified version of the full likelihood approach, which is found to be more computationally efficient while retaining nice properties of the full likelihood estimators including statistical consistency. Multivariable spatio-temporal processes, which include more than one variable, are usually seen in practice, especially for environmental quality monitoring networks. While most of the previous works on composite likelihood approaches have been focusing on univariate spatio-temporal processes, the objective of our work aims at developing a composite likelihood approach in modelling multivariable spatio-temporal processes. We propose to estimate the parameters of the cross-covariance functions based on a weighted pairwise joint composite estimating method. Its potential applications, including environmental quality monitoring and risk assessment concerning air pollution, water pollution, etc., will be discussed.

Key Words: Environmental data, geostatistics, computational efficiency, weighted pairwise joint composite estimation